

Wentley

Addiscombe Road

SYMONS'S

MONTHLY

# METEOROLOGICAL MAGAZINE.

CXCII.]

JANUARY, 1882.

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

## LE VERRIER AS A METEOROLOGIST.

THE mental power of Le Verrier was such that it may be said of him, without fear of contradiction, that he would have been as great as a physicist, chemist, or geologist, as he was as an astronomer; on the present occasion we consider him solely as a meteorologist, and in doing this we have referred chiefly to his own published documents, but are more particularly indebted to a *résumé* by M. Brault, of the French Hydrographic Office, published in M. Mascart's splendid *Annals of the Paris Meteorological Office*, and upon whose *résumé* this article is mainly based.

Precision was his strong point; and he knew what was the fruit of long patience, but he never exercised it except upon the grandest questions; while occupied with problems affecting the whole universe, his thought was at ease, and he took pleasure in studying in their minutest details, the motions of those immense spheroids in whose company, so to speak, he passed his life.

It may easily be conceived, that to such a vast mind, the study of the general movements of the atmosphere would offer considerable attraction. Meteorology, he said, is the science of the future, and if it has not yet become developed as it should be, it is because we have paid too much attention to details instead of to general laws.

"The history of the sciences shows us that the examination of the phenomena of nature should always commence with those which take place on a grand scale, and are not affected in their general results by a thousand secondary causes."

It was in this sense that Le Verrier viewed meteorology, and he did not think it unworthy of himself to prepare the harvest to be reaped in the future. In his *Historique des Entreprises Météorologiques de l'Observatoire*, a quarto volume of 78 pp., he has explained his views of the way in which the principal questions of meteorology should be attacked, both with regard to storm warnings, climatology, and general meteorology.

As pointed out in the article upon "Meteorology in France," in the number for March 1881, of this Magazine, one of Le Verrier's chief

contributions to meteorological science, was the establishment of warnings for seamen and agriculturists. In fact, he may be said to have created meteorological telegraphy on the basis on which it is generally adopted in almost all civilized countries, and although not the first to publish synoptic charts, he gave them that definite character which they have assumed at the present day.

Until 1854 Le Verrier was chiefly occupied with the reorganization of the meteorological observations at the Imperial Observatory (which up to this time had dealt only with its own records), and the number of daily observations was increased from four to six. As soon as this service had been placed upon a more satisfactory footing, he turned his attention to more serious questions, and on the 16th February, 1855, he presented to the Emperor the famous proposal which led to the creation of a general system of meteorological telegraphy in Europe.

On the 19th of the same month he communicated to the Academy various charts showing the condition of the atmosphere over the continent. At this point he met with various difficulties in the realization of his projects, and these obstacles hampered his progress more or less until the day of his death. "I had only thought," he said, "of the difficulties inherent to the scientific side of the question, without foreseeing the embarrassments of every kind which have been constantly opposed to us, and against which we have to combat even to day." The opposition with which he had to struggle may be gathered from the following remarks written in 1857 :—"There are some men who do, and let do ; there are others who don't do, but let do ; the worst kind, and unfortunately the most numerous, are those who don't do, and who will not let do." Although the system originally established in France for giving warning of storms was based upon giving notice merely of actual facts (see *Met. Mag.* above referred to), yet Le Verrier subsequently recognised the insufficiency of this method in the following remarks :—"Experience has shown that our Channel and ocean coasts are often first struck by the storm, whence it results that a system of warnings which only operates when the storm has been already observed at some place, would leave something to be desired for our own shores." And he complained that Admiral FitzRoy, whose co-operation he highly valued, was enabled to out run him in the actual prognostication of storms because FitzRoy obtained that public support in England which France denied to Le Verrier. In fact, until quite recently, the storm signals were hoisted at the French semaphores in pursuance of warnings sent from London.

But, notwithstanding opposition, Le Verrier advanced with slow steps, and took advantage of every opportunity which offered itself, and from 1857 to 1864 he continued to increase the number of reporting stations over all Europe, and to extend his system of telegraphing notices of actual storms to all French ports and to various institutions abroad.

Meteorological telegraphy being firmly established in France, Le Verrier was able to turn his thoughts to the extension of his observations to the North Atlantic. He had long felt the important bearing which observations at sea possessed on the meteorology of Europe, and their close connection with the subject of storm warnings. He accordingly on 29th January, 1864, addressed a circular to the Chambers of Commerce requesting that observations might be made at sea. He says, "Unfortunately our charts embrace only Europe, which is not sufficient. They contain nothing of what is occurring on the surface of the ocean, and this is to be the more regretted since most of the storms which attack us seem to take their origin in those parts." This was the starting point of his great *Atlas des mouvements généraux de l'atmosphère* (1864-5), from which we extract the following remarks :—"At the commencement of a similar work it would have been difficult, if not impossible, to get all the observations made simultaneously. This is a point which is to be desired, and which can only be realised at a more or less distant period. It is, in fact, of the first importance that the charts of the *Atlas Météorologique* should present the atmospheric conditions over the Atlantic ocean at one instant of time, in order that we may be able to follow their variations from one day to another. When it is seen that the observations are really utilized, it will not be impossible to ask observers to arrange their hours of observation so that there may always be one that corresponds to 8h. Paris time."

If we replace in the last phrase, 8h. Paris time by 7h.35. Washington time, we find identically the proposal made by General Myer at the Meteorological Congress at Vienna.

Le Verrier left a large number of letters referring to Climatology. Of these we will only refer here to one dated August 16th, 1864, relative to the study of thunderstorms. This letter plainly showed that it was the realisation of a general plan which Le Verrier pursued in the midst of so many difficulties of detail :—"The study of Meteorology has not led in the past to the theoretical and practical results on which we thought we could reckon. But this cannot be wondered at. Too much attention has been paid to details, while the grand laws of the movements of the atmosphere are scarcely suspected.

... Thunderstorms which travel over considerable distances, sometimes the whole length of France, are generally of only narrow breadth ; they would pass between the chief places of a department without being observed, and their march, their violence and their extent would remain unknown, and their study would be, as in the past, impossible. Hence the indispensable necessity for multiplying observers. If the *Councils General* would consent to take in hand this grand enquiry in each of the cantons, we should soon arrive at complete and important results."

This appeal resulted in the establishment of a very extensive system of thunderstorm and rain stations, amounting in 1878 to 1069 in number, and agricultural warnings were subsequently organized

over the whole of France. In this work much assistance was rendered by the *Association Scientifique de France*.

Thus, generally speaking, Le Verrier treated Meteorology under all its principal aspects and indicated the best routes to follow. We have not entered into details as to the great extensions made by M. Mascart in the lines Le Verrier originally laid down as these are generally referred to in the article in the *Meteorological Magazine* above mentioned. His plans were gigantic, and if he had been able to deal with Meteorology solely in his office, as he did with Astronomy, he would have made giant strides in all questions relating to the former science. But these grand questions require a legion of workers. If genius alone had sufficed, said M. Brault, Le Verrier could have conducted not only the Meteorology of France, but that of the whole world.

J. S. HARDING.

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### REORGANIZATION OF THE METEOROLOGICAL DEPARTMENT OF INDIA.

ALTHOUGH somewhat tardy in bearing fruit, the report of the Famine Commission is not likely to be without its results. The Government of India have, at length, called upon the Meteorological Reporter for an expression of his views as to the measures he would advise, with reference to the better collection and utilization of knowledge concerning the meteorology of this country. In response to this communication, Mr. Blanford has advocated an extension of the system at present in vogue by the addition of certain observatories at selected points, and has asked for personal help in the shape of a more complete office establishment. Hitherto, it has been usual to issue a daily report from the Calcutta Meteorological Office, compiled from statements telegraphed from eighty-four stations, twenty-four of which are only in use during the rainy season. A second class of daily reports is also published by the Meteorological Reporter of the Government of Bengal, relating to the state of the coast of that Presidency. The information having been duly collected in these offices is distributed for the benefit, not of the public at large,—except that portion which can be reached by the aid of the newspapers,—but of certain local officials and offices in or near Calcutta. It is not surprising, therefore, that as an essential to the production of that improved cognizance of meteorological conditions which Government would fain see amongst their officers, one of the first points pressed by Mr. Blanford should be that it is desirable to more freely communicate the results attained. To accomplish this, he suggests that daily reports, with elucidatory remarks attached, be published, and transmitted by post to all officials within one or two days' distance of Calcutta; and that a summary of these be sent by telegraph to all local Governments for communication to the public through the newspapers. To more efficiently illustrate facts, he would advise that a chart be lithographed daily. The additional stations he would wish established are seven in number, namely, three for Madras, situated at Cuddapah, Kurnool, and Rajahmundry, one in Assam, and three in the Himalayas. The Government of India have consented to his proposals, as far as regards the establishment of more stations, and the mode of distribution of information; they, however, object to incur any expense with respect to the issuing of a chart, as this would involve the purchase of plant, and the entertainment of skilled workmen. An assistant to Mr. Blanford is to be allowed, who will assume charge of the office during his absence or illness, and will, at other times, inspect stations, and instruct observers. The logs of ships arriving

in the Hooghly will be regularly examined, with the object of collecting facts concerning marine meteorology. Investigation of solar physics, with reference to the assumed relation of variations of sun spots and fluctuations of rainfall, will be continued by a special subordinate stationed at Leh, in Cashmere.

Altogether, meteorology in India is likely to be placed on a better footing than formerly, and intelligence on the subject will be more readily gained than hitherto by all classes. We do not, however, see that much utility will result from the proposed practice of causing each station throughout the country to telegraph its reports to Calcutta, so that they may be brought into form for re-transmission to local Governments. All useful ends might be met by telegraphic statements from various stations being published daily by the head of the Department in the Presidency concerned, copies being sent by telegraph to the Meteorological Reporter, who should give his data and deductions, derived from the whole of the Observatories in India, at least once a week. Under the present system, we have to wait at least a fortnight in the town of Madras for a report of the state of the season at our very doors. The latest Weekly Season Report published by Mr. Blanford, in the *Gazette of India*, is dated the 1st instant, and records the state of the crops, the fall, or want of rain during the last week of October. Meteorological information soon becomes stale, and the concentration of information in Mr. Blanford's office, and its dissemination thence is well calculated to magnify that office, but it militates against the utility to the public of the information when it is communicated. If all meteorological information in this Presidency were communicated by the Madras Meteorological Superintendent to the Madras newspapers immediately on its receipt, instead of being forwarded to Mr. Blanford, it would be comparatively easy to discover errors in reports. There are few things that one forgets so quickly as the state of the weather. For most practical purposes, weather reports that are three weeks old are of no value to the public at large, though they may be useful for statistical purposes. It is of comparatively little interest, or importance, to people in the Madras Presidency to learn what was the state of the season in the Punjab, or *vice versa*, three weeks ago; and though it is desirable that the reports for the whole of India should be collected together and made public, it is still more desirable, that the interim publication locally of provincial reports, should not be delayed by official circumlocution.

No provision appears to have been made to secure European superintendence of the local observatories. Formerly, Zillah Surgeons at certain stations obtained a monthly allowance for supervising the work of observers: but, in a fit of economy, Government withdrew this, still, however, regarding these officers as responsible, although meteorological science is but remotely connected with their profession. Of course, men may be found, who, taking an interest in this subject, may think worthy the trouble involved in looking after the necessary details; still, turning out on a wet or cold night to see that the observer is present at the correct time is not enticing, and would stand more chance of its regular performance if remuneration for extra duty were offered. Hence, after the abolition of the allowances, the heads of the Meteorological Department probably did not feel much astonished when they found that readings reached them that were of no value, and stultified their whole work. It is easy in an Indian climate to concoct a set of readings of instruments founded upon the average of previous days. Why then should the timorous native, lantern in hand, run the risk of getting himself bespattered with mud, or bitten by snakes, when it would be much more comfortable to be present at his friend's *tamash*? Can he not guess to the minutest fraction how his instruments should stand; and if he does not hit it off quite correctly, who will be the wiser? Data that are not thoroughly trustworthy are worse than useless—they are positively mischievous; and if their correctness can be questioned, for what possible use is it to have gone to any expense in the matter. We do not imply that shirking work amongst observers is anything but an exceptional offence, still its possibility should be guarded against, and the only way to do

this is to make them directly subordinate to some local official who is paid for his trouble of exercising supervision. Disregarding, however, this phase, it is a fact not to be forgotten that the class of men employed, albeit that they understand how to read their instruments, are occasionally so little aware of the theory of their use, or the ends sought after, that the state in which they are kept, or mode of disposal in relation to surrounding objects, not infrequently annuls the value of their observations. Hence the necessity of frequent inspection by a skilled and interested officer, and we do not think if Government mean to take up the subject seriously, that they would find money better spent in restoring the old scale of allowance to local Superintendents of Meteorology, than in increasing the office establishment of the Meteorological Reporter.—*The Madras Mail*, Nov. 15, 1881.

### GALE OF DECEMBER 17TH-18TH.

*To the Editor of the Meteorological Magazine.*

SIR,—Another tremendous gale, blowing hard all day yesterday ; got worse in night, reaching its height about 6 a.m. Wind W. and sky clear at 9 a.m., but force not moderating till afternoon. Rainfall .67in. in old gauge, .72in. in Snowdon ; high rim giving greater difference even than on Nov. 26th. .86in. fell on 9th; the three days, 8th, 9th, and 10th, giving 1.59 in., and renewing the floods. There has fallen 6.53in. in 28 days since November 17th, of which 5.95in. fell in 23 days since November 24th.—Yours very truly,

J. E. MACE, Jun.

*Tenterden, Kent, 18th December, 1881.*

*To the Editor of the Meteorological Magazine.*

SIR,—The gale on the 18th inst. having been exceptionally severe, I send you a short account of it, with a table of observations for the 17th and 18th.

The morning of the 17th was threatening ; rain fell from 11.15 a.m. to 5.40 p.m., and again from 7.40 p.m. to 3.25 a.m. on the 18th ; followed by showers, accompanied with snow, at 8 and 8.45 a.m., and hail at 2.35 and 4.52 p.m. (on the 18th). The wind blew a strong gale from S.W. from noon to 2 p.m. on the 18th, but lulled to a fresh breeze from 7 to 10 p.m., and then increased rapidly to a tremendous gale from 11 p.m. to 3.20 a.m., on the 18th, attaining a velocity of 60 miles in the hour from 2 to 3 a.m., and reaching a rate of 100 miles per hour in some of the terrific gusts, which did much damage to roofs, trees, &c. The above velocities are the greatest yet registered by my Robinson's anemometer, since its erection in December, 1878. The subjoined table shows the great variations in the barometer and temperature experienced during the gale. The actual min. of the barometer was 28.892 in. at 3.10 a.m. ; the rise which followed it was very sudden, amounting to .108 in. in 20 minutes ; whilst the temperature fell rapidly from a max. of 52°.7 about 3.10 a.m., to a min. of 36°.2 before 9 a.m., accompanied by a strong W.N.W. wind. 0.65 in. of

rain fell in the 24 hours ending 9 a.m. on the 18th, and the total velocity of the wind for the same period was 859 miles.

Yours sincerely,

EDWIN E. GLYDE

*Kirkham, Babbacombe, Torquay, Dec. 23, 1881.*

Date.	Hour. G. M. T.	Bar. cor. to 32° and sea level.	Temperature.		Wind.		Weather.
			Dry Bulb.	Wet Bulb.	Direction.	Force (0-12)	
Dec. 17.	9.14 a.m.	29.380	44.3	42.5	W.S.W.	5	C.M.
„	2 p.m.	29.187	50.4	49.8	S.W.	9	O.D.G.
„	4 p.m.	29.198	50.9	50.3	W.S.W.	8	O.D.G.
„	6 p.m.	29.254	50.0	49.0	W.S.W.	6	O.
„	9.14 p.m.	29.237	46.8	46.6	W.S.W.	5	O.D.
„	11 p.m.	29.113	51.6	51.2	S.W.	10	O.Q.
„	12 p.m.	29.061	51.2	50.5	S.W.	10	O.R.Q.
Dec. 18.	1 a.m.	29.021	51.0	...	S.W.	11	O.R.Q.
„	2 a.m.	28.949	51.9	51.3	S.W.	11	O.D.Q.
„	3 a.m.	28.895	52.6	52.0	S.W.	11	O.D.Q.
„	3.30 a.m.	29.000	49.8	48.2	W.N.W.	6	O.
„	4 a.m.	29.095	43.7	42.1	N.W.	5	C.B.
„	9.14 a.m.	29.481	38.8	37.5	W.N.W.	5	B.Q.

## THE METEOROLOGICAL SOCIETY.

THE usual monthly meeting of this Society was held on Wednesday, the 21st inst., at the Institution of Civil Engineers, Mr. G. J. Symons, F.R.S., President, in the chair. The following gentlemen were duly elected Fellows of the Society :—H. P. Bell, F. B. Edmonds, T. C. Evans, S. L. Fox, J. J. Gilbert, M. Henry, J. B. McCallum, J. Parry, and B. C. Wainwright.

The papers read were :—(1) “The Rainfall of Cherrapunji,” by Prof. J. Eliot, M.A., F.M.S. Cherrapunji is notorious for its excessive rainfall, larger in amount than that of any other place, as far as is at present known. Cherrapunji is a small Indian station, situated in the south-west of Assam, on a small plateau forming the summit of one of the spurs of the Khasia hills. These hills rise on the south with exceeding abruptness, and have the Bengal plains and lowlands at their base. Cherrapunji stands on the summit of one of these hills, at an elevation of about 4,100 feet. The hill on which it is situated rises precipitously from the lowlands of Cachar and Sylhet, which are barely 100 feet above sea level. During the S.W. monsoon the lower atmospheric current advancing across the coast of Bengal, has a direction varying between S.S.W. and S.E. in lower and central Bengal. In thus advancing almost directly towards the hills of Western Assam, the mountain ranges cause a very considerable

deflection of the current ; one portion is forced upwards as an ascending current, with a velocity directly dependent upon the strength of the current in the rear, and upon other conditions which need not be enumerated. The rapid diminution of temperature which accompanies expansion due to ascensional movement of air, is usually followed by rapid condensation in the case of a moist current such as the S.W. monsoon current. The normal annual rainfall in Cachar and in the plains of northern Bengal, is about 100 inches. The average annual rainfall of Cherrapunji is 493 inches, or nearly five times that at the foot of the hills on which it is situated. The rainfall of Cherrapunji is due to the presence, in the hills, of a vast mechanical obstruction, which converts horizontal air motion into vertical air motion.

(2.) "On the Meteorology of Cannes, France," by Dr. W. Marcet, F.R.S., F.M.S. This is a discussion of the observations made at this celebrated health resort during the six winter seasons ending 1880.

(3.) "Report on the Phenological Observations, 1881," by the Rev. T. A. Preston, M.A., F.M.S.

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#### GALE OF NOVEMBER 15TH.

*To the Editor of the Meteorological Magazine.*

SIR,—The storm that was predicted from America to reach the British coast between the 14th and 16th inst., visited Shap and neighbourhood in all its strength. The early part of the 14th was mild with a heavy fog, followed by a clear afternoon. At an early hour on the 15th clouds began to gather and the wind began to blow ; rain commenced about 2 p.m. ; from that time till 9 a.m. on the 15th, 1.11 inches fell.

The 15th was the roughest day I can remember ; rain came down at times in sheets of water, 1.35 inches fell during the day. The gale was awful ; but I am glad to say no harm was reported in this district, further than a few branches broken off trees. I am told on good authority that Swindale beck and the river Lowther, at Keld, have not been known to be so large for many years. The valley facing our house was like a lake all day on the 16th.—Yours, &c.,

J. HOGGARTH.

*Copy Hill, Shap, 19th November, 1881.*

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#### EARLY SPRING.

In the lanes south of London it seems already spring. Dandelions are to be found in flower, and the sheathes of the pointed arum are pushing up, some even unrolling. On the briars there are young leaves, the chaffinches call, larks soar, and thrushes sing. The chorus of thrushes in the early morning is very pleasant to listen to, the wood is full of their voices. As for elder-bushes, they had opening leaves in December, so had the woodbine, and on the last day of the year there were buttercups, avens, and white nettle in flower, so that up to the present there has been no winter. The above refers to a clay and cold soil ; much greater progress is reported from warmer localities.—*Times, January 12th, 1882.*



## SUPPLEMENTARY TABLE OF RAINFALL IN DEC., 1881.

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

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
II.	Dorking, Abinger .....	3·83	XI.	Carno, Tybrite ... ..	5·50
„	Margate, Acol .....	2·89	„	Corwen, Rhug .....	2·37
„	Littlehampton .....	3·16	„	Port Madoc .....	5·23
„	St. Leonards .....	4·28	„	Douglas.....	4·78
„	Hailsham .....	3·55	XII.	Carsphairn ... ..	7·62
„	I. of W., St. Lawrence.	4·71	„	Melrose, Abbey Gate ...	3·01
„	Alton, Ashdell.....	3·52	XIV.	Glasgow, Queen's Park.	3·46
III.	Great Missenden.....	4·15	XV.	Islay, Gruinart School..	...
„	Winslow, Addington ...	4·16	XVI.	Cupar, Kembach.....	2·68
„	Oxford, Magdalen Col...	2·89	„	Aberfeldy H.R.S. ....	...
„	Northampton .....	2·89	„	Dalnaspidal .....	5·73
„	Cambridge, Beech Ho...	3·03	XVII.	Tomintoul.....	1·48
IV.	Harlow, Sheering .....	3·31	„	Keith H.R.S. ....	1·39
„	Diss .....	3·13	XVIII.	Forres H.R.S. ....	·99
„	Swaffham .....	2·67	„	Strome Ferry H.R.S....	8·20
„	Hindringham .....	2·65	„	Lochbroom .....	5·18
V.	Salisbury, Alderbury ...	3·35	„	Tain, Springfield.....	1·49
„	Calne, Compton Bassett	3·46	„	Loch Shiel, Glenaladale	15·99
„	Beaminster Vicarage ...	4·65	XIX.	Lairg H.R.S. ....	3·47
„	Ashburton, Holne Vic..	7·01	„	Altnabreac H.R.S. ....	2·25
„	Langtree Wick .....	5·31	„	Watten H.R.S. ....	2·08
„	Lynmouth, Glenthorne.	5·60	XX.	Fermoy, Glenville .....	6·59
„	St. Austell, Cosgarne...	...	„	Tralee, Castlemorris ...	6·19
„	Taunton, Fullands .....	2·77	„	Cahir, Tubrid .....	4·74
VI.	Bristol, Clifton .....	4·15	„	Tipperary, Henry St....	5·05
„	Ross .....	2·38	„	Newcastle West .....	4·78
„	Wem, Sansaw Hall.....	2·38	„	Kilrush .....	4·50
„	Cheadle, The Heath Ho.	2·96	„	Corofin .....	6·30
„	Coundon .....	2·94	XXI.	Kilkenny, Butler House	..
VII.	Melton, Coston .....	2·66	„	Carlow, Browne's Hill..	3·59
„	Horncastle, Bucknall ...	2·05	„	Killsallaghan .....	...
VIII.	Macclesfield Park .....	3·73	„	Navan, Balrath .....	2·86
„	Walton-on-the-Hill....	3·29	„	Athlone, Twyford .....	3·33
„	Broughton-in-Furness..	5·98	XXII.	Mullingar, Belvedere ...	3·42
IX.	Wakefield, Stanley Vic.	2·20	„	Ballinasloe .....	3·46
„	Ripon, Mickley .....	4·22	„	Clifden, Kylemore .....	13·67
„	Scarborough.....	2·40	„	Crossmolina, Enniscoe..	7·30
„	Mickleton .....	3·32	XXIII.	Carrick-on-Shannon ...	3·04
X.	Haltwhistle, Unthank..	4·30	„	Dowra .....	...
„	Shap, Copy Hill .....	7·96	„	Rockcorry.....	3·36
XI.	Llanfrechfa Grange .....	3·98	„	Warrenpoint .....	3·27
„	Llandovery .....	4·65	„	Newtownards .....	3·20
„	Solva .....	4·43	„	Carnlough.....	...
„	Castle Malgwyn .....	6·67	„	Bushmills .....	4·40
„	Rhayader, Nantgwillt..	7·06	„	Buncrana .....	4·06

## DECEMBER, 1881.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.					TEMPERATURE.				No. of Nights below 32°	
		Total Fall.	Difference from average 1870-9	Greatest Fall in 24 hours.		Days on which .01 or more fell.	Max.		Min.		In shade.	On grass.
				Dpth.	Date.		Deg.	Date.	Deg.	Date.		
		inches	inches.	in.								
I.	Camden Square.....	2.47	+ .30	.71	17	15	53.6	2	28.1	24	9	22
II.	Maidstone (Hunton Court)...	2.79	+ .39	.57	9	16	...	...	...	...	...	...
	Strathfield Turgiss .....	2.66	+ .64	.56	17	14	53.5	18	19.8	24	13	24
III.	Hitchin .....	3.58	+ 1.53	1.26	17	17	50.0	2	22.0	23	16	...
"	Banbury .....	3.50	+ 1.35	.93	17	23	51.0	2.6	20.0	24	18	...
IV.	Bury St. Edmunds (Culford)...	3.36	+ 1.21	1.41	17	17	52.0	2	25.0	23	16	...
"	Norwich (Cossey).....	3.01	+ .69	.87	17	19	52.0	2	22.0	24	13	...
V.	Bridport .....	3.49	...	.65	14	17	54.0	2	16.0	23	20	...
"	Barnstaple.....	5.70	+ 1.94	1.27	16	20	56.0	2*	...	...	...	...
"	Bodmin .....	6.81	+ 1.36	1.32	16	23	54.0	2	28.0	11	10	18
VI.	Cirencester .....	3.46	+ .85	1.07	17	14	...	...	...	...	...	...
"	Church Stretton (Woolstaston)	4.10	+ 1.31	1.26	16	18	51.0	6	27.5	14	14	20
"	Tenbury (Orleton) .....	2.59	+ .08	.74	17	18	54.0	6	22.2	23	14	17
VII.	Leicester (Town Museum) .....	...	...	...	...	...	...	...	...	...	...	...
"	Boston .....	2.42	+ .35	.50	18	14	51.0	2	22.0	24	8	...
"	Grimsby (Killingholme) .....	1.93	— .50	.44	20	16	50.0	6	25.0	24	7	...
"	Mansfield .....	2.58	+ .05	.52	17	18	50.9	2	21.0	24	10	24
VIII.	Manchester (Ardwick).....	...	...	...	...	...	...	...	...	...	...	...
IX.	Wetherby (Ribstone) .....	3.51	+ 1.30	1.03	17	14	...	...	...	...	...	...
"	Skipton (Arncliffe) .....	8.01	+ 2.73	1.44	16	24	49.0	2	19.0	22	...	...
X.	North Shields .....	1.86	— 1.23	.31	1	18	52.5	25	25.0	23§	15	15
"	Borrowdale (Seathwaite).....	14.92	+ 1.19	2.95	29	25	...	...	...	...	...	...
XI.	Cardiff (Ely) .....	4.71	+ .80	1.83	17	19	...	...	...	...	...	...
"	Haverfordwest .....	5.79	+ .66	1.11	16	16	54.0	1†	20.7	10	12	15
"	Aberystwith (Goginan) .....	...	...	...	...	...	...	...	...	...	...	...
"	Llandudno.....	2.55	— .30	.75	3	18	56.5	6	30.2	23	4	...
XII.	Cargen .....	3.83	— .70	.58	18	16	52.1	3	23.8	23	10	...
"	Hawick (Silverbut Hall)....	2.86	— .00	.50	11	18	...	...	...	...	...	...
XIV.	Douglas Castle (Newmains)...	5.50	+ 1.41	.80	24	22	...	...	...	...	...	...
XV.	Kilmory .....	8.05	+ 1.87	1.17	24	22	...	...	20.0	10	13	...
"	Appin (Airds) .....	6.70	...	...	...	...	...	...	...	...	...	...
"	Mull (Quinish) .....	...	...	...	...	...	...	...	...	...	...	...
XVI.	Loch Leven .....	3.40	— .26	.80	3	13	...	...	...	...	...	...
"	Arbroath .....	2.00	— .90	.34	13	12	52.0	29	24.0	23	12	...
XVII.	Braemar .....	2.67	— .76	.71	2	16	49.9	25	12.2	23	18	30
"	Aberdeen .....	1.82	...	.61	1	16	52.0	27†	24.0	22	12	...
XVIII.	Portree .....	11.89	+ 3.02	2.00	13	26	...	...	...	...	...	...
"	Inverness (Culloden) .....	1.22	— .62	.41	7	6	55.8	25	23.0	23	12	24
XIX.	Dunrobin .....	2.23	...	.63	18	11	...	...	...	...	...	...
"	Sandwick .....	4.92	+ .53	1.30	14	25	51.8	25	29.3	21	4	14
XX.	Cork (Blackrock).....	6.00	+ 1.24	.92	31	23	53.0	3	18.0	11	17	...
"	Dromore Castle .....	8.12	...	1.45	2	23	57.0	13	24.0	11¶	...	...
"	Waterford (Brook Lodge) .....	4.27	...	.70	31	18	53.0	27	22.0	11	13	...
"	Killaloe .....	6.34	...	.93	2	18	53.0	2	20.0	12**	15	...
XXI.	Portarlington .....	3.68	+ .82	.64	2	20	53.0	2	22.0	10	12	...
"	Monkstown .....	1.69	...	.22	2, 31	18	...	...	...	...	...	...
XXII.	Galway .....	4.45	+ .63	.62	19	23	54.0	6	20.0	11¶	7	...
XXIII.	Waringstown .....	3.16	+ .20	.57	13	18	56.0	25	21.0	11††	21	26
"	Londonderry.....	3.88	...	.66	13	25	52.0	1, 2	22.0	11	7	22
"	Edenfel (Omagh) .....	...	...	...	...	...	...	...	...	...	...	...

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

\* And 3, 7. † And 2, 3. ‡ And 29. § And 24. || And 11. ¶ And 12. \*\* And 13, 23. †† And 22.

# METEOROLOGICAL NOTES ON DECEMBER.

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

## ENGLAND.

STRATHFIELD TURGISS.—White and red nettle, creeping buttercup, dandelion, veronica, primroses, groundsell and potentilla all in full flower at the beginning of the month, and honeysuckle in full leaf.

HITCHEN.—On the 17th, 1·26 in. of R fell, the heaviest fall recorded in December, during more than 30 years.

BANBURY.—High wind on five days, fog on 27th, S on 11th and 17th.

CULFORD.—The weather throughout the month was very open, from the 14th to 20th very wet, followed by several hoar frosts; fine and mild at the close. S on 17th.

BODMIN.—Mean temp.  $40^{\circ}\cdot5$ ,  $2^{\circ}\cdot4$  below the average of 32 years.

CIRENCESTER.—A mild, genial month.

WOOLSTASTON.—First week of the month unusually mild, several primroses in blossom on the 7th. Mean temp. of the month  $38^{\circ}\cdot2$ ; S on 10th,  $2^{\circ}\cdot37$  in. of R fell on 16th and 17th.

TENBURY, ORLETON.—The first week was cloudy and generally warm, with wind. On the 8th the air became clear and frosty, followed by a dense fog and R on the 9th and 10th; the temp. then remained low till the 25th, with many severe frosts and much R from the 16th to the 21st, flooding the rivers; another dense fog occurred on the 23rd and 24th. On the evening of the 25th it became warmer and continued so with only occasional slight frosts till the end of the month. The fluctuations of the bar. were great, the total range being 1·6 in.; the mean temp. was about  $1^{\circ}$  below the average of the last 20 years.

KILLINGHOLME.—The month was mild and fine, with many pleasant days, but a good deal of fog, equatorial winds prevailing throughout.

ARNcliffe.—Very stormy on the 18th.

SEATHWAITE.—S fell on 5 days, H on 3, falls of R exceeding one inch occurred on 6 days.

## WALES.

HAVERFORDWEST.—The mild weather which characterised November continued up to the 8th of this month, when the air became much colder, the temp. at times being very low; after the 14th a very stormy period set in with heavy rainfall, the temp. continuing low, finer again from the 21st to the end of the month. A terrible storm of T, L, and H, with R, on 19th; mean temp. below the average.

## SCOTLAND.

CARGEN.—The month was mild with the exception of pretty sharp frosts on 13th, 16th, 22nd, and 24th, the weather being generally stormy, dull, and wet. Mean temp.  $39^{\circ}\cdot3$ , half-a-degree above the average; 52 hours of sunshine, 11 hours below the average.

HAWICK.—A remarkably mild December, several gooseberry bushes in flower during the second week. S on 5 days.

KILMORY.—Dull and showery from 1st to 7th, then frosty till the 13th; the remainder of the month was very unsettled with a good deal of R.

BRAEMAR.—An unusually fine December.

ABERDEEN.—Mild open weather, the prevailing winds being southerly to south-westerly. Rainfall fully an inch below the average. Fresh gale on 6th, H on 11th, aurora on 10th.