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## THE RAINFALL OF THE WINTER MONTHS.

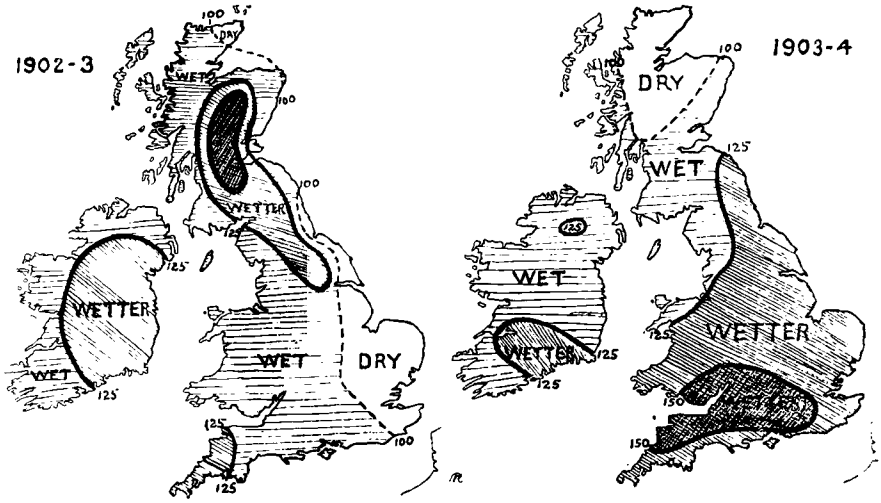
The month of March concludes the winter half-year, and, before considering that period as a whole, it is desirable to look at the distribution of rainfall for the month. Over the greater part of England the rainfall of March was close to, or rather under, the average of the last ten years, that is to say considerably under the long-period average. In the east of England there was a slight excess of rainfall, the relatively wettest station reported in our tables being Brundall near Norwich, where, however, the excess amounted only to 20 per cent. The deficiency of rainfall was most marked in North Wales, where at Llandudno it amounted to 32 per cent. of the ten years' average.

In Scotland the rain was generally far below the average for the month, especially in the district bordering the Moray Firth, where the total fall of rain was less than one inch, and the deficiency at Cawdor near Nairn amounted to 72 per cent.; in other words, the rainfall was little more than one quarter the usual amount. Ireland, however, showed a considerable excess of rainfall, except in the extreme north where it was dry. The wettest station was Waterford, where the excess amounted to 43 per cent. of the average fall.

The month, in fact, was a very ordinary March so far as rainfall is concerned; rather wet in Ireland, rather dry in Scotland, and as nearly as possible normal in England.

In the ordinary treatment of rainfall statistics the figures are grouped according to the calendar years, but for many purposes it is more natural and more useful to divide the circle of the year into two parts as near the equinoxes as possible. The six months from October to March include the whole Winter, the late Autumn, and the early Spring, and the rainfall at a series of 51 stations for that period is summarised in the following Table. The first column gives the number of inches of rain above (+) or below (—) the ten years' average of the six months, and the second column shows the ratio which the rainfall of the six months bears to that average expressed as 100. It is interesting to compare the figures for the previous winter half-year as given in the number of this Magazine for April, 1903, p. 41. For the sake of clearness, the comparison has been

thrown into a graphic form in the two little maps here reproduced. The unshaded portion indicates the districts in which the six months, including winter, were drier than the average, the increasingly dark shading distinguishes those districts within which the rainfall




exceeded the average by less than 25 per cent., between 25 and 50 per cent., and by more than 50 per cent.; these may be called the wet, wetter and wettest areas. The chief interest in both cases attaches to Great Britain, the rainfall of Ireland having been similar each time, and showing an excess of from 20 to 26 per cent. During 1902-1903 it will be noticed that the wettest area lay in the centre of Scotland, and the dry area was confined to Caithness and the east of England. This was due entirely to the extraordinarily high rainfall of the first three months of 1903 in Scotland, when it was comparatively dry in England. During 1903-1904, on the other hand, the dry area was confined to northern Scotland, including almost the whole of the Highlands, while the greater part of England had a rainfall more than 25 per cent. in excess of the average, rising in the south in the Thames valley and the land bordering the Bristol Channel to an excess of more than 50 per cent. This was mainly due to the extraordinarily heavy rainfall of October, 1903, in that region.

For the British Isles, as a whole, the two periods of six months had approximately the same total rainfall, 1902-3 having an excess seven per cent. less than 1903-4; but in the latter period England was 30 per cent. wetter than in the former, while both Scotland and Ireland were drier. The exact ratios to the average of 100 are:—

| | 1902-3. | 1903-4. | Diff. |
|---|---|---|---|
| England and Wales ..... | 107 | 137 | + 30 |
| Scotland ..... | 127 | 107 | — 20 |
| Ireland..... ..... | 126 | 120 | — 6 |
| British Isles ..... | 117 | 123 | + 6 |

The curious interchange of position in the wettest and the dry area may be summed up by saying that in the winter half-year, 1902-3, the country grew wetter from south-east to north-west, while in the winter half-year, 1903-4, it grew wetter from north to south, the wetness and dryness being considered relatively to the ten-years' average at each point.

*Six Months' Winter Rainfall: October, 1903—March, 1904.*

| Stations. | Diff. from Aver. | Per cent. of Aver. | Stations. | Diff. from Aver. | Per cent. of Aver. | Stations. | Diff. from Aver. | Per cent. of Aver. |
|---|---|---|---|---|---|---|---|---|
| | in. | | | in. | | | in. | |
| London .....+ | 4·43 | 139 | Arncliffe ...+ | 5·04 | 114 | Braemar ...— | 1·61 | 91 |
| Tenterden .....+ | 3·79 | 129 | Hull .....+ | 1·15 | 109 | Aberdeen ...+ | 3·42 | 120 |
| Hartl'yW'ntn'y+ | 7·27 | 157 | Newcastle...+ | 6·13 | 148 | Cawdor .....— | 2·02 | 86 |
| Hitchin .....+ | 4·61 | 140 | Seathwaite + | 4·73 | 106 | Glencarron -- | 6·74 | 88 |
| Winslow .....+ | 4·68 | 139 | Cardiff .....+ | 11·30 | 153 | Dunrobin ...— | ·19 | 99 |
| Westley.....+ | 2·66 | 122 | Haverf'dwest+ | 7·11 | 128 | Darrynane + | 5·17 | 119 |
| Brundall.....+ | 2·01 | 117 | Gogerddan + | 7·52 | 130 | Waterford + | 9·26 | 146 |
| Alderbury .....+ | 8·81 | 158 | Llandudno + | 3·16 | 119 | Broadford..+ | 7·59 | 144 |
| Ashburton .....+ | 13·91 | 145 | Dumfries ...+ | 3·17 | 113 | Carlow .....+ | 2·01 | 111 |
| Polapit Tamar + | 14·95 | 174 | Lilliesleaf ...+ | 4·40 | 128 | Dublin .....+ | ·42 | 103 |
| Stroud .....+ | 6·57 | 149 | Colmonell ...+ | 4·71 | 119 | Mullingar...+ | 3·86 | 121 |
| Woolstaston ...+ | 5·88 | 139 | Glasgow ...+ | 1·49 | 108 | Ballinasloe + | 3·53 | 119 |
| Boston .....+ | 3·83 | 140 | Inveraray ...+ | ·17 | 100 | Clifden .. ...+ | 4·60 | 111 |
| Hesley Hall ...+ | 2·87 | 127 | Islay .....+ | 5·09 | 119 | Crossmolina + | 5·32 | 117 |
| Derby.....+ | 4·19 | 139 | Mull .....+ | 6·54 | 120 | Seaforde ...+ | 4·44 | 123 |
| Bolton .....+ | 6·37 | 132 | Loch Leven + | ·68 | 103 | Londonderry+ | 2·49 | 112 |
| Wetherby .....+ | 8·10 | 171 | Dundee .....+ | 1·48 | 110 | Omagh .....+ | 7·34 | 136 |

## SOME WEATHER PROPHETS.

By William Ellis, F.R.S.

We are sometimes told that in improving elementary education and teaching the masses to read, the more difficult task of at the same time instilling a desire to read intelligently, has not in equal degree been imparted, a scrappy and sensational class of literature having arisen adapted to the existing order of mind, thus misdirecting an ability that might be better employed. But like all good things, education has also its weak side. In matters scientific the increased opportunities for study in our day are again good, but in this direction also there is misdirected energy. Not that a lesser degree of scientific knowledge is useless, rather is it beneficial when used with discretion, but unfortunately the present facilities for publication are such as to tempt those only partially acquainted with a subject to presume to teach. Their incomplete knowledge instead of suggesting further study and inquiry, seems rather to impel them to publish crude and ill-considered theories that reveal only the incapacity of the

author, who in some blind manner convinces himself that he has all at once discovered that which previous patient workers have failed to find. Ignorance is shown of the conditions of a problem as well as of the proper manner of treating it. There have been those who to their own satisfaction have shown Newton to be wrong, or the Earth to be flat, in spite of overwhelming evidence to the contrary. In our day, however, a favourite pursuit seems to be prediction of the weather and other natural phenomena for long periods in advance. In this field we have many prophets, who seem to consider inductive methods to be to a great extent superfluous, preferring rather to form arbitrary theories of weather change to which Nature is expected to submit; at least, each separate prophet appears to make out that his own particular predictions are verified.

These remarks have been suggested by the variety of publications that we receive treating of weather change and prediction of the weather on a supposed scientific basis that is really grounded in error. We have on our table "The British Astronomical Weather Almanac and Chart, 1904, by B. G. Jenkins, F.R.A.S.," which is said to be "for landed proprietors, farmers, gardeners, sailors, fishermen, and the public generally." This is a large claim to make. Let us examine it a little. The main feature of the almanac is "The British Weather Chart." Investigating the question of weather change, Mr. Jenkins says that although the moon has a great deal to do therewith, her influence alone is not sufficient to account for all the observed weather phenomena, and that the sought-for perturbation is to be found in the combined influence of the sun, moon and planets. The whole matter, however, is said to be fully explained in a separate publication, "'Tellustria'; a method for determining astronomically the variations in the temperature and pressure of the atmosphere." What is called the "telluric curve," showing the disturbance produced in our atmosphere, is given for the whole year, also the corresponding thermometric and barometric curves, with predictions of the probable weather in each month of the year. The explanation given in the almanac is not, however, complete. All this apparently would be satisfactory, but that "there are discrepancies which the telluric curve does not explain, even when it is calculated from estimates of the masses and distances of the planets used by English, French, German, and American astronomers, which are not identical; but it is reasonable to suppose that these will disappear when astronomers have secured more accurate data." It is sad to think that errors in that supposed most exact of all sciences, astronomy, should so hinder the perfecting of a weather theory; but does Mr. Jenkins understand how comparatively insignificant are these so-called discrepancies? Surely, data good enough to foretell eclipses of the sun and moon for very many years to come to within a few seconds of time should be sufficient for his purposes. It is indeed mere trifling; there is no sense of proportion in such a contention. What is proposed cannot be done. Besides, the monthly

forecasts, even if they were in any degree accurate, are altogether so vague. Unfortunately the employment of a scientific phraseology gives an appearance of authority to predictions of the kind that they in no way possess, and the press, which should be able to guide the public mind in the matter, gives not unfrequently only laudatory notices to such works. Mr. Jenkins quotes two on the title-page of his almanac, both from journals of good standing. One of these states that he is "a scientific meteorologist who merits our serious attention," the other says that persons of undoubted veracity declare that it is "wonderfully accurate." But to predict the character of the weather month by month for a year in advance is at present wholly impossible. No editor of any journal of note would be content to show ignorance in matters of art, why then should any editor be satisfied with so low a standard of criticism in a matter involving a little knowledge of science?

To consider now another case. In a volume reviewed in these pages in February, 1903 (Vol. **38**, p. 9), Mr. William Digby, C.I.E., enthusiastically puts forward the theories of Mr. Hugh Clements, of whom we have often heard before. Mr. Clements himself also publishes from time to time pamphlets concerning his far-reaching theories. Here again, as with Mr. Jenkins, the moon is a great agent in producing weather changes, for as the influence of the sun is "exactly the same on any given date of any given month year after year" it may be neglected, "and the moon's motions alone considered in the estimation of weather changes." To predict the weather correctly for any given place it is necessary to know "the actual height of the barometer." This is determined by the consideration that as at the beginning and end of some one of certain lunar cycles (any one of several it seems might be employed) the position of the moon will be nearly similar, the height of the barometer should be also nearly similar, and the reading recorded on the day in the past being corrected for the difference between the two positions of the moon, according to a supposed satisfactorily determined relation, the reading on the day in the future is found. Wonderful, is it not? Unfortunately, however, it has no foundation whatever in fact. Whether Mr. Clements formed his "Weather Predictions for the Autumn, 1904," in this way from heights of the barometer determined as described seems not clear; he, however, gives the dates of unsettled weather for the four months of September to December at some twenty places as widely separated over the globe as London, New York and Tokio. According to this the meteorological condition is to be similar at Christiania, Stockholm and St. Petersburg, and, what is equally remarkable, similar also at Paris and Vienna. By means of the lunar-cycle theory of barometric variation there is to be found in Appendix I. of Mr. Digby's book some wonderful work concerning the height of the barometer on days round that first fixed for the coronation of the King, June 26, 1902, prepared in the previous spring, the energy displayed in which

is, we fear, simply a measure of the uselessness of the result. And as though the absurdities in regard to weather prediction were not enough, Mr. Clements applies his amazing theories to other natural phenonema, claiming to predict earthquakes and volcanic eruptions, both small and great, as accurately as eclipses of the sun and moon. Neither are droughts and famines at all out of his way. It is settled that sun-spots are produced by planetary attraction, and magnetic storms are easily foretold. But these disquisitions on subjects into which we cannot here enter are equally as absurd as are those regarding weather change. The question having been asked in some journal, "When will a Kepler and a Newton arise to evolve order out of chaos in meteorology?" it is contended that in Mr. Clements the man has been found. Indeed, it is seriously suggested that the time is passed when "a proved theory of vast public value, a theory which put into practice . . . . . would make British agriculture less of a chance, and more of a business than it now is, or in existing conditions can ever possibly become, shall be allowed to languish for lack of proper recognition and adequate support," since it is not possible to conceive greater advantages to be derived "from any discovery in recent centuries, or perhaps at any time in the world's history." But yet after working for some twenty years, Mr. Clements finds public bodies to be still indifferent.

Another writer, who expreses himself in agreement with the views of Mr. Clements, sends from Zomba, in British Central Africa, forecasts of rainfall for a year in advance at four separate districts in that region. He endeavours to connect rainfall with lunar action, and writes:—"The above and below years of rain appeared to coincide with more than accidental similarity to the declination of the moon in a 19 years' cycle, and so similar as to suggest that the moon was possibly the cause." The author would appear to be scarcely competent to conduct such inquiries, the knowledge of astronomy disclosed in his communication being of a crude order. He, however, keeps what appears to be a very creditable meteorological register, observations of the usual character being made three times on each day; and this is a solid contribution to scientific knowledge.

Referring to our opening remarks, may we not ask how it happens that men, otherwise of considerable intelligence, can persevere in a task at present so utterly hopeless as the endeavour to predict detailed weather changes for long periods in advance, thus deceiving themselves (if only they knew it) and also those who put any sort of trust therein? When such predictions appear to be in some degree correct, it is entirely a matter of accident, since by no known method, by reference to no celestial body whatever, can the character of the weather, for any length of time in advance, be foretold. One or two such forecasts accidentally fulfilled seem to convince some people that a true weather prophet has at last appeared. They forget all the failures. Even mere guessing will not unfrequently be, to an extent, right. Do people ever realize that if the weather were set

down by hazard, in advance, on alternate days throughout some year, as simply "wet" or "dry," how often the "prediction" would be correct? and yet it would all signify *nothing* as regards prevision of the weather.

One idea that so misleads many weather prophets, and also others, is that as the moon is the principal agent in producing ocean tides, so also must she be the main cause of weather change. Such an impression is held more or less strongly by a not inconsiderable number of persons of general intelligence, not exactly perhaps of a scientific turn of mind. Some cannot see, and others have never remarked, what so repeatedly has been pointed out, that tides are a matter of attraction, whilst weather changes are an effect of heat, the action of solar heat on our atmosphere combined with the revolution of the Earth on its axis, by which means are produced all those varia tions of temperature (daily and yearly), of atmospheric pressure, cloud, wind, and, by evaporation and precipitation also, rainfall, which go to make up what we experience as weather. No sensible heat whatever is received from the moon, and it is doubtful whether any even small degree of lunar influence on weather has ever been definitely traced

The able criticism which Professor Klossovski, of Odessa, has brought to bear on the lunar weather forecasts of his countryman, Mr. Demchinsky, whose wealth and social influence have enabled him to give a more elaborate expression to his views than his fellow-prophets in other lands could attempt, has already been summarised in this Magazine for March, Vol. **39**, p. 31, and the arguments seem absolutely conclusive.

Our own Meteorological Office, receiving daily telegrams of the condition of the weather from numbers of stations covering a wide extent of country including the Continent, can do no more than predict weather for one or two days in advance. We suffer in some degree from the circumstance that our country borders on the Atlantic, from which direction weather changes will so suddenly come, and nothing better in the way of forecasts can be at present done. The use of the Meteorological Office consists as much in the valuable meteorological statistics that are collected, and from time to time published, as in the forming of weather forecasts for the coming day.

## Correspondence.

*To the Editor of Symons's Meteorological Magazine.*

### GRADUATION OF RAIN GLASSES.

IN the Magazine received this morning I see a letter *re* "Graduation of Rain Glasses." As an observer since 1855, now nearly half a century, I quite agree with the writer that glasses might be more clearly graduated, and that it should be done on both sides. Mine

have always been so, and are clear enough to me now, though I cannot see as well as I used to do. I think they might well be graduated to ·60 in. I have always glued a bit of paper to mine with the graduations above ·50 in. marked on it, but it was seldom required.

MICHAEL FOSTER WARD.

*Upton Park, Slough, 17th March, 1904.*

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YOU ask for the opinion of your readers on the point raised in the last number of the Meteorological Magazine: "the Graduation of Rain Glasses." I see no reason for alteration; rather the reverse. The usual scale engraved on the measuring glasses as supplied, for instance, by Casella fulfils every necessary requirement; with such an instrument I have registered the rainfall for even a longer period than your correspondent. Provided the glass be kept clean, the scale is definite enough; quickness in reading any scale, especially one so simple as usually marked on rain glasses, is to be deprecated.

W. L. W. EYRE.

*Swarraton Rectory, Alresford, Hants, March 18th, 1904.*

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I FOR one quite endorse your correspondent's remarks as to the advisability of more definitely marking the rain measuring glasses, and such a method as he suggests would no doubt lend itself to the accurate reading of them. I do not, however, think it would be at all advisable to alter the length from ·50 in. to ·60 in., for then the reading would be much more liable to error when one is dealing with over an inch of rain, which one has frequently to do in this locality, and I also think that we should find the ·60 in. would just as often be exceeded as ·50 in.; so where would be the gain?

I have just looked through my records for the past four years and find that during that period I have between ·50 and ·60 22 times, and between ·60 and ·70 22 times, exactly the same number.

CHAS. P. CHAMBERS.

*Orchard Head, Broughton-in-Furness, April 2nd, 1904.*

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ABOUT the marking of the measuring glasses of rain gauges: I have been a daily observer and registrar since 1872, and I have never experienced the difficulty which your correspondent mentions. From that time I have used Casella's rain gauge and his glass for measuring, and though my sight may not be as good as the majority of observers possess, I have never had the slightest difficulty. I can always register the exactest decimal point required, and though for uniformity's sake I strictly keep to it, I am often tempted to read more closely still—so easy is it to be even more accurate.

T. W. SIDEBOTHAM.

*The Bourne Vicarage, Farnham, 2nd April, 1904.*

## ATMOSPHERIC PRESSURE IN RELATION TO CLIMATE.

IN reply to the letter of Mr. Dines which appeared in the March number, I must say that by "anticyclonic conditions over the British Isles," I do not mean the prevalence (a meaning which, as Mr. Dines says, would be quite incorrect) of a system of high pressure over Scandinavia; in other words, the easterly type of weather, which, as is well known, is often responsible for extremely low temperatures in the south of England.

Of course it is a matter of common observation that many of the anticyclones which temporarily control the weather over the United Kingdom during the winter are not associated with any great reduction of temperature below the mean, and the facts which Mr. Dines adduces doubtless render his assertion, such as it stands, indisputable. But it must be a fact well known to everyone, that after a period of high temperature in winter the effect of the advance of an anticyclone over the United Kingdom is almost invariably to reduce the mean temperature to the normal or slightly below it, and there can be little doubt that if anticyclonic conditions, properly so called, were to set in during the autumn and to persist throughout the winter months, just as they do over the great continental land masses, the mean temperature would sink to somewhere near the normal for a country situated between the 50th and 60th parallels of north latitude—that is to say, it would be from 10° to 20° F. lower than it is—for under these conditions the gradient for *strong* south-westerly winds, to the prevalence of which undoubtedly the comparatively high winter temperature must be ascribed, would not exist.

An anticyclone to develope its effects must be persistent, and it is not indeed surprising that the high-pressure systems which we so often experience for a brief period are frequently not productive of great cold.

Finally, as a matter of interest I might add that a recent example of a severe though short frost, accompanying conditions which must be described as typically anticyclonic, occurred in Scotland during the winter of 1902. On the mornings of the 31st of January and 1st of February of that year the centre of an anticyclone of exceptional intensity was situated off the east coast of Scotland. (Meteorological Office Reports.) At 8 a.m., January 31st, the barometer at Aberdeen stood at the unusually high level of 31·05 inches, and the air temperature at the same time was 15° F.; on the following morning the barometer at Aberdeen stood at 31·04 inches, and the thermometer at 19° F., while at Nairn at the same time temperature was as low as 10° F. and pressure as high as 31·04 inches. This cold, which was doubtless still greater further inland, accompanying light airs or calms and clear skies, was evidently directly related to the anticyclone. By the middle of February the frost had entirely disappeared from Scotland, the area of greatest

cold having by that time shifted to the south of England and the adjacent parts of the continent; on the morning of the 16th, temperature was as low as 18° F. both in London and in Paris, and the charts show that on that morning the south-east of England lay well within the influence of an anticyclone centred over the very cold region of northern Germany.

L. C. W. BONACINA.

*22nd March, 1904.*

## THE STORMS OF MARCH 29th–30th, 1904.

A FEW notes may be of interest on the storms of the above dates as experienced in this district. On the 29th, towards 2.30 p.m., after a fairly fine forenoon, cumulo nimbus (thunder clouds), preceded by cirro-velum, gathered up. A sharp thunderstorm broke towards 2.45 p.m., and though of short duration, was very heavy while it lasted, fork and sheet lightning were especially vivid, hail of an exceptional size falling in the rear of the storm. In the evening, at 7.30 p.m., a remarkable sky of a most brilliant green hue was visible to the westward. On the 30th heavy snowstorms prevailed to noon, the snow flakes being remarkable for their size. Thunder clouds again gathered up towards 3 p.m., a storm passing over about 3.15 p.m., with almost continuous flashes of sheet and fork lightning, hail again falling, and in exposed situations the rattling of the stones on glass was very loud. Inky darkness prevailed for a short time on both occasions. A noticeable feature of both storms was the remarkable lowness of the clouds at the time.

S. C. RUSSELL.

*Sutton, Surrey, April 4th, 1904.*

## SCOTTISH METEOROLOGICAL SOCIETY.

THE half-yearly General Meeting of this Society was held in the Philosophical Institution, Edinburgh, on March 24th, the Hon. John Abercromby presiding over a large attendance.

The report of the Council was adopted, Lord M'Laren being appointed President of the Society in place of the late Duke of Richmond and Gordon, and Sir Arthur Mitchell, K.C.B., succeeding Lord M'Laren as Vice-President. Three Members of Council retired by rotation, the vacancies being filled by the election of Professor J. G. MacGregor, and the re-election of Sir John Murray, K.C.B., and Mr. J. Y. Buchanan.

It was intimated that the Council had some time ago received a request from the German Marine Observatory (Deutsche Seewarte) for daily weather telegrams from the Ben Nevis and Fort William Observatories, to be used in connection with the daily forecasts issued from Hamburg. Arrangements were now completed, and a letter had just been received requesting that the transmission of these telegrams should commence in April. The meteorological

bureau of a foreign country would thus be the first to utilize the Ben Nevis observations in its daily weather report.

It was further intimated that it would not be possible to finance the Ben Nevis Observatories after the beginning of October of this year unless a sum of at least £600 per annum were guaranteed, in addition to the continuance of the sums of £100 and £250 which had up to that time been given by the Meteorological Council out of the Parliamentary grant.

Dr. Buchan read a paper on "The Ben Nevis Observatories in relation to Forecasting," in which he discussed some of the points dealt with in the last Report of the Ben Nevis Committee to the British Association (see this Magazine for February, Vol. **39**, p. 11), and showed what had been done in working out some of the lines of research indicated in that report. Diagrams were exhibited showing by monthly averages for each hour of the day the difference between the Ben Nevis and Fort William barometric readings when both were reduced to sea level by the usual tables. Including all observations, except those where strong winds rendered the barometric readings unsatisfactory through pumping of the mercury, the curves showed that for the greater part of the year the reduced Ben Nevis barometer came out higher than the Fort William barometer during the night and lower during the day. If, however, only those days were considered for which the mean difference of temperature between the top and bottom of the mountain exceeded 18° F., the curves showed that the reduced Ben Nevis barometer was below that for Fort William throughout, though not so much below at night as during the day. On the other hand, on days when the mean difference was small, less than 12° F., the reduced Ben Nevis barometer was higher than that at Fort William. The curves for the days when the temperature difference was between 12° F. and 18° F. lay between the curves for the extreme cases.

Lord M'Laren congratulated Dr. Buchan on his paper, and remarked upon the action of the Meteorological Office with respect to Ben Nevis.

Mr. A. Watt followed with a paper on "Sunshine at Home and Abroad." He was indebted for his material to the mean values published by the Meteorological Council, to H. König's exhaustive treatise, and to original MSS. In Scotland, and indeed in North-western Europe generally, May was the sunniest month, and it was to be noted that May was also the month of highest atmospheric pressure in that region. The May maximum was peculiarly well marked in the Orkneys—Deerness averaging about an hour more sunshine per day in May than in June (May 180 hrs., June 151 hrs.) In the South of Europe July and August were the sunniest months, and in the South of England there was an inclination to this later maximum. Comparing the climate of Davos with that of the South of England, it was found that in the course of the year Davos and such favoured places as Hastings and Torquay received about the

same amount of sunshine. The seasonal distribution, however, differed greatly. In summer the English stations were much sunnier, but from October to March Davos had 30 per cent. more sunshine, and from November to February it averaged fully an hour more sunshine per day than any place in England.

The Swiss sunshine records were of exceptional interest, as returns were available for very different heights. Thus ten years' observations for Zürich (1617 ft.), Davos (5108 ft.) and Säntis (8202 ft.) gave the following mean values, in hours :—

| | Jan. | Feb. | Mar. | Apr. | May. | June | July. | Aug. | Sept. | Oct. | Nov. | Dec. | Year. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Zürich... | 42 | 94 | 137 | 171 | 185 | 223 | 241 | 243 | 179 | 111 | 51 | 43 | 1720 |
| Davos ... | 92 | 109 | 153 | 161 | 168 | 176 | 208 | 214 | 176 | 143 | 109 | 87 | 1796 |
| Säntis ... | 113 | 126 | 138 | 148 | 145 | 148 | 174 | 193 | 161 | 151 | 141 | 114 | 1752 |

Except in March, the amount for Davos was intermediate between those for Zürich and Säntis, whilst from October to February Säntis recorded the most, and from April to September the least of the three stations.

## ROYAL METEOROLOGICAL SOCIETY.

THE monthly meeting of this Society was held on Wednesday evening, March 16th, at the Institution of Civil Engineers, Great George Street, Westminster, Captain D. Wilson-Barker, President, in the chair.

The following gentlemen were elected Fellows:—Mr. Peter Anderson, Mr. Eugene André, F.R.G.S., Mr. William Henry Dobson, Mr. Thomas Price Thomas, and Mr. Hanns Vischer, M.A., F.R.G.S.

This being the "popular" meeting of the session, Mr. Richard H. Curtis, at the request of the Council, gave a lecture on "Water Vapour," which he illustrated by experiments and lantern slides.

After explaining the nature of water-vapour, the lecturer proceeded to speak of the processes of evaporation and condensation, and showed that the capacity of the air for moisture varies according to the temperature. He pointed out that the quantity of vapour present in the atmosphere varies very much in different regions of the globe, and in most places it varies also a great deal at different times and occasionally within very brief periods. It is a most important factor in Climate. There are parts of the globe where vapour is always present in great abundance, and in consequence the air is constantly damp and humid, and in a nearly saturated condition. The calm region near the Equator which marks the meeting place of the North-east and South-east Trade winds is an example of such a humid climate. On the other hand, there are regions where the quantity of vapour is always small, both relatively and absolutely. Inland regions far removed from any considerable source of supply, and subject to strong sun-heat, are generally in

this condition; and the central portions of Australia, parts of Arabia, and the desert regions of Africa, are examples of such parched and arid climates.

The amount of vapour in the air has a great deal to do with our personal comfort. A dry cold air is not so unpleasant and does not feel so cold as a damp air, although the temperature of the damp air as shown by the thermometer may be the higher. But our sensations are often at variance with the thermometer, and this is generally so because of the way in which they are affected by the vapour in the air. If the air be dry a degree of heat also can be enjoyed which would be simply unendurable if it occurred with a humid atmosphere.

Mr. Curtis referred to some phenomena of the atmosphere in which water-vapour plays a leading part, and described the formation of dew, hoar-frost, fog, cloud, halos, rain, snow and hail. He concluded by saying that he had tried to show how a particle of water may be taken from the ocean and stored away invisible in the atmosphere above it; how that particle may travel to distant parts of the globe, and then by the action of another of Nature's processes be changed back again into water, and fall once more upon the ground beneath; here it may unite itself to other similar drops, and together form a tiny stream, which may gradually grow to the dimensions of a river; and once again our drop of water may find itself a constituent part of the ocean, to repeat its pilgrimage and carry on the part it is destined to play in the economy of Nature.

## METEOROLOGICAL NEWS AND NOTES.

THE BRITISH ANTARCTIC EXPEDITION returned to Lyttelton, New Zealand, on April 1st, with all well on board. Captain Scott has thus the unique distinction of having spent two consecutive winters in the Antarctic regions at a higher latitude than any other expedition has ever penetrated, and without the loss of a man from disease. The meteorological observations cannot fail to have been of the greatest interest; and, although no particulars of the scientific results have yet been received, Captain Scott states that the work of the second year was more important than that of the first. The expedition throughout has been a brilliant success, surpassing all expectation.

IN NEW ZEALAND Meteorological matters are provided for in two Government Departments:—The Climatological, or Statistical, in one (from the control of which Sir James Hector has recently retired); and the Weather, or Forecasting Branch, in another, under the charge of Captain Edwin, R.N., of the Marine Department.

THE HEALTH RESORTS OF NEW ZEALAND are the subject of a forthcoming work by Dr. Wohlmann, the Government Balneologist at Rotorua, the most famous sanatorium of New Zealand. It will

deal with the climate of that favoured colony, the natural beauty of the scenery of which is probably unrivalled in the southern hemisphere.

A CENTRAL WEATHER BUREAU FOR AUSTRALIA is, we understand, likely to become an accomplished fact. There is no department in which the federal government of the Commonwealth can incorporate or correlate the separate State organizations with more probability of increasing efficiency without sacrificing economy than in the treatment of Meteorology. We hope that the new meteorological system will be extended to all Australasia, including New Guinea, New Zealand and Fiji.

THE METEOROLOGICAL DEPARTMENT OF THE TRANSVAAL has, we understand, decided to present to a certain number of its observers a year's issue of this Magazine, with the object of encouraging the study of Meteorology and bringing the isolated observers in different parts of the empire into touch with one another. We are gratified in obtaining an accession to the number of our readers in a country so full of interest as the Transvaal, and hope that the exchange of experiences with fellow-observers at home will be of profit to both.

THE PHOTOGRAPH OF THE METEOROLOGICAL BREAKFAST at Southport, which was issued with the number of this Magazine for December, 1903, and intended to serve as a frontispiece to Vol. **38**, seems to have been omitted from some copies. Any reader who has received the December number without the plate is requested to return it to the Editor at 62, Camden Square, London, N.W., and a perfect copy will be sent in exchange.

## SIR JOHN ELIOT ON THE METEOROLOGY OF THE EMPIRE.

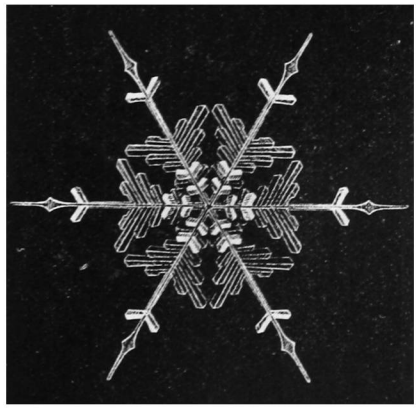
THE new magazine, *Broad Views*, for March contains an instructive article by Sir John Eliot on "The Meteorology of the Empire," for the unique period 1892—1902, during which time India, Australia, and South Africa, especially suffered more severely from droughts than during any other similar period for a hundred years at least. It is estimated that in New South Wales alone some fifty million sheep perished during the almost continued drought of 1895—1902. The author deals more particularly with the meteorology of India, the primary feature of which is, as is well known, the nearly equal division of the year into wet and dry seasons. The dry period culminates about the end of May, over Northern and Central India, when day temperatures of 115° to 120° are registered. The weather conditions are completely reversed with the advent of the wet season, and in the course of a few days all nature becomes instinct with life and growth. Excessive rains, such as occurred in 1892-4, rarely affect large areas to such an extent as to destroy crops, but deficient rainfall, which occurred between 1895 and

1902, with the exception of 1898, especially when the falls terminate early, is very serious, and may prevent the maturing of the crops. We are unable to enter fully here into this very interesting article, but may mention the author's opinion that the next development of weather study will almost certainly be in the relation of meteorology to the phenomena of sun spots and terrestrial magnetism. He also approves of what he considers a most valuable suggestion, made by Sir Norman Lockyer, that the meteorological data from the whole Empire should be collected and dealt with by a special branch of the British Meteorological Office.

## REVIEW.

*Studies among the Snow Crystals during the winter of* 1901–1902, *by* MR. WILSON A. BENTLEY. *Reprinted from the Annual Summary of the U.S. Monthly Weather Review for* 1902. Size $11\frac{1}{2} \times 9\frac{1}{2}$. Pp. 10. *Plates.*

MR. W. A. BENTLEY has devoted twenty years to the study of the forms of snow-crystals, and this contribution consists of twenty-two plates, each containing twelve micro-photographs of snow-crystals magnified about twenty diameters. Before photography was enlisted to aid the artist, the pictures of snow-crystals were necessarily rather unsatisfactory. Seen in their entirety only for a moment, it was impossible to say that any slight irregularity was natural or merely the result of melting setting in at one point before another. In the delightful series of snow-crystals published by the late Mr. Glaisher in 1855, we understand that only one ray or segment of the crystal was actually drawn from nature, the other five being filled in by copying the first. How near the truth this method came may be judged by the accompanying comparison of one of Mr. Glaisher's symmetrical drawings with one of Mr. Bentley's actual photographs of a somewhat similar form.



DRAWING BY MR. GLAISHER.

PHOTOGRAPH BY MR. BENTLEY.

# RAINFALL AND TEMPERATURE, MARCH, 1904.

| Div. | STATIONS. [The Roman numerals denote the division of the Annual Tables in *British Rainfall* to which each station belongs.] | RAINFALL. Total Fall. | Diff. from average, 1890-9. | Greatest in 24 hours. Depth | Greatest in 24 hours. Date. | Days on which 01 or more fell. | TEMPERATURE. Max. Deg. | Max. Date. | Min. Deg. | Min. Date. | No. of Nights below 32°. Shade | Grass |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | inches | inches. | in. | | | | | | | | |
| I. | London (Camden Square) ... | 1·72 | + ·26 | ·36 | 30 | 15 | 61·0 | 9 | 27·9 | 17 | 8 | 19 |
| II. | Tenterden ... | 1·47 | — ·22 | ·32 | 1 | 14 | 58·0 | 8, 9 | 24·0 | 2 | 9 | 20 |
| ,, | Hartley Wintney ... | 1·35 | — ·21 | ·26 | 28 | 16 | 57·0 | 31 | 25·0 | 12 | 11 | 23 |
| III. | Hitchin ... | 1·32 | — ·12 | ·24 | 28 | 16 | 57·0 | 9 | 26·0 | 1, 11 | 15 | ... |
| ,, | Winslow (Addington) ... | 1·45 | — ·07 | ·25 | 28 | 16 | 59·0 | 9 | 25·0 | 12 | 15 | 26 |
| IV. | Bury St. Edmunds (Westley) | 1·55 | — ·08 | ·30 | 29 | 16 | 63·0 | 19 | 24·0 | 17 | 17 | ... |
| ,, | Brundall ... | 1·93 | + ·32 | ·50 | 28 | 19 | 60·0 | 19 | 24·2 | ... | 9 | 18 |
| V. | Alderbury ... | 1·39 | — ·29 | ·31 | 4 | 12 | 52·0 | 9 | 26·0 | 15 | 12 | ... |
| ,, | Winterborne Steepleton ... | 1·85 | ... | ·53 | 7 | 11 | 59·1 | 9 | 25·3 | 16 | 11 | 17 |
| ,, | Torquay (Cary Green) ... | 2·03 | ... | ·62 | 4 | 15 | 58·6 | 9 | 32·5 | 1, 12 | 0 | 17 |
| ,, | Polapit Tamar [Launceston] | 2·14 | — ·14 | ·66 | 7 | 12 | 57·1 | 9 | 23·1 | 12 | 13 | 16 |
| ,, | Bath ... | 1·86 | ... | ·55 | 4 | 16 | 59·5 | 9 | 25·5 | 12 | 1 | 2 |
| VI. | Stroud (Upfield) ... | 1·57 | — ·11 | ·38 | 28 | 16 | 57·0 | 23 | 29·0 | 1, 2, 11 | 10 | ... |
| ,, | Church Stretton (Woolstaston) | 1·57 | — ·20 | ·36 | 7 | 21 | 57·0 | 20 | 24 5 | 1 | 17 | ... |
| ,, | Bromsgrove (Stoke Reformatory) | 1·03 | — ·22 | ·22 | 7 | 15 | 54·0 | 20 | 23·0 | 1 | 19 | ... |
| VII. | Boston ... | 1·21 | + ·02 | ·20 | 8, 14 | 12 | 58·0 | 20 | 26·0 | 18 | 15 | ... |
| ,, | Bawtry (Hesley Hall) ... | 1·64 | + ·24 | ·44 | 7 | 18 | 60·0 | 20 | 23·0 | 12 | ... | ... |
| ,, | Derby (Midland Railway)... | 1·57 | + ·15 | ·40 | 7 | 20 | 58·0 | 20 | 24·0 | 11 | 14 | ... |
| VIII. | Bolton (The Park) ... | 2·34 | — ·38 | ·29 | 13 | 18 | 54·2 | 20 | 26·9 | 1 | 9 | 22 |
| IX. | Wetherby (Ribston Hall) ... | 1·94 | + ·31 | ·57 | 7 | 19 | ... | ... | ... | ... | ... | ... |
| ,, | Arncliffe Vicarage ... | 4·65 | — ·47 | 1·59 | 28 | 23 | ... | ... | ... | ... | ... | ... |
| ,, | Hull (Pearson Park) ... | 1·85 | + ·19 | ·39 | 14 | 19 | 59·0 | 20 | 26·0 | 18 | 8 | 21 |
| X. | Newcastle (Town Moor) ... | 1·38 | — ·56 | ·20 | 7 | 18 | ... | ... | ... | ... | ... | ... |
| ,, | Borrowdale (Seathwaite) ... | 12·51 | + 1·85 | 3·73 | 20 | 17 | ... | ... | ... | ... | ... | ... |
| XI. | Cardiff (Ely) ... | 2·73 | + ·17 | ·73 | 7 | 18 | ... | ... | ... | ... | ... | .. |
| ,, | Haverfordwest (High St.).. | 2·29 | — ·45 | ·55 | 7 | 15 | 52·6 | 23 | 26·5 | 12 | 8 | 15 |
| ,, | Aberystwith (Gogerddan).. | 2·12 | — ·72 | ·28 | 18 | 14 | 60·0 | 9 | 22·0 | 10*a* | 14 | ... |
| ,, | Llandudno ... | 1·31 | — ·63 | ·40 | 13 | 11 | 55·0 | 19 | 29·0 | 15 | 5 | ... |
| XII. | Cargen [Dumfries] ... | 3·48 | + ·43 | 1·08 | 28 | 15 | 53·0 | 23, 24 | 25 0 | 11 | 14 | ... |
| XIII. | Edinburgh (Royal Observy.) | 1·07 | ... | ·24 | 20 | 17 | 55·4 | 19 | 26·6 | 1 | 13 | 23 |
| XIV. | Colmonell ... | 2·50 | — ·74 | ·60 | 20 | 11 | 55·0 | 19 | 23·0 | 10 | 12 | ... |
| XV. | Tighnabruaich ... | 3·91 | ... | ·75 | 31 | 15 | 48·6 | 23 | 25·0 | 10 | 23 | 21 |
| ,, | Mull (Quinish) ... | 3·95 | — ·22 | ·94 | 27 | 15 | ... | ... | ... | ... | ... | ... |
| XVI. | Loch Leven Sluices ... | 2·13 | — ·45 | ·38 | 8 | 13 | ... | ... | ... | ... | ... | ... |
| ,, | Dundee (Eastern Necropolis) | 1·75 | — ·23 | ·35 | 28 | 18 | 53·4 | 20 | 28·3 | 31 | 16 | ... |
| XVII. | Braemar ... | 1·35 | — ·97 | ·32 | 22 | 14 | 52·3 | 24 | 18·2 | 2 | 23 | 29 |
| ,, | Aberdeen (Cranford) ... | 2·94 | + ·74 | 1·00 | 28 | 18 | 51·0 | 19 | 24 0 | 14, 23 | 16 | ... |
| ,, | Cawdor (Budgate) ... | ·63 | — 1·61 | ·36 | 22 | 8 | ... | ... | ... | ... | ... | ... |
| XVIII. | Glencarron Lodge ... | 3·05 | — 3·89 | ·64 | 21 | 18 | 51·9 | 17 | 22·0 | 1 | 15 | ... |
| ,, | Bendamph ... | 5·68 | — 2·43 | ·96 | 13 | 15 | ... | ... | ... | ... | ... | ... |
| XIX. | Dunrobin Castle ... | 1·53 | — ·91 | ·53 | 22 | 11 | 55·0 | 19 | 25·0 | 1 | 14 | ... |
| ,, | Castletown ... | 1·93 | ... | ·47 | 7 | 19 | 55·0 | 19 | 24·0 | 1 | 17 | ... |
| XX. | Killarney ... | 3·56 | + ·36 | ·74 | 21 | 14 | 57·5 | 23 | 25·5 | 2 | ... | ... |
| ,, | Waterford (Brook Lodge)... | 3·61 | + 1·09 | ·76 | 20 | 20 | 56·0 | 23 | 25·0 | 12 | 9 | ... |
| ,, | Broadford (Hurdlestown) ... | 2·51 | + ·31 | ·60 | 20 | 16 | 54·0 | 19 | 28·0 | 1*b* | 7 | ... |
| XXI. | Carlow (Browne's Hill) ... | 2·29 | + ·08 | ·73 | 20 | 16 | ... | ... | ... | ... | ... | ... |
| ,, | Dublin (Fitz William Square) | 2·09 | + ·27 | ·52 | 7 | 19 | 60·8 | 19 | 28·9 | 11 | 3 | 13 |
| XXII. | Ballinasloe ... | 2·88 | + ·46 | ·65 | 20 | 19 | 64·0 | 16, 19 | 18·0 | 2 | 15 | ... |
| ,, | Clifden (Kylemore House).. | 5·74 | + ·55 | ·95 | 27, 28 | 14 | ... | ... | ... | ... | ... | ... |
| XXIII. | Seaforde ... | 2·41 | ·00 | ·57 | 20 | 19 | 57·0 | 19 | 23·0 | 10 | 14 | 17 |
| ,, | Londonderry (Creggan Res.) | 2·12 | — ·57 | ·39 | 31 | 16 | ... | ... | ... | ... | ... | ... |
| ,, | Omagh (Edenfel) ... | 2·99 | + ·41 | ·45 | 20 | 17 | 55·0 | 23 | 23·0 | 10 | 14 | 21 |

+ Shows that the fall was above the average; — that it was below it. *a* and 11, 26. *b* and 10, 14.

## SUPPLEMENTARY RAINFALL, MARCH, 1904.

| Div. | STATION. | Rain. inches | Div. | STATION. | Rain. inches |
|---|---|---|---|---|---|
| II. | Dorking, Abinger Hall | 1·60 | XI. | New Radnor, Ednol | 2·60 |
| ,, | Sheppey, Leysdown | 1·48 | ,, | Rhayader, Nantgwillt | 3·05 |
| ,, | Hailsham | 1·19 | ,, | Lake Vyrnwy | 2·82 |
| ,, | Crowborough | 1·36 | ,, | Ruthin, Plâs Drâw | 2·26 |
| ,, | Ryde, Beldornie Tower | ·93 | ,, | Criccieth, Talarvor | 2·61 |
| ,, | Emsworth, Redlands | 1·01 | ,, | Anglesey, Lligwy | 2·16 |
| ,, | Alton, Ashdell | 1·63 | ,, | Douglas, Woodville | 3·07 |
| ,, | Newbury, Welford Park | 1·56 | XII. | Stoneykirk, Ardwell House | 2·50 |
| III. | Harrow Weald | 1·59 | ,, | Dalry, Old Garroch | 4·18 |
| ,, | Oxford, Magdalen College | 1·12 | ,, | Langholm, Drove Road | 5·93 |
| ,, | Banbury, Bloxham | 1·56 | ,, | Moniaive, Maxwelton House | 3·46 |
| ,, | Pitsford, Sedgebrook | 1·42 | ,, | Lilliesleaf, Riddell | 2·34 |
| ,, | Huntingdon, Brampton | 1·46 | XIII. | N. Esk Reservoir [Penicuick] | 3·05 |
| ,, | Wisbech, Bank House | 1·34 | XIV. | Maybole, Knockdon Farm | 2·11 |
| IV. | Southend | 1·36 | ,, | Glasgow, Queen's Park | 1·68 |
| ,, | Colchester, Lexden | 1·55 | XV. | Inveraray, Newtown | 3·77 |
| ,, | Saffron Waldon, Newport | 1·40 | ,, | Ballachulish, Ardsheal | 5·89 |
| ,, | Rendlesham Hall | 1·44 | ,, | Campbeltown, Redknowe | 2·41 |
| ,, | Swaffham | 1·49 | ,, | Islay, Eallabus | 3·08 |
| ,, | Blakeney | 1·40 | XVI. | Dollar | 1·57 |
| V. | Bishop's Cannings | 1·57 | ,, | Balquhidder, Stronvar | ... |
| ,, | Ashburton, Druid House | 3·30 | ,, | Coupar Angus Station | 1·90 |
| ,, | Okehampton, Oaklands | 3·11 | ,, | Blair Atholl | 1·67 |
| ,, | Hartland Abbey | 1·87 | ,, | Montrose, Sunnyside | 2·11 |
| ,, | Lynmouth, Rock House | 3·28 | XVII. | Alford, Lynturk Manse | 1·96 |
| ,, | Probus, Lamellyn | 2·60 | ,, | Keith, H.R.S. | ·93 |
| ,, | Wellington, The Avenue | 2·08 | XVIII. | Fearn, Lower Pitkerrie | ·41 |
| ,, | North Cadbury Rectory | 1·53 | ,, | S. Uist, Askernish | 2·48 |
| VI. | Clifton, Pembroke Road | 2·17 | ,, | Invergarry | 3·13 |
| ,, | Moreton-in-Marsh, Longboro' | 1·78 | ,, | Aviemore, Alvie Manse | 1·22 |
| ,, | Ross, The Graig | 1·70 | ,, | Loch Ness, Drumnadrochit | 1·04 |
| ,, | Shifnal, Hatton Grange | 1·68 | XIX. | Invershin | ·80 |
| ,, | Wem Rectory | 1·59 | ,, | Altnaharra | 1·48 |
| ,, | Cheadle, The Heath House | 1·73 | ,, | Bettyhill | ·48 |
| ,, | Coventry, Kingswood | 1·58 | ,, | Watten, H.R.S. | ·94 |
| VII. | Market Overton | 1·71 | XX. | Cork, Wellesley Terrace | 2·55 |
| ,, | Market Rasen | 1·79 | ,, | Darrynane Abbey | 3·41 |
| ,, | Worksop, Hodsock Priory | 1·72 | ,, | Glenam [Clonmel] | 2·66 |
| VIII. | Neston, Hinderton | 1·61 | ,, | Ballingarry, Hazelfort | 2·54 |
| ,, | Southport, Hesketh Park | 2·02 | ,, | Miltown Malbay | 3·35 |
| ,, | Chatburn, Middlewood | 2·86 | XXI. | Gorey, Courtown House | 3·01 |
| ,, | Duddon Valley, Seathwaite Vic. | 6·22 | ,, | Moynalty, Westland | 3·24 |
| IX. | Langsett Moor, Up. Midhope | 2·92 | ,, | Athlone, Twyford | 2·94 |
| ,, | Baldersby | 1·72 | ,, | Mullingar, Belvedere | 3·38 |
| ,, | Scalby, Silverdale | 1·89 | XXII. | Woodlawn | 3·05 |
| ,, | Ingleby Greenhow Vicarage | 2·38 | ,, | Westport, Murrisk Abbey | 3·02 |
| ,, | Middleton, Mickleton | 1·75 | ,, | Crossmolina, Enniscoe | 3·75 |
| X. | Beltingham | 2·24 | ,, | Collooney, Markree Obsy | 2·46 |
| ,, | Bamburgh | 1·77 | XXIII. | Enniskillen, Portora | 2·86 |
| ,, | Keswick, The Bank | 3·39 | ,, | Warrenpoint | 2·87 |
| ,, | Melmerby Rectory | 1·80 | ,, | Banbridge, Milltown | 1·71 |
| XI. | Llanfrechfa Grange | 1·93 | ,, | Belfast, Springfield | 2·01 |
| ,, | Treherbert, Tyn-y-waun | 4·25 | ,, | Bushmills, Dundarave | 1·62 |
| ,, | Llandovery, Tonn | 1·77 | ,, | Stewartstown | 2·33 |
| ,, | Castle Malgwyn | 1·68 | ,, | Killybegs | 2·32 |
| ,, | Llandefaelog-fach | 2·20 | ,, | Horn Head | 1·91 |

# METEOROLOGICAL NOTES ON MARCH, 1904.

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

## ENGLAND AND WALES.

LONDON, CAMDEN SQUARE.—The first week was practically sunless, with frequent but light R. From 8th there was a considerable amount of sunshine, and very little R until the last few days, when slight TSS occurred with some H. Duration of sunshine 62·3 hours and of R 41·7 hours. Mean temp. 40°·8, or 1°·3 below the average.

ABINGER HALL.—Moderately fine but not much sun. Ground wet and cold for seeds, and low germination. Sunshine greatly needed.

TENTERDEN.—Dull and cold generally but mostly dry. Wind N. and E., except about 14th, 21st and 28th, but not of much force. S on 1st, 2nd and 30th. Duration of sunshine 102 hours.

SHEPPEY, LEYSDOWN.—The first and last weeks were rainy and unsettled. Cold N.E. wind from 22nd to 27th. About 3 inches of S on 1st.

CROWBOROUGH.—R below the average and temp. low. From 8th to 23rd it was fairly mild, but the remainder was very cold. Mean temp. 39°·0. Prevailing wind E. and N.E. L, T, H, S and R on 30th.

HARTLEY WINTNEY.—Quiet and free from wind and dust. The first week was foggy and showery, followed by a dry and cold fortnight. Sleet showers in the last week and heavy H storm with T on 29th. Ozone on 20 days with a mean of 5·9.

WINSLOW, ADDINGTON MANOR.—Wintry weather at the beginning with S. Frost on many nights but never severe. Much H and rough wind on 30th.

PITSFORD.—R ·28 in. below the average of 10 years. Mean temp. 39°·7.

COLCHESTER.—Almost continuous E. wind till 18th, with much sunshine but few warm days. The land was in excellent condition, but the season rather late.

BRUNDALL.—A fair average March, the mean temp. being only 0°·1 below the normal. Vegetation at the close was quite a month behind 1903.

WINTERBOURNE STEEPLETON.—Cold and dry, with mean temp. 2°·3 less than the average of 11 years. The wind was N. or E. for nearly the whole month. The dry weather was very beneficial for farm work.

TORQUAY.—R ·56 in. below the average. Duration of sunshine 124 3 hours, or 15·3 hours below the average. Mean temp. 43°·4, or 0°·7 below the average. Mean amount of ozone 4·5.

LYNMOUTH.—The first week was cold, with S and R on 4th and 5th. T and L on 9th. In the middle of the month there was a good deal of sunshine. Gales from N.W. in the last week, and T and L at 8 a.m. on 29th.

WELLINGTON.—After the 9th set in one of the driest periods experienced for a considerable time, lasting for nearly three weeks. The last four days were stormy and unsettled.

NORTH CADBURY RECTORY.—Very seasonable; dry and unusually calm, with normal temp. and no strong wind. Except the first 7 and last 4 days the weather was very pleasant, and being practically rainless was of enormous benefit to agriculture.

CLIFTON.—R or sleet every day till 9th and very cold till 7th with N.E. winds and slight frosts. Then warmer with occasional slight R. Last few days stormy. Heavy TS from 6 to 7 p.m. on 9th.

ROSS.—The first week was wet and very cold, and from 8th to 23rd principally warm, fine and dry. Cold, rainy and unpleasant in the last week.

WORKSOP, HODSOCK PRIORY.—Dull and rather cold with normal R. Showers kept the ground moist and the proverbial "peck of March dust" did not appear.

BOLTON.—Cold, with N. or E. wind on 17 days. The R was below the average, and this, with the drying wind, was beneficial to agriculture. Mean

temp. 37°·9, or 1°·5 below the average. Duration of sunshine 47·5 hours, the least on record.

SOUTHPORT.—Quiet, dull and rather cool, with high bar. and easterly airs. Mean temp. 2°·0 below the average. Duration of sunshine 29 hours less than the average, and R ·12 in. below the average. Underground water exceptionally high. Remarkably little ozone.

LLANFRECHFA GRANGE.—Cold and wet, with very little dry wind. The land was too wet to work and grass not growing. Sharp T and L at 7 p.m. on 9th.

HAVERFORDWEST.—Commenced cold and frosty with a wintry sky, and although a few days were mild, it continued cold throughout, the max. temp. reaching 50° on only three days. Duration of sunshine 78·4 hours. Agricultural operations fairly well advanced.

ABERYSTWITH, GOGERDDAN.—The early part was dry but rough; the middle dull, wet and calm; but towards the end it became somewhat drier. Little sunshine.

DOUGLAS.—Cold, the temp. being persistently low throughout. Wet, very sunless and thoroughly unseasonable, with a remarkable absence of wind. Hardly a sign of spring and no fruit blossom.

## SCOTLAND.

CARGEN.—Wet, cold and sunless, with vegetation very backward and farm work at a standstill.

MAXWELTON HOUSE.—Another cold month. Mean temp. 37°·0, or 5°·0 below the average. The first half was cold and bright, the latter cold and wet, with a fine bright interval from 23rd to 27th. A backward season.

LILLIESLEAF.—R ·18 in. above the average. There were two periods of cold: from 1st to 15th, and from 21st to the end. The S and cold winds were much against grass and garden growth.

COUPAR ANGUS.—R slightly below the average. Mean temp. 38°·6, or 1°·0 below the average. Several severe morning frosts. Strong winds but no gales.

DRUMNADROCHIT.—R the lowest in 19 years, being 2·05 in. below the average of that period.

ALTNAHARRA.—Exceptionally fine, with bright sunshine for the greater part, but some storms towards the end.

CASTLETOWN.—The first part was cold, with S.E. winds, and S from 5th to 7th. The middle and latter part were fairly dry, with cold winds and some "March dust." Farmers were taking up last autumn's potato crop.

## IRELAND.

MILTOWN MALBAY.—Not satisfactory for tillage. The last week was very rainy, with H and S, driven by squalls verging on storm force.

DUBLIN.—Generally cold and changeable. Mean temp. 42°·7, or exactly that of January and 0°·7 below the average for March. Duration of sunshine 101 hours. H on 7 days.

MARKREE OBSERVATORY.—Very fine throughout, with frost on many nights. The last few days were very stormy, with H, sleet and frequent S.

OMAGH, EDENFEL.—Up to 27th the weather was generally clear, calm and rainless; many days would have done no discredit to the Riviera. Much grain was sown and farm work was proceeded with, but the inevitable change came towards the end and the weather for the last five days was literally terrible.

## BATH METEOROLOGICAL OBSERVATIONS.

In the present number, observations at Bath appear for the first time in the Table on p. 56. It is convenient to place on record the values for the preceding months of 1904.

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| January ..... | 3·20 | ... | ·46 | 13 | 22 | 55·0 | 13 | 23·2 | 23 | 5 | 8 |
| February..... | 3·61 | ... | ·47 | 10 | 23 | 54·0 | 21 | 24·5 | 29 | 2 | 6 |

## Climatological Table for the British Empire, October, 1903.

| STATIONS. (*Those in italics are South of the Equator.*) | Absolute. Maximum. Temp. | Absolute. Maximum. Date. | Absolute. Minimum. Temp. | Absolute. Minimum. Date. | Average. Max. | Average. Min. | Average. Dew Point. | Average. Humidity. | Absolute. Max. in Sun. | Absolute. Min. on Grass. | Total Rain. Depth. | Total Rain. Days. | Aver. Cloud. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ° | | ° | | ° | ° | ° | 0-100 | ° | ° | inches | | |
| London, Camden Square | 65·2 | 2 | 36·0 | 24 | 59·1 | 47·6 | 48·9 | 87 | 109·2 | 29·0 | 6·03 | 26 | 7·2 |
| Malta | 83·1 | 13 | 54·8 | 26 | 76·3 | 63·0 | 62·8 | 85 | 131·8 | 40·2 | ·25 | 3 | 3·3 |
| Lagos, W. Africa | 88·0 | 31 | 70·0 | 17*b* | 84·8 | 73·9 | 74·5 | 78 | 148·0 | 69·0 | 6·87 | 12 | 5·0 |
| *Cape Town* | 78·0 | 22 | 38·5 | 18 | 63·9 | 49·1 | 50·2 | 78 | ... | ... | 3·73 | 15 | 5·8 |
| *Durban, Natal* | 93·4 | 17 | 54·0 | 20 | 78·5 | 61·8 | ... | ... | 143·9 | ... | 1·16 | 12 | 4·9 |
| *Mauritius* | 82·0 | 23 | 57·2 | 6 | 78·7 | 63·2 | 59·9 | 69 | 147·2 | 48·4 | 1·20 | 20 | 5·9 |
| Calcutta | 90·9 | 4 | 66·9 | 27 | 87·0 | 74·9 | 73·9 | 80 | 155·0 | 61·7 | 8·02 | 14 | 5·7 |
| Bombay | 91·5 | 24 | 72·4 | 3 | 87·2 | 76·6 | 73·7 | 77 | 140·5 | 61·9 | 5·91 | 6 | 4·0 |
| Madras | 94·0 | 12 | 67·9 | 29 | 88·5 | 75·1 | 73·7 | 82 | 143·2 | 67·0 | 8·84 | 15 | 5·2 |
| Kodaikanal | 67·5 | 20 | 47·4 | 27 | 63·5 | 51·3 | 50·7 | 83 | 140·1 | 35·3 | 5·65 | 10 | 6·8 |
| Colombo, Ceylon | 89·6 | 14 | 72·8 | 16*c* | 86·4 | 76·0 | 73·9 | 84 | 151·2 | 70·8 | 11·17 | 23 | 7·1 |
| Hongkong | 87·1 | 26 | 57·4 | 29 | 81·5 | 72·2 | 66·1 | 70 | 137·5 | ... | 1·66 | 4 | 6·0 |
| *Melbourne* | 87·7 | 11 | 40·8 | 3 | 70·2 | 50·8 | 48·7 | 69 | 149·8 | 31·6 | 2·77 | 14 | 5·9 |
| *Adelaide* | 94·8 | 30 | 41·5 | 2 | 74·9 | 53·0 | 46·4 | 53 | 149·4 | 36·7 | ·66 | 9 | 4·7 |
| *Coolgardie* | 89·1 | 25 | 39·2 | 9 | 75·3 | 48·7 | 43·0 | 49 | 158·1 | 29·7 | ·46 | 6 | 4·2 |
| *Sydney* | 77·9 | 13 | 48·8 | 4 | 66·6 | 55·3 | 54·3 | 77 | 116·0 | 43·4 | 4·12 | 19 | 6·4 |
| *Wellington* | 72·4 | 23 | 42·0 | 5 | 63·9 | 50·7 | 47·4 | 70 | 133·0 | 29·0 | ·67 | 7 | 7·0 |
| *Auckland* | 72·0 | 31 | 51·5 | 5 | 64·6 | 55·5 | 52·4 | 76 | 131·0 | 48·0 | 3·27 | 14 | 6·0 |
| Jamaica, Negril Point | 90·2 | 13 | 71·1 | 16 | 87·3 | 73·8 | 73·5 | 79 | ... | ... | 4·71 | 14 | ... |
| Trinidad | 91·0 | 7*a* | 68·0 | 9*d* | 89·2 | 70·7 | 74·0 | 82 | 166·0 | 66·0 | 2·12 | 5 | ... |
| Grenada | 87·4 | 8 | 70·0 | 13 | 84·7 | 75·1 | 72·9 | 78 | 153·0 | ... | 9·11 | 23 | 3·3 |
| Toronto | 73·9 | 7 | 27·9 | 27 | 59·5 | 42·1 | 45·1 | 78 | ... | ... | 2·78 | 10 | 5·7 |
| Fredericton | 71·3 | 1 | 34·9 | 30 | 53·6 | 34·9 | 34·1 | 62 | ... | ... | 4·14 | 11 | 6·1 |
| Winnipeg | 69·0 | 29 | 15·4 | 26 | 56·8 | 33·1 | ... | ... | ... | ... | ·69 | 5 | 4·3 |
| Victoria, B.C. | 65·7 | 12 | 37·3 | 3 | 57·0 | 45·5 | ... | ... | ... | ... | 1·77 | 14 | 6·4 |
| Dawson | 43·0 | 4 | 4·1 | 15 | 26·6 | 15·0 | ... | ... | ... | ... | 1·25 | 6 | 4·6 |

*a* and 8, 10. *b* and 21. *c* and 17. *d* and 10, 13.

MALTA.—Mean temp. of air 68°·3 or 1°·1 below, mean hourly velocity of wind 6·7 or 2·2 below, average. Mean temp. of sea 72°·7. L on 3 days.

*Mauritius.*—Mean temp. of air 1°·8, dew point 2°·0, and R ·37 in. below, average. Mean hourly velocity of wind 12·1 miles, or 1·0 above average.

KODAIKANAL.—Mean temp. of air 55°·8. Mean velocity of wind 273 miles per day. Bright sunshine 135·9 hours.

COLOMBO, CEYLON.—Mean temp. of air 80°·5 or 0°·3 above, of dew point 0°·9 above, and R 3·39 in. below, average. Mean hourly velocity of wind 10 miles, prevailing direction S.W. T88 on 10 days.

HONGKONG.—Mean temp. of air 76°·1. R 3·70 in. below average. Bright sunshine 174 hours or 40 below average. Mean hourly velocity of wind 13·9 miles; prevailing direction N.E. by E.

*Adelaide.*—Mean temp. of air 1°9 above, R 1·09 in. below, average. Moderately dry over agricultural areas.

*Sydney.*—Mean temp. of air 2°·5 below, humidity 8·2 above, and R 1·13 in. above, average.

*Wellington.*—Mean temp. of air 3°·7 above, and R 3·70 below average.

TRINIDAD.—R 4·65 in. below 40 years' average.