

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 .

CLVII.]

FEBRUARY, 1879.

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CONCERNING OUR TABLES.

WE have to give an unusual amount of tabular matter this month, and think that a few words are desirable respecting it.

It is probably known to most of our readers that this periodical was originally a sort of monthly supplement to the annual volumes of *British Rainfall*. It was, however, thought well to add to the rainfall details, notes upon other branches of meteorology, and our efforts in that direction met with sufficient appreciation to cause the development of these supplements into the periodical which we have had the pleasure of carrying on for thirteen years.

Although the functions of the *Meteorological Magazine* as a medium of unrestrained communication among meteorologists have developed far beyond our anticipations, we have never neglected the original object whence it arose; on the contrary, while No. I. contained the total rainfall at 50 stations, No. CLVI. contained that at 116, and on and after this month we hope to give records from 138 stations.

Our readers must not, however, imagine that we intend overloading the magazine with tables—far from it. The large space occupied this month is purely exceptional, and arises from our giving complete tables of the geographical positions of all the stations. This information is extremely valuable to those of our English readers who utilize the rainfall data which we give, and to residents in other countries it is indispensable. The positions assigned are mostly correct to the nearest minute, as they have nearly all been taken from the Ordnance maps, and they are certainly accurate enough for the purpose intended, viz., enabling readers to find the localities designated.

It will be seen that the rainfall for January at the supplementary stations is given along with the latitudes and longitudes; for the regular stations this was of course impossible.

ATLANTIC WEATHER MAPS.

JUST at the moment of going to press we have received from Prof. Cleveland Abbe, of the Signal Office, Washington, a note respecting the article upon the above subject in our last number, and along with it some charts of "Ocean Storm-tracks." We postpone until next month further remarks upon the subject except on one point: of the following words on page 177 of Vol. XIII., "and the United States Government have printed masses of figures, *but no maps and no discussion of the data,*" those in italics are incorrect; they have printed some maps involving the discussion of the European synchronous observations. The explanation of the error is, that although the Signal Office is known to be very liberal in distributing its publications, the *Meteorological Magazine* has, we are sure unintentionally, been omitted from its list; and although, partly by presents from other persons, and partly by purchase, we have a large collection of publications of the Signal Office, it is far from perfect, and does not contain any maps similar to those now sent.

FROST PHENOMENA.

To the Editor of the Meteorological Magazine.

SIR,—The winter of 1878-9, though raising the rate of mortality, and causing much hardship to the poor, will have done good in many ways. It will have rid our agriculturalists of many of the insect pests that have gained ground during the recent mild seasons, and possibly, in other countries, it may have checked the ravages of the phylloxera and the progress of the colorado beetle; it will have been a great boon to the fast increasing army of figure skaters; and it will, let us hope, have served to dispel some of the fallacies, both meteorological and botanical, of which we have lately heard too much; notably, the supposed change in our climate, the ability to judge of a coming winter by the abundance or scarcity of certain berries, and the advantage of planting our parks or gardens with tropical trees, sure to be utterly disfigured, if not killed outright, by the first of the severe winters, which recur, with some regularity, at intervals of about seven years.

Mr. Cordeaux's prediction, on 10th December, 1878, of a severe winter, based as it was on the unusual arrival of migratory birds (see *Times*, 12th December, 1878), was well timed, and has been triumphantly successful; but what prophet, of the more usual type, would have ventured to predict a min. temperature of 7°·7 on Christmas Day, followed by a min. of 50° on December 31st, the latter 5°·4 above the min. of 21st June last (the longest day of the year), and 6°·8 above that of June 20th!

The believers in the berry theory (the same, probably, who *insist* on our weather being influenced by the moon) will be at a loss to

account for a total absence of beech nuts, and a scarcity of thorn, holly and other berries, being followed by a November-January period of most unusual cold; and those who have written to the papers, stoutly defending the hardiness of their pet tree, the "blue gum" (*eucalyptus globulus*), will be dismayed to find it killed, though standing, as it has done here, by the side of such plants as the fan palm (*chamærops excelsa*) and bamboo (*bambusa metake*), which, without any protection, have survived the frost uninjured.

The continuance, rather than the severity, of the frost has led to the low mean temperatures.

From 17th to 31st January, both inclusive, there was a total range of only 12° (24° and 36°), while the sun was "conspicuous by his absence" during the whole of that period. There were 23 frosts here during December, and 27 in January, with skating on 37 or 38 of the 62 days. From December 15th to 24th, and from January 3rd to 6th, a succession of frosts occurred, with the wind almost continuously due W., and from January 16th to 31st, a succession of slight frosts, with the wind steady in the N.E.

I am, Sir, yours faithfully,

PERCY BICKNELL.

Forgrove, Beckenham, 1st Feb., 1879.

	Dry Bulb, 9 a.m.		Max.		Min.
<i>December, 1878.</i>					
Mean.....	33°·5	...	38°·2	...	28°·1
Highest...	53°·4 on 30th	..	55°·1 on 30th	...	50°·0 on 31st.
Lowest ...	20°·0 on 13th	...	29°·5 on 13th	...	7°·7 on 25th.
<i>January, 1879.</i>					
Mean.....	32°·4	...	36°·6	...	27°·8
Highest ..	47°·5 on 3rd	...	49°·0 on 3rd	...	46°·5 on 1st.
Lowest ...	21°·3 on 12th	...	27°·6 on 11th	...	18°·1 on 12th.

To the Editor of the Meteorological Magazine.

SIR,—In case you may be collecting comparative temperatures of the late frost, I send you some of my own notes.

The winter effects on the landscape have been most beautiful, especially when everything was covered with rime one-third to half an inch thick in crystal laminæ. I enclose for your acceptance a not very good photograph of an araucaria taken on the afternoon of Dec. 14th, too late for the light.

On Christmas night the trees were all coated with frozen rain, so that the form of every leaf could be taken off in ice.

The night of Jan. 10th and morning of Jan. 11th, a little light snow fell, in the largest and most beautiful and varied star crystals I have ever seen.

Saturday night last (Feb. 1st) we had a shower of clear ice drops, some single, but most of them clustered in the most fantastic forms. The effect was as if rain had fallen through a freezing stratum,

then through a warmer one that partially melted them, and then through another which froze them again.

Excuse the roughness of these notes.—Yours truly,
B. WOODE SMITH.

Branch Hill Lodge, Hampstead Heath, Feb. 5th, 1879.

To the Editor of the Meteorological Magazine.

SIR,—You may be glad of the results of observations on the appalling winter we have just emerged from. My records are now complete for 30 years, and they give no similar instance of uniform persistent low temperature. The means of the last three months are :—

November ... 36°·8 December ... 31°·1 January ... 28°·0

making a mean of only a trifle above freezing point. Our lowest reading, 15°, has often been exceeded, viz., in March and December, 1853, 1854; February and December, 1855, 1856, 1857, 1858; March and December, 1859, 1860, 1861, 1864, 1865, 1867; January and December, 1870, and 1874.

The very low temperature of November and January appear to be the most striking features of the winter, which has been almost continuous for nine weeks.—Yours truly,

W. LUCAS.

Hitchin, 9th February, 1879.

To the Editor of the Meteorological Magazine.

SIR,—Should the following particulars of the weather experienced here during November and December, 1878, and January, 1879, be of any interest, they are much at your service. Out of 92 days composing the period in question, 73 of them showed a frost on grass, 55 a frost in the stand at 4 ft. above it, and 14 a frost throughout the 24 hours, as indicated by the ther. never rising above 32°. The highest temp. in the three months was 53°·4 on the 31st of December (during a short thaw), the lowest, 4°·2, on the 12th of January, on which same day the terrestrial radiation ther. *in vacuo* on grass sank to 2° below zero. The adopted mean temperature of Nov., Dec., and January, as derived from the simple arithmetical mean of the daily maxima, minima, and 9 a.m. and 9 p.m. observations, is 34°·5. Of rainfall during the time above quoted, we have had 43 days (on 11 of which it snowed), yielding an amount of 8·54 inches, 3·35 in. of this falling between the 25th of December and the 3rd January.

From the 23rd to the 31st January no glimpse of the sun (even of the smallest description) was ever discernible. To-day, the 1st of February, is not only marked by a continuance of the frost and gloom, but by a heavy fall of snow in addition.—I am, Sir, yours faithfully,

F. BONNYCASTLE GRITTON, F.M.S.

Eglinton Villa, Holt, Trowbridge, Wilts, 1st February, 1879.

NOTE.—The instruments from which the above readings have been taken are all Kew verified.

To the Editor of the Meteorological Magazine.

SIR,—The mean temperature of the last three months has been $34^{\circ}6$, which is fully 6° below the average.

Cold weather set in on October 27th, and, with a few slight breaks, endured until February 5th.

In November the mean was...	...	...	$38^{\circ}9$
In December the mean was...	...	...	$33^{\circ}5$
In January the mean was ...	...	...	$31^{\circ}3$

The most severe frost occurred on the morning of January 12th, when the thermometer here registered $11^{\circ}5$. It was the coldest month we have had since February, 1855, when the mean temperature was $29^{\circ}4$.—Yours faithfully,

W. F. DENNING, F.R.A.S.

Tyndale House, Ashley Down, Bristol, Feb. 7th, 1879.

To the Editor of the Meteorological Magazine.

SIR,—I have to call your attention to the very low temperature which prevailed here between Dec. 10—26, as shown by thermometers 4 feet from ground, enclosed in a Stevenson box.

		Max.		Min.		Mean.
Dec. 10	...	21°	...	14°	...	$17^{\circ}5$
„ 11	...	20	...	10	...	15 0
„ 12	...	14	...	2	...	8 0
„ 13	...	12	...	—4	...	4 0
„ 14	...	15	...	—2	...	6 5
„ 15	...	20	...	6	...	13 0
„ 16	...	24	...	10	...	17 0
„ 17	...	15	...	7	...	11 0
„ 18	...	19	...	14	...	16 5
„ 19	...	31	...	21	...	26 0
„ 20	...	36	...	24	...	30 0
„ 21	...	24	...	14	...	19 0
„ 22	...	21	...	11	...	16 0
„ 23	...	19	...	15	...	17 0
„ 24	...	20	...	14	...	17 0
„ 25	...	10	...	—2	...	4 0

Giving mean daily temperature $14^{\circ}8$

The mean temperature of December was $24^{\circ}0$.

Yours truly,

JOHN COPPIN.

Bingfield, Corbridge-on-Tyne, Jan. 23rd, 1879.

To the Editor of the Meteorological Magazine.

SIR,—You may possibly care to be informed that on the night of the 11-12th inst., the registering thermometer in my stand, at 4 ft. from the ground, and of course thoroughly protected from radiation, indicated a minimum temperature of 10° , and had not risen *in the least* up to 9.10 a.m. on the 12th. At the latter hour the minimum thermometer on the snow stood at 2° , but registered the unusually low reading of -3° as the lowest temperature of the night. At 0.30 p.m. on the same day it stood at $32^{\circ}5$ whilst lying on the

snow, which was melting under the influence of a warm westerly breeze. So many observers appear to have allowed their grass minimum thermometer to remain buried under the snow, that, as yet, I have not heard of any similar low readings in this neighbourhood.—Yours very truly,

F. F. TUCKETT.

Frenchay, near Bristol, Jan. 21st, 1879.

THE SHAPE OF RAIN-DROPS.

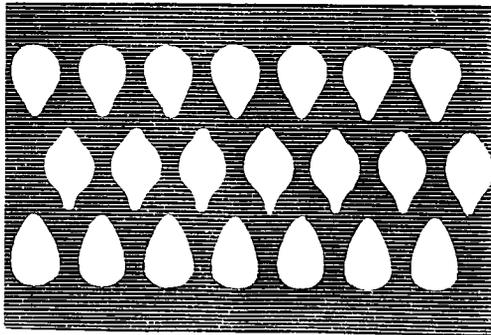
To the Editor of the Meteorological Magazine.

SIR,—This subject appears never to have received any attention from meteorological observers, although with the aid of recent discoveries it would appear possible to photograph falling rain, and this would definitely settle the question.

In the absence of photographs, it can only be discussed from a theoretical point of view, and the following ideas are therefore sketched out for consideration.

Rain-drops have a certain weight, which causes them to fall to the earth, and therefore their shape probably approaches to spherical; but as they fall through the air, their weight would cause them constantly to change their shape, each part of the drop having the tendency to fall. If then the rain-drops are completely spherical at first, the water would run out towards the middle of the lower part of each drop, being the point of greatest weight; this would cause the drops to be pointed at the base, and they would assume a balloon shape. In the next stage the main portion of the rain-drop would be progressing towards the lower part, and thus both the top and bottom would be pointed. The third stage is at last reached, and in this the main portion of the rain-drop would have been carried by its own weight to the lower part, and the drop would then be pear-shaped.

These three supposed shapes are shewn in the following sketch, which represents a small portion of a shower of rain.



Of course it is assumed that these shapes are only found during a calm, and the effect of wind would be to vary the forms and render them more attenuated.

FREDERICK E. SAWYER, F.M.S.

REVIEWS.

The Meteorology of the North Atlantic during August, 1873. By CAPTAIN HENRY TOYNBEE. 4to and Atlas of Plates. Stanford, 1878.

IN our last number we gave so brief a notice of the above work that we return to it, and especially because we think that a short review will be instructive to our readers, and may lead some to examine the work for themselves.

The labour necessary to chart such a number of observations must have been considerable, especially when we see that the bulk of the observations was obtained from ordinary ships' logs; but the work, though dealing chiefly with observations made on board ships, is by no means limited to the sea; the information obtained from the ships' logs has been used as a link connecting the American and European observations, and, to quote Captain Toynbee's own words—

“Although the chief object of this work is to throw light on the rise and progress of the hurricane, the charts also illustrate the ordinary circulation of the air over the North Atlantic and the neighbouring countries of North America and Europe during August, 1873.”

The letterpress which accompanies the charts is written in such a manner that it may easily be understood by the student of meteorology, and the remarks and conclusions derived from a study of the data will be found to be full of valuable information.

We see from the “Remarks on the Hurricane” that the first indication of its existence was observed on August 12th, in about 11° N. and 28° W., and its course is traced to the coast of Newfoundland on the 26th, when it seems to have broken up, though apparently the disturbance afterwards took the form of a slight area of low pressure which crossed to the British Isles on the 31st, and to Norway on September 2nd.

The following quotations from the work we consider peculiarly interesting, since they strike us as somewhat recouping the Americans for the pains they are taking just now with respect to warning us of coming storms:—

“*Possibility of Warning America.*—Its existence was known on the 18th at St. Thomas, a week before the damage was done on the American coast, and on the 21st the residents at Bermuda were fully aware of its existence and could have foretold its track; from both of these places warnings might have been sent to America if telegraphic communication had existed.”

“*Meeting between Area of High Pressure and Hurricane.*—It seems most probable that much of the destructive force of the northerly wind, which did so much damage on the 25th, was caused by a meeting between an area of high pressure moving from the north-westward and one of low pressure connected with the hurricane which was coming up from the S., and that more complete telegraphic communication would have made it possible to warn the coasts of the serious results to be expected from such a meeting, many hours before they experienced the gale.”

The direction of the wind with regard to the bearing of the hurri-

cane centre is made a point of especial importance, and is extremely well handled; the substance of the conclusion is that the wind does not blow in circles, but in the N. hemisphere

With the wind N. the centre of a hurricane probably bears E.S.E. or more Sly.
 " " E. " " " S.S.W. or more Wly.
 " " S. " " " W.N.W. or more Nly.
 " " W. " " " N.N.E. or more Ely.

this is followed by good practical suggestions for the seaman.

Then follows the mean height of the barometer, and force of wind at given distances from the centre of the hurricane.

Distance from centre	Near centre	100	200	300	400	500	Miles.
Mean Barometer ...	27·95	28·63	29·28	29·63	29·83	29·95	Inches.
Mean Wind force ...	12·0	9·8	8·2	7·1	6·2	5·6	Beaufort's Scale.

A mere glance at the charts is sufficient to show the normal circulation of the air in the month of August, which may be described as follows:—In the centre of the North Atlantic there is an area of high barometric pressure, around which the winds blow in the manner known as anti-cyclonic, so that on the northern side of this area the winds are westerly, on the eastern side they are northerly, on the southern side they are easterly, and on the western side they are southerly.

The difference of barometric pressure is greatest on the northern side of the area of high pressure, and this part may be considered the channel followed by the *systems* which cross to our Islands from the Atlantic.

Since the British Islands are situated to the north-eastward of the area of high pressure which is situated in the middle of the Atlantic, the following remark is of considerable importance to us at home:—

“*N.E. end of Area of Highest Pressure.*—At the N.E. end of the area of highest pressure there is generally a branching of the isobars, part going on to the E. and N.E., whilst others turn sharply to the S.E., S., and S.W., the winds follow the isobars so that to the N.E. of a westerly wind there will be south-westerly winds, whilst to the S.E. of it there will be north-westerly and northerly winds, the latter being due to a circulation of air round the area of high pressure, whilst the former are due to its being drawn towards an area of low pressure. This fact shows the importance of knowing the relative distribution of areas of high and low pressure when endeavouring to estimate the probable wind in a certain district.”

“In the month of August, 1873, the N.E. corner of the area of highest pressure lay very frequently near the entrance of the English Channel, causing a tendency for north-westerly winds there, which winds were not disturbed by the ordinary changes which passed over the British Islands from the westward. This near approach of the area of highest pressure to the Channel in summer makes it probable that north-westerly winds may be strong there, whilst the neighbouring south-westerly winds are relatively light. In winter, when the highest pressure often lies over France, south-westerly winds may be strongest.”

We do not recollect having seen any explanation by Capt. Toynbee of the unique form of the isobars upon his maps. In everybody

else's maps they run in graceful curves, but in those issued by Capt. Toynbee they ziz-zag about like what Mr. Nasmyth so truthfully called "painter's lightning." Very probably this peculiarity indicates that the position of each is computed instead of being, as is very usual, guessed at, and we do not for a moment impugn their accuracy, but, as it is impossible to believe that they really turn off at acute angles, they would gain both in actual and in apparent truthfulness if the corners were rounded.

While remarking upon draughtsmanship we suggest for Capt. Toynbee's consideration the advisability of either putting some lettering on the land, or putting wave lines round the coasts, or stippling all the land—if faintly done in blue it would render the charts much clearer, and would not at all hinder the prominence of the meteorological data.

Stanford's Compendium of Geography and Travel. AFRICA, by KEITH JOHNSTON. Stanford, London: 8vo, 610 pages, maps and engravings.

NOBODY has defined, or can define, the boundary line between descriptive and physical geography, or between physical geography and meteorology. There are, doubtless, many geographical works which could not claim notice in these pages, but meteorologists who neglect the work before us will miss a most valuable paper, giving the results of an entirely novel mode of investigating the seasonal distribution of African rainfall. We cannot spare space for epitomising the 34 pages in which Mr. Keith Johnston sums up the results of his investigations, and besides it could not be well done without the reproduction of the set of a dozen maps; we therefore leave it with the plain but true statement that it affords better information respecting the rainfall of Africa than any publication extant.

Lastly, a few words as to the rest of the volume, which is one of a series, based upon translations of Hellwald's *Die Erde und ihre Völker*. It is really a condensation of nearly all the books of travels ever written—a labour so vast that it may well originally come from Germany—but it does not read like a translation, nor has it the heaviness which the mass of information contained in it would imply. Reading it, is like listening to the personal narrative of an educated man who has himself made all the journeyings "Across the Dark Country" from the fifteenth century to the present time. If the rest of the series are as interesting as is Africa, we consider that a valuable addition will have been made to English literature.

The present troubles with Cetywayo (pronounced Ketchwayo) lend a melancholy interest to the portion of the work dealing with the Zulus and their military organization.

LATITUDES AND LONGITUDES OF THE SUPPLEMENTARY
STATIONS, AND RAINFALL FOR JANUARY THEREAT.

Div.	COUNTY.	STATION.	Latitude.	Longitude.	Total Rain.
II.	Kent	Margate, Acol	51° 21' N.	1° 19' E.	2·04
„	Sussex	Littlehampton	50 48 „	0 32 W.	3·30
„	„	Horsham, Swallowfield	51 1 „	0 18 W.	...
„	„	Hastings, Manor House	50 52 „	0 36 E.	2·59
„	„	Hailsham	50 52 „	0 16 E.	...
„	Hampshire	I. of W., St. Lawrence	50 35 „	1 14 W.	4·38
„	„	Strathfield Turgiss	51 20 „	1 0 „	3·24
III.	Buckingham	Great Missenden	51 42 „	0 42 „	2·60
„	„	Winslow, Addington Manor	51 57 „	0 55 „	2·77
„	Oxford	Oxford, Magdalen Col.	51 45 „	1 15 „	3·13
„	Northampton	Northampton, St. Giles' Street	52 14 „	0 54 W.	2·17
„	Cambridge	Cambridge, Merton Villa	52 13 „	0 8 E.	1·50
IV.	Essex	Harlow, Sheering	51 48 „	0 11 „	2·49
„	Norfolk	Diss	52 22 „	1 7 „	1·40
„	„	Swaffham	52 39 „	0 42 „	1·04
„	„	Hindringham	52 53 „	0 57 E.	·87
V.	Wilts	Salisbury, Alderbury	51 3 „	1 44 W.	3·54
„	„	Calne, Compton Bassett	51 27 „	1 56 „	3·35
„	Dorset	Beaminster Vicarage	50 48 „	2 44 „	5·32
„	Devon	Dartmoor Prison	50 33 „	4 0 „	9·24
„	„	Torrington, Langtree Wick	50 55 „	4 11 „	4·42
„	„	Lynmouth, Glenthorne	51 14 „	3 43 „	4·11
„	Cornwall	St. Austell, Cosgarne	50 21 „	4 48 „	8·11
„	Somerset	Taunton, Hoveland's Terrace.	51 1 „	3 6 „	4·27
VI.	Gloucester	Bristol, Ashleydown	51 28 „	2 35 „	3·98
„	Shropshire	Wem, Sansaw Hall	52 48 „	2 44 „	·77
„	Stafford	Cheadle, The Heath House	52 58 „	1 57 „	2·24
„	Warwick	Bickenhill Vicarage	52 26 „	1 44 „	2·14
VII.	Leicester	Melton Mowbray, Coston Rec.	52 48 „	0 45 „	1·18
„	Lincoln	Horncastle, Bucknall	53 13 „	0 15 „	1·26
VIII.	Lancashire	Walton-on-the-Hill	53 30 „	3 8 „	1·66
„	„	Broughton-in-Furness	54 17 „	3 12 „	2·50
IX.	York	Wakefield, Stanley Vic.	53 43 „	1 28 „	1·10
„	„	Ripon, High Bank, Mickley	54 11 „	1 37 „	1·17
X.	Durham	Gainford	54 32 „	1 44 „	·89
„	Northumberland	Haltwhistle, Unthank Hall	54 58 „	2 26 „	·67
„	Westmoreland	Shap, Copy Hill	54 31 „	2 41 „	1·50
XI.	Monmouth	Llanfrechta Grange	51 38 „	2 58 „	4·59
„	Carmarthen	Llandovery	52 0 „	3 48 „	2·97
„	Pembroke	Solva	51 52 „	5 12 „	2·98
„	„	Llechryd, Castle Malgwyn	52 3 „	4 35 „	2·42
„	Radnor	Rhayader, Nantgwilt	52 16 „	3 35 „	3·53
„	Montgomery	Carno, Tybrittle	52 34 „	3 32 „	2·30
„	Merioneth	Corwen, Rhug	52 59 „	3 24 „	1·22
„	Carnarvon	Port Madoc	52 56 „	4 7 „	1·91
„	Isle of Man	Douglas	54 9 „	4 28 „	...
XII.	Kirkcudbright	Carsphairn	55 11 „	4 17 „	1·99
„	Roxburgh	Melrose, Abbey Gate	55 37 N.	2 48 W.	1·50

Div.	COUNTY.	STATION.	Latitude.	Longitude.	Total Rain.
XIV.	Lanark	Lanark, Baronald	55° 38' N.	3° 47' W.	...
XV.	Argyll	Islay, Gruinart School	55 49 ,,	6 20 ,,	2·60
XVI.	Fife	St. Andrew's, Cambo House ..	56 18 ,,	2 43 ,,	2·35
„	Perth	Aberfeldy H.R.S.	56 36 ,,	3 52 ,,	1·25
XVII.	Banff	Tomintoul	57 14 ,,	3 23 ,,	2·52
„	„	Keith H.R.S.	57 35 ,,	2 53 ,,	2·33
„	Elgin	Forres H.R.S.	57 38 ,,	3 36 ,,	1 93
XVIII.	Ross	Strome Ferry H.R.S.	57 21 ,,	5 32 ,,	3·01
„	„	Lochbroom	57 51 ,,	5 12 ,,	2·44
„	„	Auchnasheen H.R.S.	57 36 ,,	5 5 ,,	2·49
„	„	Tain, Springfield	57 49 ,,	4 4 ,,	·77
„	Inverness	Loch Shiel, Glenfinnan	56 50 ,,	5 30 ,,	3·72
„	„	Dalwhinnie H.R.S.	56 56 ,,	4 15 ,,	...
XIX.	Sutherland	Lairg H.R.S.	58 3 ,,	4 24 ,,	...
„	Caithness	Altnabreac H.R.S.	58 27 ,,	3 33 ,,	·87
„	„	Watten H.R.S.	58 29 ,,	3 19 ,,	1·45
XX.	Cork	Fermoy, Glenville	52 3 ,,	8 27 ,,	7·66
„	Kerry	Tralee, Godfrey Place	52 16 ,,	9 42 ,,	3·84
„	Tipperary	Cahir, Tubrid	52 19 ,,	7 58 ,,	4·34
„	„	Tipperary, Henry Street	52 28 ,,	8 9 ,,	3·50
„	Limerick	Newcastle West	52 27 ,,	9 5 ,,	3·55
„	Clare	Kilrush	52 37 ,,	9 29 ,,	2·21
„	„	Corofin	52 57 ,,	9 6 ,,	3·61
XXI.	Kilkenny	Kilkenny, Butler House	52 40 ,,	7 15 ,,	3·11
„	Kildare	Naas, Ballymore Eustace	53 8 ,,	6 38 ,,	...
„	Dublin	Kilsallaghan, Corrstown Ho... ..	53 27 ,,	6 17 ,,	2·15
„	Meath	Navan, Balrath	53 38 ,,	6 36 ,,	2·04
„	Westmeath	Athlone, Twyford	53 26 ,,	7 50 ,,	2·56
„	„	Mullingar, Belvedere	53 30 ,,	7 22 ,,	2·74
XXII.	Galway	Ballinasloe, Kilconnell	53 19 ,,	8 15 ,,	3·14
„	„	Clifden, Kylemore	53 33 ,,	9 52 ,,	7·81
„	Mayo	Crossmolina, Enniscoe	54 4 ,,	9 19 ,,	...
„	Leitrim	Carrick-on-Shannon	53 56 ,,	8 5 ,,	2·92
„	„	Dowra	54 13 ,,	7 56 ,,	1·78
XXIII.	Monaghan	Rockcorry	54 6 ,,	7 1 ,,	2·18
„	Down	Warrenpoint, Summer Hill	54 44 ,,	6 15 ,,	4·35
„	„	Newtownards	54 36 ,,	5 42 ,,	2·12
„	Antrim	Larne, Carnlough	54 59 ,,	6 0 ,,	2·28
„	„	Bushmills	55 13 ,,	6 31 ,,	1·87
„	Donegal	Buncrana, Rockfort	55 10 N.	7 26' W.	2·07

LATITUDES AND LONGITUDES OF THE 50 REGULAR STATIONS.

Div.	COUNTY.	STATION.	Latitude.	Longitude.
I.	Middlesex	London, Camden Square	51° 33' N.	0° 8' W.
II.	Kent	Maidstone, Hunton Court	51 13 "	0 28 E.
"	Hampshire	Selborne, The Wakes	51 6 "	0 56 W.
III.	Hertford	Hitchin	51 57 "	0 17 W.
"	Oxford	Banbury, High Street	52 4 "	1 20 W.
IV.	Suffolk	Bury St. Edmunds, Culford	52 18 "	0 42 E.
"	Norfolk	Sprowston, Oak Lodge	52 40 "	1 20 E.
V.	Dorset	Bridport	50 44 "	2 46 W.
"	Devon	Barnstaple	51 5 "	4 3 "
"	Cornwall	Bodmin, Castle Street	50 28 "	4 43 "
VI.	Gloucester	Cirencester, The Firs	51 43 "	1 58 "
"	Shropshire	Shifnal, Haughton Hall	52 40 "	2 23 "
"	Worcester	Tenbury, Orleton	52 18 "	2 26 "
VII.	Leicester	Leicester, Town Museum	52 38 "	1 8 "
"	Lincoln	Boston	52 59 "	0 1 "
"	"	Ulceby, Killingholme	53 39 "	0 16 "
"	Notts	Mansfield, Grove House	53 9 "	1 12 "
VIII.	Lancashire	Manchester, Ardwick	53 28 "	2 13 "
IX.	York	York, Bootham	53 58 "	1 5 "
"	"	Arncliffe	54 9 "	2 6 "
X.	Northumberland	North Shields	55 0 "	1 26 "
"	Cumberland	Seathwaite	54 30 "	3 12 "
XI.	Glamorgan	Cardiff, Crockherbtown	51 29 "	3 10 "
"	Pembroke	Haverfordwest, High Street	51 48 "	4 58 "
"	Merioneth	Aberdovey	52 33 "	4 2 "
"	Carnarvon	Llandudno, Warwick Ho.	53 20 "	3 50 "
XII.	Kirkcudbright ..	Cargen, Dumfries	55 2 "	3 37 "
"	Roxburgh	Hawick, Silverbut Hall	55 26 "	2 46 "
XIV.	Ayr	Kilmarnock, Annanhill	55 38 "	4 30 "
XV.	Argyll	Lochgilphead, Kilmory	56 2 "	3 23 "
"	"	Mull, Quinish	56 38 "	6 13 "
XVI.	Kinross	Loch Leven Sluice	56 11 "	3 19 "
"	Perth	Tyndrum, Ewick	56 25 "	4 43 "
"	Forfar	Arbroath	56 34 "	2 34 "
XVII.	Aberdeen	Braemar	57 0 "	3 25 "
"	"	Aberdeen, Bonaccord Street ..	57 9 "	2 6 "
XVIII.	Inverness	Skye, Portree	57 24 "	6 13 "
"	"	Inverness, Culloden House	57 30 "	4 9 "
XIX.	Sutherland	Golspie, Dunrobin Castle	57 59 "	3 56 "
"	Orkney	Pomona, Sandwick	59 3 "	3 20 "
XX.	Cork	Cork, Queen's College	51 54 "	8 30 "
"	Kerry	Caherciveen, Darrynane Abbey.	51 45 "	10 5 "
"	Waterford	Waterford, Newtown	52 12 "	7 0 "
"	Tipperary	Ballina [Killaloe]	52 48 "	8 26 "
XXI.	King's County ..	Portarlington	53 8 "	7 10 "
"	Dublin	Monkstown, Easton Lodge	53 17 "	6 10 "
XXII.	Galway	Galway, Queen's College	53 17 "	9 3 "
XXIII.	Down	Waringstown	54 25 "	6 16 "
"	Tyrone	Omagh, Edenfell	54 35 "	7 17 "
"	Donegal	Ballyshannon	54 30 N.	8 12 W.

JANUARY, 1879.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.					TEMPERATURE.				No. of Nights below 32° On Grass.		
		Total Fall.	Difference from average 1860-5	Greatest Fall in 24 hours.		Days on which '01 or more fall.	Max.		Min.				
				Dpth	Date.		Deg.	Date.	Deg.	Date.	In shade.	On Grass.	
I.	Camden Square.....	inches	inches.	in.									
II.	Maidstone (Hunton Court)...	2.87	+ .92	1.12	1	12	51.0	1	19.2	12	27	27	
III.	Selborne (The Wakes).....	2.40	+ .36	1.15	1	8	...	...	...	...	...	...	...
III.	Hitchen.....	4.42	+ 1.15	1.24	2	14	50.0	1	15.0	10	27	30	
IV.	Banbury.....	2.57	+ .43	1.00	1	15	44.0	1	17.0	5†	29	31	
IV.	Bury St. Edmunds (Culford).	2.37	+ .28	.50	1	9	45.5	1	15.5	6	29	...	
V.	Norwich (Sprowston).....	1.57	- .30	.60	2	11	44.0	1	17.0	10	29	30	
V.	Bridport.....	4.97	+ 1.78	1.21	1	10	...	...	...	...	...	...
VI.	Barnstaple.....	4.04	+ .52	.79	2	12	54.0	1	18.0	12	...	...
VI.	Bodmin.....	6.55	+ 1.36	1.11	2	16	52.0	1	15.0	12	21	23.	
VII.	Cirencester.....	3.65	+ .65	1.17	1	12	...	...	...	...	...	...
VII.	Shifnal (Haughton Hall) ...	1.64	- .26	.42	17	8	48.0	1	16.0	12	30	30	
VII.	Tenbury (Orleton).....	2.31	- .22	.54	17	10	49.5	13	10.0	12	29	30	
VIII.	Leicester (Town Museum) ...	1.33	...	.29	14	11	50.6	1	17.0	11	28	31	
VIII.	Boston.....	.92	- 7.9	.52	14	4	42.0	15	19.0	4	26	...	
VIII.	Grimsby (Killingholme).....	.91	...	.41	14	15	43.0	14	25.5	6	22	...	
VIII.	Mansfield.....	1.64	...	.43	14	10	49.4	1	8.8	11	26	26	
IX.	Manchester (Ardwick).....	1.64	- .58	.40	13	6	45.0	13†	16.0	5	29	...	
IX.	York.....	1.05	- .53	.52	14	...	42.0	1	23.0	...	...	...
X.	Skipton (Arncliffe).....	1.34	- 4.30	.52	16	7	...	...	...	...	...	...
X.	North Shields.....	1.29	- .82	.25	11*	14	42.2	13	14.5	27	25	25	
XI.	Borrowdale (Seathwaite).....	3.34	- 13.02	1.52	12	6	...	...	...	...	...	...
XI.	Cardiff (Crockherbtown).....	4.71	...	1.30	1	10	49.3	14	17.6	12	25	...	
XI.	Haverfordwest.....	4.67	- .38	.94	17	12	50.0	14	14.0	11	26	27	
XI.	Aberdovey.....	1.55	...	...	...	...	...	...	...	...	...	...
XI.	Llandudno.....	.82	- 1.72	.26	17	9	49.7	13	19.1	11	24	...	
XII.	Cargen.....	1.92	- 2.77	.86	12	4	49.3	1	18.0	12§	27	...	
XII.	Hawick (Silverbut Hall).....	.89	...	.30	12	8	...	...	...	...	...	...
XIV.	Annanhill.....	1.66	...	.86	12	9	40.2	20	19.0	12	28	31	
XVI.	Kilmory.....	2.41	...	1.23	12	11	...	...	15.0	12	27	...	
XVI.	Mull (Quinish).....	1.29	...	.65	12	6	43.0	14	28.0	8	6	...	
XVII.	Loch Leven.....	...	...	...	...	...	...	...	...	...	...	...
XVII.	Tyndrum (Ewick).....	...	...	...	...	...	...	...	...	...	...	...
XVII.	Arbroath.....	1.92	- .60	.35	12	10	43.0	14	19.0	3	20	...	
XVII.	Braemar.....	.65	- 2.48	.08	7	15	41.0	15	3.0	12	29	31	
XVIII.	Aberdeen.....	...	...	...	...	...	...	...	...	...	...	...
XVIII.	Portree.....	1.96	- 11.13	.37	14	16	...	...	...	...	...	...
XVIII.	Inverness (Culloiden).....	.53	- 1.75	...	...	12	44.9	14	19.9	3	20	31	
XIX.	Dunrobin.....	1.51	- 1.14	.50	3	12	45.0	13	19.8	3	20	...	
XIX.	Sandwick.....	2.36	- .93	.39	3, 12	18	43.5	15	15.4	3	13	25	
XX.	Cork.....	6.51	...	.70	19	17	...	...	...	...	...	...
XX.	Caherciveen Darrynane Abbey	9.05	...	2.90	19	21	...	...	...	...	...	...
XX.	Waterford.....	5.05	+ .19	.88	17	16	53.0	1	20.0	11*	20	...	
XX.	Killaloe.....	2.73	- 2.13	.61	12	10	52.0	18	17.0	2, 12	22	...	
XXI.	Portarlington.....	2.44	- 1.57	.46	17	17	51.0	1	19.0	23	22	...	
XXI.	Monkstown, Dublin.....	2.44	- .95	.81	7	10	...	...	...	...	...	...
XXII.	Galway.....	3.74	...	1.00	19	17	52.0	13	21.0	25	20	...	
XXIII.	Waringstown.....	2.32	...	.85	17	13	50.0	14	14.0	11	28	28	
XXIII.	Edenfel (Omagh).....	1.87	...	.56	17	7	45.0	13	15.0	22	29	...	
XXIII.	Ballyshannon.....	...	...	...	...	...	...	...	...	...	...	...

* And 12. † And 14. ‡ And 10, 11. § And 20, 27.
 + Shows that the fall was above the average; - that it was below it.

METEOROLOGICAL NOTES ON JANUARY.

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

ENGLAND.

HITCHEN.—A very sunless month, with constant N. and E. winds. Highest barometer since March, 1878, and not a glimpse of sun for ten days.

BANBURY.—High wind on 6th, 7th and 12th; S on nine days.

CULFORD.—An exceedingly cold month, the average temp. being only 30°·9. Polar winds prevailed during twenty-one days, and the earth has now (Feb. 1st) been frost bound for more than two months.

BODMIN.—Average temp. of the month 35°·7. On the 23rd the grass min. fell to 9°, the lowest temp. I have registered during thirty years.

SHIFNAL.—Ground covered with S throughout the month (except from 14th to 17th), but never more than 3 in. deep. Frost nightly after the 1st; ice 8 in. thick. Slight, but bitter, winds, chiefly from N. and N.E., accompanied by mist; sun scarcely visible throughout. Birds sadly famished, unless fed; starlings and throats all gone; blackbirds remain. The Severn, at Shrewsbury, frozen, and will bear.

ORLETON.—A singularly cold month, with very persistent frost. The wind generally from N. and E., and the sky rarely clear. For the last eight days a thick veil of cloud covered the sky, without any break day or night, accompanied by a strong, dry wind. Mean temp. nearly 8½° below the average, and lower than that of any month I have registered. A bright solar halo on the morning of the 1st.

BOSTON.—Temp. 6° below the average. Prevailing winds N.E., and the weather very cold. On the 13th a rapid thaw set in, accompanied by S and R, the temp. suddenly rising 16°, but on the 16th it fell again below freezing point, and continued so to the end of the month.

GRIMSBY.—A month of almost unbroken frost, with very little sunshine, but the cold not severe.

MANCHESTER.—The month may be characterised as one of a good old-fashioned winter, and the delight of skaters; the frost continued, with scarcely any intermission, and S lay on the ground the whole month. The min temp. was below freezing every night but one, and the max. was also low, except for a few days in the middle of the month, when it rose to above 40°.

WALES.

HAVERFORDWEST.—During the first three days a considerable fall of S. Severe E. gale on 7th and 8th, with more S; the E. wind continued, with a black frost, till 13th, when a sudden and rapid thaw took place, with a considerable fall of R, which caused heavy floods. Frost returned on the 15th, and continued, almost without intermission, to the end of the month; the day temperatures of the last twelve days being uniformly low. The most persistent frost during the last twenty-five years, although the min. temperatures were not very low.

LLANDUDNO.—A dry, cold and comparatively sunless month, almost a continuous frost. The coldest January since observations were commenced in 1860. Mean temp. 34°·0.

SCOTLAND.

HAWICK.—Such a lengthened period of frost and S has not been experienced here since 1837. The wind and consequent snow drifts were not severe, but the long continued S has been very disastrous to the feathered tribes. All outdoor labour has been suspended for about eight weeks.

BRAEMAR.—A month of continuous frost and S.

PORTREE.—The coldest January on record, almost continuous S and frost. Such frost and S was never known before in Skye. Sheep suffering greatly on the pastures. Distant T and L on 13th, from 6 a.m. to 3 p.m.

DUNROBIN.—Outdoor operations very much retarded by the continued S. By the end of the month, sunny places, near the sea, were clear of S, but everywhere inland it lies to a considerable depth, without a break. Sheep farmers are incurring great expense, hand-feeding their flocks, as all herbage and heather have been covered up by S since the beginning of December.

SANDWICK.—January has been remarkably cold. During most of it there was a continuance of the frost and S which began on November 23rd, and has been of unprecedented duration; there were, indeed, partial thaws when the wind became westerly, but it was not until the 27th, when the wind was W.S.W. that the thaw approached completeness, though there was still frost at night. There were gales of wind from 50 to 60 miles per hour on five different occasions. One flash of L was seen on the night of the 27th.

IRELAND.

DARRYNANE.—The wettest January registered in ten years, but the number of wet days was below the average. Of the total fall, more than half fell on four days. A very changeable month; one day soft and summerlike, the next dry and bitterly cold, and the next wet, was the rule, until the last ten days, which were dry, but otherwise like the others, changeable.

KILLALOE.—Very low temp. during the month, the mean temp. being $34^{\circ}9$. Sharp frosts on twenty-two nights, with many bright and agreeable days. Scarcely any fog or mist. Heavy gale, from E. and S.E., on the last three days.

WARINGSTOWN.—Frost continuous, with the exception of three days. Latter part of month bitterly cold E. wind.

EDENFEL, OMAGH.—The frost, which settled upon us in the beginning of December, continued throughout this month, with little intermission, but with somewhat diminished intensity; occasional rapid thaws broke up the rivers, but as rapid returns to frost, leaves the ice still of immense thickness on the lakes, where there has been continuous skating for two months. Altogether the frost has been the most severe and prolonged in the memory of the oldest inhabitant.

THE WEATHER IN JANUARY.

DURING the last three days of 1878, pressure was lowest to the westward or northward of these Islands, and high in the S. of France. S.W. to W. breezes prevailed, bringing dull rainy weather to almost all districts, with high temperatures, the maximum temperatures at Roche's Point and Cambridge being as high as 59° . On the 1st January the first sign of a change occurred; the barometer, after rising quickly over these Islands, began to fall in the S.W., and a well-marked depression advanced to our shores. This disturbance passed in an easterly and south-easterly direction right over the S. of England and the Channel, and was shown on the morning of the 2nd over the N.E. of France. In the rear of this depression the barometer rose briskly with a N. breeze, very fine weather and a sharp frost. On the afternoon of the 2nd a new disturbance appeared in the S.W., and following the same course as its immediate predecessor gave first S. and then E. to N. breezes, the weather being dull, damp, and raw. On the 4th (by which time the depression had passed on to Denmark, while a third had advanced to Brittany), the barometer rose generally; an anti-cyclone was shown over Ireland, and fine, cold weather prevailed.

During the next period (5th-11th) the barometer showed some important oscillations. At first readings were highest over France, whence an arm of high pressure extended northwards over England to our N.W. coasts, com-

paratively low readings being shown to the S.W. of Ireland and over the Baltic, southerly breezes and warm weather consequently prevailed in the W., and N.W. breezes and low temperatures in the E. During the 6th pressure increased briskly over Scandinavia, while a fall of the barometer began on our W. coasts, and extended eastward. These changes continuing the charts of the following day (7th) showed a large anti-cyclone on the eastern shores of the North Sea, and a deep depression off our western coasts, causing fresh to very severe S.E. to S. gales nearly everywhere. The next day the lowest pressures were shown near the mouth of the Channel, whence they afterwards passed very quickly in a south-easterly direction across France, the wind simultaneously backing to the E., still blowing a gale. In the course of the following night a very rapid recovery occurred in the barometer in the S.W., but early on the morning of the 9th a fresh fall began at Valentia, and a new and serious disturbance advanced, taking the same direction as the former one. Severe S.E. to E. gales were experienced in the W. and S.W., through this and the following day. The temperature was low all the week, and sharp frosts prevailed over England. The sea was rough on most coasts; snow fell frequently, but not very heavily, and a good deal of rain in the S.W.

The weather during the following week (12th-18th) was subject to considerable changes. On the 13th and 14th depressions continued to pass northward, or N.N.E., along our western coasts, and S. to S.W. winds prevailed generally, rising on some occasions to the force of a gale, with comparatively warm weather. On the 15th the motion of this area of low pressure suddenly changed to a S.E. direction, from our N. coasts, over the North Sea, towards N. Germany, the wind veered towards W. and N.W., and temperature fell. On the 16th a deep depression advanced to our S.W. coasts; pressure rose over the northern parts of Western Europe, and E. winds, with cold weather, prevailed all day. This depression also moved south-eastwards. On the 17th another change began; a small anti-cyclone was formed over Eastern England, occasioning fog and frost, while a fresh disturbance, approaching our western coasts, occasioning southerly winds and higher temperatures, and travelling in a N.N.E. direction. This change eventually spread eastward and northward, and on the evening of the 17th and 18th S. to S.S.E. winds were reported, while a slight thaw set in over the country, accompanied by heavy sleet and snow.

At the beginning of this week (19th-25th) an anti-cyclone was shown on the eastern shores of the North Sea, while an area of low pressure, occasioning a brisk fall of the bar., was advancing to our S.W. coasts. On the 21st the bar. fell briskly over France; the lowest readings were reported from the Bay of Biscay, while pressure was very high, and still rising, over Scandinavia. These conditions caused general easterly winds, and continued, with slight modifications, until the 23rd. On that day, and till the end of the week, a tongue of high pressure extended W.S.W., from the anti-cyclone over Scandinavia, across the North Sea and the British Isles, occasioning the appearance of W. winds in Scotland, with a continuation of the E. breezes in the south. Temperature was below the average, for the time of year, throughout the week. The weather was for the most part dry.

On the 27th a decided rise of the barometer took place over the whole of our Islands, and a band of high readings lay from W.N.W. to E.N.E. across Ireland and N. England, North Sea and the south part of Scandinavia. Atmospheric pressure from this day till the 31st continued high with very little variation, while gradients were nowhere steep. Temperature changed irregularly, and severe frost prevailed on the 26th, 27th, and 28th. The weather was dry and gloomy, except on the 30th, when slight rain, hail or snow was reported from the N. and E. of Scotland and N.E. of England and Ireland.

H. E. M.

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2	Symons, G. J.	Barometrical Depression, December 23-27, 1860	London	1860	4to.	2
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