

S Y M O N S ' S  
M O N T H L Y  
M E T E O R O L O G I C A L M A G A Z I N E .

---

CXXXVII.]

JUNE, 1877.

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

---

THE FRENCH AGRICULTURAL STORM-WARNING  
SYSTEM.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

## THE CLIMATES OF VARIOUS BRITISH COLONIES.

*(Continued from page 60).*

### BOMBAY.

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

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

### MADRAS.

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

## CEYLON.

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

## STRAITS SETTLEMENTS.

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

## QUEENSLAND.

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

## NEW SOUTH WALES.

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

## VICTORIA.

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

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

#### SOUTH AUSTRALIA.

This Colony has always struck me as the most energetic of all our Australian Colonies. Nothing but tremendous energy would have induced the comparatively small population of South Australia to attempt the most difficult telegraphic enterprise ever undertaken ; and certainly none but men of great energy would expect *one* man efficiently to discharge the duties of Postmaster-General, Superintendent of a land telegraph nearly 2,000 miles long, Government Astronomer, and Director of the meteorological system of the Colony. Yet this is what Mr Todd is expected to do, and does do well. In his article upon "South Australia : Its Observatory and Meteorology," Mr. Todd truly remarks that "in a young Colony, where a mere handful of people have to bring vast wastes under cultivation; build new homes, construct roads and railways, and carry out other extensive public works necessary for the development of the country they have traversed the ocean to occupy, it is not to be expected that much time, thought or money can be devoted to science or art." Yet the South Australians have not only kept up perfect second-order stations at Adelaide, and four or five other stations in the South, but they have fifty-five rainfall stations, besides the fifteen, which are perhaps the most important set in the world, viz., those which run like a chain through the very centre of Australia. Neither Queensland, New South Wales, nor Victoria have penetrated to the inland boundaries of their own territories ; South Australia has pierced through the very heart of the continent. The Adelaide results are as follows : Mean temp. 63°·1, highest 113°·5, lowest 34°·2, range 79°·3, mean daily range 20°·6, humidity 60, rain 21 in. In the southern part of South Australia the temp. and rainfall are fairly represented by the above figures ; in the centre it is hotter and drier—in fact, according to the short period that the telegraph stations have been established, the rainfall seems to be only 4 or 5 in. In the extreme north the temp. is uniform and high, the air is very damp, and the rainfall about 50 in.

#### WEST AUSTRALIA.

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

#### TASMANIA.

Having received no reply to the circular sent to this Colony, I have only my own knowledge upon which to rely. I am not aware that the government has done anything towards ascertaining the climate of Tasmania. A very full and accurate journal has been kept (in continuation of that kept in connection with the Magnetic Observatory) by a private gentleman, Mr. F. Abbott, F.R.A.S., for a quarter of a century, at Hobart Town, and during 1862 he also established stations at the lighthouses round the north and east coasts, but I do not know that they were continued. I have no records for any length of time, except for Hobart Town, of which the mean temp. is 54°·4, highest 105°, lowest 29°, range 76°, mean daily range 17°·9, humidity 75, rainfall 23 in.

#### NEW ZEALAND.

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

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

#### BRITISH GUIANA.

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

#### TRINIDAD.

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

#### BARBADOES.

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

#### ST. KITTS.

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

#### JAMAICA.

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

#### BRITISH HONDURAS.

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

BERMUDA.

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

CANADA.

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

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

Toronto: Mean temperature  $44^{\circ}\cdot 1$ , highest  $99^{\circ}\cdot 2$ , lowest  $-26^{\circ}\cdot 5$ , range  $125^{\circ}\cdot 7$ , mean daily range  $16^{\circ}\cdot 6$ , mean humidity 77, mean rainfall 36 in.

St. John's, Newfoundland: Mean temperature  $40^{\circ}$ , highest  $92^{\circ}\cdot 5$ , lowest  $-21^{\circ}\cdot 0$ , range  $113^{\circ}\cdot 5$ , daily range  $14^{\circ}\cdot 4$ , rainfall 55 in.

Spence's Bridge, British Columbia: Mean temperature  $46^{\circ}\cdot 3$ , highest  $100^{\circ}$ , lowest  $-29^{\circ}\cdot 0$ , range  $129^{\circ}\cdot 0$  daily range  $19^{\circ}\cdot 3$ , humidity 62, rainfall doubtful.

Manitoba, Winnipeg: Mean temperature  $31^{\circ}\cdot 3$ , highest  $95^{\circ}\cdot 0$ , lowest  $-43^{\circ}\cdot 1$ , range  $138^{\circ}\cdot 1$ , daily range,  $23^{\circ}\cdot 2$ , humidity 84, rainfall 22 in.

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

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

Colombo, Ceylon, has the highest average temperature,  $80^{\circ}\cdot 7$ , but Madras and British Honduras are nearly as hot.

The highest point reached in the shade at any of the stations quoted is at Adelaide,  $113^{\circ}\cdot 5$ , but still higher temperatures are reported from the district near the junction of the Murray and Darling rivers.

The lowest temperature— $43^{\circ}\cdot 1$ ,  $75^{\circ}$  below freezing, is reported from Winnipeg, Manitoba. This station is in lat.  $49^{\circ}53'N.$ , and is, therefore, nearer the Equator than any part of England, yet the cold is so intense as to freeze mercury nearly every winter.

The range of temperature, or the difference between the very highest and very lowest temperatures, and which may be regarded as the exponent of the amount of change between summer and winter, varies greatly, viz., from  $21^{\circ}$  at Barbadoes and British Guiana, to  $138^{\circ}\cdot 1$  at Manitoba, thus illustrating in an extreme manner the difference between tropical and insular and continental climates.

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

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

*Leading Climatological Features of the Principal British Colonies.*

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

Although not a medical man, I should have been glad of the opportunity of saying a little respecting the effect of Colonial climates on the health of Englishmen; but time forbids more than a few words. As regards excessive heat, the hottest which has come under our notice is Central Australia, and there Mr. Todd says he has ridden fifty miles in the day with the temperature as high as  $113^{\circ}$  without much inconvenience or distress, because these high temperatures are always accompanied by such extreme dryness that perspiration affords instantaneous relief. Damp heat is what tells upon white men; and though a good deal of the injury ascribed to tropical climates is due to irregularities of life, there seems to be little doubt that to the majority of men continued damp heat is seriously injurious. In 1744 one John Peter Purry wrote a pamphlet with the title "Method for Determining the Best Climate of the Earth," in which he demonstrated to his own satisfaction that Eldorado was to be found on the  $33^{\circ}$  of latitude, both N. and S. He induced a sufficient number of people to believe in him to start with a party for South Carolina and establish a little Colony called Purrysburgh, but the only relic is the small town now called Parisburgh, near the

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

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

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

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

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

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

## UPPER CURRENTS AND CYCLONE AXES.

*To the Editor of the Meteorological Magazine.*

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

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

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

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

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

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

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

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

Yours truly,  
W. CLEMENT LEY.

June 8th, 1877.

BAROMETRIC TIDES.

*To the Editor of the Meteorological Magazine.*

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

*Bushy Hill, Cambuslang, 1st June, 1877.*

“ 30th October, 1876.

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

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

“HENRY MUIRHEAD.”

GREENWICH EXTREME TEMPERATURES.

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

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

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

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

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

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

EDWD. MAWLEY.

Addiscombe, June 6th, 1877.

TEMPERATURE OF RAIN.

To the Editor of the Meteorological Magazine.

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

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

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

G. DINES.

Woodside, Watton-on-Thames.

SUPPLEMENTARY TABLE OF RAINFALL IN MAY, 1877.

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

| Div.   | Station.                    | Total Rain. | Div.   | Station.                | Total Rain. |
|--------|-----------------------------|-------------|--------|-------------------------|-------------|
|        |                             | in.         |        |                         | in.         |
| II.    | Acol .....                  | 2·48        | XI.    | Llanfrechfa .....       | 4·40        |
| „      | Hailsham .....              | 2·07        | „      | Castle Malgwyn .....    | 3·67        |
| „      | St. Lawrence, I. of W... .. | 2·20        | „      | Heyope .....            | ...         |
| „      | Andover.....                | 2·28        | „      | Carno .....             | 5·14        |
| „      | Strathfield Turgiss .....   | 2·04        | „      | Rhug, Corwen .....      | 4·24        |
| III.   | Addington Manor .....       | 3·34        | „      | Port Madoc .. ..        | 3·45        |
| „      | Oxford .....                | 2·22        | XII.   | Melrose .....           | 2·12        |
| „      | Northampton .....           | 2·06        | XIV.   | Cessnock, Glasgow ..... | 1·98        |
| „      | Cambridge.....              | 1·44        | XV.    | Gruinart .....          | 1·60        |
| IV     | Sheering .....              | 2·97        | XVII.  | Keith .....             | 3·06        |
| „      | Ipswich .....               | 1·73        | XVIII. | Dalwhinnie .....        | 1·33        |
| „      | Diss .....                  | 2·03        | „      | Auchnasheen .....       | 3·42        |
| „      | Swaffham .....              | 1·59        | „      | Springfield, Tain ..... | 2·49        |
| V.     | Compton Bassett .....       | 3·08        | XX.    | Skibbereen .....        | ...         |
| „      | Dartmoor .....              | 7·58        | „      | Glenville, Fermoy ..... | 4·36        |
| „      | Teignmouth .....            | 4·01        | „      | Tralee.....             | 2·90        |
| „      | Langtree, Torrington ..     | 3·63        | „      | Newcastle W., Limerick  | 3·18        |
| „      | Cosgarne, St. Austell ..    | 5·66        | „      | Kilrush .....           | 2·16        |
| „      | Taunton.....                | 3·20        | XXI.   | Kilkenny .....          | 2·68        |
| VI.    | Bristol .....               | 2·24        | „      | Kilsallaghan .....      | 2·76        |
| „      | Sansaw .....                | 2·48        | „      | Twyford, Athlone .....  | 3·28        |
| „      | Cheadle .....               | 3·42        | XXII.  | Ballinasloe .....       | 3·45        |
| VII.   | Coston, Melton Mowbray      | 2·47        | „      | Kylemore .....          | 8·70        |
| „      | Bucknall .....              | 1·70        | „      | Carrick on Shannon..... | 2·85        |
| V III. | Walton, Liverpool .....     | 2·58        | XXIII. | Rockcorry .....         | 2·58        |
| „      | Broughton-in-Furness ..     | 3·97        | „      | Warrenpoint .....       | 3·56        |
| IX.    | Stanley, Wakefield .....    | 2·01        | „      | Carnlough, Larne.. ..   | 3·15        |
| X.     | Gainford .....              | 2·28        | „      | Bushmills .....         | 1·91        |
| „      | Shap .....                  | 4·36        | „      | Buncrana .....          | 2·22        |

MAY, 1877.

| Div.     | STATIONS.<br>[The Roman numerals denote the division of the Annual Tables to which each station belongs.] | RAINFALL.      |                                         |                                  |       | Days on which<br>"01 or more fell. | TEMPERATURE. |       |      |       | No. of<br>Nights<br>below<br>32° |     |
|----------|-----------------------------------------------------------------------------------------------------------|----------------|-----------------------------------------|----------------------------------|-------|------------------------------------|--------------|-------|------|-------|----------------------------------|-----|
|          |                                                                                                           | Total<br>Fall. | Difference<br>from<br>average<br>1860-5 | Greatest<br>Fall in<br>24 hours. |       |                                    | Max.         |       | Min. |       |                                  |     |
|          |                                                                                                           |                |                                         | Dpth                             | Date. |                                    | Deg.         | Date. | Deg. | Date. |                                  |     |
| I.       | Camden Town .....                                                                                         | 1.91           | -.49                                    | .28                              | 19    | 15                                 | 68.0         | 26    | 29.2 | 4     | 4                                | 5   |
| II.      | Maidstone (Hunton Court)...                                                                               | 2.26           | +.02                                    | .77                              | 12    | 12                                 | ...          | ...   | ...  | ...   | ...                              | ... |
| III.     | Selborne (The Wakes).....                                                                                 | 3.25           | +.77                                    | .56                              | 16    | 19                                 | 63.0         | 8     | 26.5 | 5     | 6                                | 7   |
| IV.      | Hitchin .....                                                                                             | 2.52           | +.59                                    | .34                              | 16    | 19                                 | 63.0         | 31    | 23.0 | 3, 4  | 6                                | ... |
| V.       | Banbury .....                                                                                             | 3.31           | +1.09                                   | 1.00                             | 16    | 19                                 | 65.0         | 27*   | 27.0 | 5     | 6                                | ... |
| VI.      | Bury St. Edmunds (Culford).                                                                               | 1.54           | -.62                                    | .31                              | 28    | 16                                 | 70.0         | 31    | 22.0 | 4     | 6                                | 7   |
| VII.     | Norwich (Sprowston).....                                                                                  | 1.91           | ...                                     | .47                              | 19    | 14                                 | ...          | ...   | ...  | ...   | ...                              | ... |
| VIII.    | Bridport .....                                                                                            | 2.10           | +.07                                    | .72                              | 16    | 13                                 | ...          | ...   | ...  | ...   | ...                              | ... |
| IX.      | Barnstaple .....                                                                                          | 2.95           | +.51                                    | .65                              | 16    | 13                                 | 66.0         | 26†   | 34.0 | 6     | ...                              | ... |
| X.       | Bodmin .....                                                                                              | 6.02           | +3.56                                   | 1.28                             | 31    | 16                                 | 63.0         | 26    | 37.0 | 7     | 0                                | 1   |
| XI.      | Cirencester .....                                                                                         | 2.55           | +.27                                    | .77                              | 16    | 15                                 | ...          | ...   | ...  | ...   | ...                              | ... |
| XII.     | Shifnal (Haughton Hall)...                                                                                | 2.32           | +.06                                    | .39                              | 16    | 15                                 | 68.0         | 31    | 28.0 | ...   | ...                              | ... |
| XIII.    | Tenbury (Orleton) .....                                                                                   | 3.32           | +.44                                    | .68                              | 14    | 15                                 | 66.0         | 31    | 26.0 | 4     | 7                                | 8   |
| XIV.     | Leicester (Belmont Villas)...                                                                             | 2.15           | ...                                     | .41                              | 31    | 16                                 | 72.2         | 31    | 27.0 | 5     | 6                                | 9   |
| XV.      | Boston .....                                                                                              | 1.41           | -.53                                    | .32                              | 17    | 17                                 | 70.0         | 31    | 28.0 | 4     | 3                                | ... |
| XVI.     | Grimsby (Killingholme)...                                                                                 | 1.34           | ...                                     | .39                              | 18    | 12                                 | 63.0         | 27    | 29.0 | 5     | 2                                | ... |
| XVII.    | Mansfield .....                                                                                           | 3.40           | ...                                     | .69                              | 10    | 17                                 | 71.0         | 31    | 23.2 | 6     | 5                                | 7   |
| XVIII.   | Manchester .....                                                                                          | 2.76           | +.10                                    | .49                              | 10    | 15                                 | 67.0         | 18    | 26.0 | 6     | 3                                | 6   |
| XIX.     | York .....                                                                                                | 2.29           | +.34                                    | .66                              | 17    | 13                                 | 64.0         | 31    | 26.0 | 6     | 2                                | ... |
| XX.      | Skipton (Arncliffe) .....                                                                                 | 3.73           | +.38                                    | .82                              | 27    | 14                                 | 62.0         | 26    | ...  | ...   | ...                              | ... |
| XXI.     | North Shields .....                                                                                       | 2.23           | -.41                                    | .42                              | 11    | 15                                 | 59.5         | 26    | 30.0 | 4, 5  | 2                                | 6   |
| XXII.    | Borrowdale (Seathwaite)...                                                                                | 10.92          | +1.38                                   | 3.35                             | 24    | 13                                 | ...          | ...   | ...  | ...   | ...                              | ... |
| XXIII.   | Cardiff (Crockherbtown)...                                                                                | 2.47           | ...                                     | .99                              | 16    | 14                                 | 67.0         | 26    | 32.5 | 4     | 0                                | ... |
| XXIV.    | Haverfordwest .....                                                                                       | 4.42           | +1.70                                   | 1.54                             | 27    | 10                                 | 66.0         | 26    | 28.3 | 4     | 4                                | 11  |
| XXV.     | Aberdovey .....                                                                                           | 3.32           | ...                                     | .90                              | 28    | 12                                 | 74.0         | 26    | 34.0 | 5     | 0                                | ... |
| XXVI.    | Llandudno.....                                                                                            | 2.32           | -.06                                    | .55                              | 10    | 13                                 | 68.5         | 8     | 34.0 | 5     | ...                              | ... |
| XXVII.   | Dunfries (Crichton Asylum)                                                                                | 3.20           | +.77                                    | .83                              | 27    | 14                                 | 60.6         | 15    | 25.0 | 5     | 8                                | 9   |
| XXVIII.  | Hawick (Silverbut Hall)...                                                                                | 2.66           | ...                                     | .68                              | 27    | 15                                 | ...          | ...   | ...  | ...   | ...                              | ... |
| XXIX.    | Kilmarnock (Annanhill)...                                                                                 | 2.14           | ...                                     | .52                              | 17    | 16                                 | 61.5         | 9     | 28.0 | 4     | 5                                | 11  |
| XXX.     | Castle Toward .....                                                                                       | 1.71           | -1.68                                   | .40                              | 28    | 8                                  | 63.0         | 21    | 26.0 | 8     | 8                                | ... |
| XXXI.    | Mull (Quinish) .....                                                                                      | 2.63           | ...                                     | .73                              | 27    | 9                                  | ...          | ...   | ...  | ...   | ...                              | ... |
| XXXII.   | St. Andrews (Cambo Ho.)...                                                                                | 1.55           | ...                                     | ...                              | ...   | ...                                | ...          | ...   | ...  | ...   | ...                              | ... |
| XXXIII.  | Grandtully .....                                                                                          | 2.62           | ...                                     | 1.06                             | 31    | 10                                 | ...          | ...   | ...  | ...   | ...                              | ... |
| XXXIV.   | Braemar .....                                                                                             | 1.89           | +.09                                    | .57                              | 17    | 14                                 | 56.8         | 7     | 23.0 | 3, 5  | 8                                | 10  |
| XXXV.    | Aberdeen .....                                                                                            | 2.96           | ...                                     | .51                              | 17    | 18                                 | 59.2         | 30    | 30.6 | 3     | 3                                | 7   |
| XXXVI.   | Gairloch .....                                                                                            | ...            | ...                                     | ...                              | ...   | ...                                | ...          | ...   | ...  | ...   | ...                              | ... |
| XXXVII.  | Portree .....                                                                                             | 3.57           | ...                                     | .89                              | 26    | 16                                 | ...          | ...   | ...  | ...   | ...                              | ... |
| XXXVIII. | Inverness (Culloden)...                                                                                   | 2.37           | +.81                                    | .94                              | 19    | 17                                 | 62.7         | 16    | 27.1 | 3     | 7                                | 12  |
| XXXIX.   | Helmsdale .....                                                                                           | 2.39           | ...                                     | .72                              | 17    | 15                                 | ...          | ...   | ...  | ...   | ...                              | ... |
| XL.      | Sandwick .....                                                                                            | 2.73           | +.47                                    | .79                              | 26    | 19                                 | ...          | ...   | ...  | ...   | ...                              | ... |
| XLI.     | Caherciveen Darrynane Abbey                                                                               | 3.52           | ...                                     | .90                              | 31    | 15                                 | 59.0         | 27    | 29.6 | 3     | 2                                | 8   |
| XLII.    | Cork .....                                                                                                | 3.80           | ...                                     | 1.27                             | 31    | 13                                 | ...          | ...   | ...  | ...   | ...                              | ... |
| XLIII.   | Waterford .....                                                                                           | 3.31           | +1.06                                   | .81                              | 27*   | 15                                 | 68.0         | 21§   | 30.0 | 6     | 3                                | ... |
| XLIV.    | Killaloe .....                                                                                            | 3.48           | +.30                                    | .50                              | 11    | 15                                 | 71.0         | 26    | 31.0 | 6, 9  | 3                                | ... |
| XLV.     | Portarlington .....                                                                                       | 1.86           | -1.34                                   | .29                              | 28    | 17                                 | 63.0         | 26    | 28.0 | 4     | 2                                | ... |
| XLVI.    | Monkstown, Dublin .....                                                                                   | 2.10           | +.19                                    | .31                              | 16    | 15                                 | 67.0         | 27    | 29.0 | 5     | 2                                | 2   |
| XLVII.   | Galway .....                                                                                              | 3.53           | ...                                     | .70                              | 14    | 18                                 | 64.0         | 21    | 31.0 | 5     | 2                                | ... |
| XLVIII.  | Ballyshannon .....                                                                                        | 2.66           | ...                                     | .37                              | 15†   | 15                                 | ...          | ...   | ...  | ...   | ...                              | ... |
| XLIX.    | Waringstown .....                                                                                         | 3.21           | ...                                     | .79                              | 10    | 17                                 | 72.0         | 19    | 27.0 | 4     | 4                                | 7   |
| L.       | Edenfel (Omagh) .....                                                                                     | 2.46           | ...                                     | .43                              | 31    | 13                                 | 61.0         | 14    | 26.0 | 3, 4  | 5                                | ... |

\* And 31. † 18. ‡ 27. § 25. || 16, 26. ¶ 5, 6.  
 † Shows that the fall was above the average; — that it was below it.

ABBR...  
 JUN...  
 S...  
 SE...  
 W...  
 BA...  
 the fi...  
 CU...  
 able...  
 temp...  
 than...  
 result...  
 out the...  
 winds...  
 SPR...  
 unabl...  
 high v...  
 HA...  
 frosts...  
 includ...  
 copion...  
 out the...  
 heard...  
 ORL...  
 E. win...  
 mornin...  
 and de...  
 and the...  
 but c...  
 was ver...  
 9th; t...  
 of the...  
 month...  
 LIT...  
 the the...  
 mean t...  
 GRIM...  
 ash, o...  
 migrato...  
 and T...  
 MAN...  
 the 25...  
 everyth...  
 on the 1...  
 ARNO...  
 from E...  
 HAVE...  
 wet Ma...  
 backwar...  
 the rain...  
 blossom...  
 also gale...  
 ABBR...  
 have bee...  
 LLAN...

METEOROLOGICAL NOTES ON MAY.

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

ENGLAND.

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

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

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

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

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

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

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

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

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

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

WALES.

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

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

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

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

#### SCOTLAND.

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

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

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

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

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

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

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

#### IRELAND.

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

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

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

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

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