

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 .

CXXIII.]

APRIL, 1876.

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O C E A N R A I N F A L L .

[THE determination of the fall of rain at sea is a very difficult matter. There is scarcely one of the conditions which are requisite for accurate observations on land which can be fulfilled at sea. The mouth of the gauge must be truly level, but how often is this possible at sea? Mr. Black, to whom we are indebted for the following communication, has endeavoured to lessen the evil by putting the gauge on gymbals (a method we adopted for the Nore Light Ship gauge, in 1866). At the best this is but a palliative. It is extremely difficult to find any but a very elevated position which is free from spray, and the influence of the sails, &c. A ship's rain gauge is always moving, and may travel *pari passu* with a cloud, and thus continue to catch rain from the same portion, or by the mere accident of their going in opposite directions, it may scarcely catch any. Mr. Gaster (*Brit. Rain.*, 1860, p. 13) in his article on "Ocean Rainfall," attacked the subject on the basis of *duration* of rainfall. Mr. Black has for some years been trying to obtain quantitative results, and we have much pleasure in drawing attention to the importance of the subject.—ED.]

The following Return is an abstract of observations of the rainfall at sea, taken by direction of Capt. H. C. St. John, commanding H.M.S. *Sylvia*, on the passage from England to China, in March, April, and May, 1874, by the Mediterranean and Red Sea route.

It will be seen that there was but little rain in the Mediterranean, none in the Red Sea, and but little in the Arabian or Bay of Bengal, owing, probably, to the prevalence of the easterly winds and monsoons in spring. There next appears to have been more rain in the Java Seas about the change of the monsoons, and most in the China Seas, which will probably be coincident with the commencement of the S.W. monsoons at the approach of summer, except near Hong Kong, where the easterly winds would still have been blowing at that time. It will further be observed, that the amount of the rainfall was very small altogether, either in or out of the tropics, and the same phenomenon had already been observed by the late Capt. Goodenough, of H.M.S. *Pearl*, during a voyage in the Atlantic, in 1873 (*Nature*, vol. IX., p. 63). The general impression of landsmen is, that there is

more rain falling at sea than on land, and it would be somewhat surprising if observers on board ship were to discover that this idea might be modified, and still more pleasant to find that on going a voyage one might be cheered with a prospect of dry weather.

These observations were taken with a marine rain gauge, of 6 in. diameter, of new design, a description of which appeared in *Nature*, two or three year's ago, vol. VII., p. 202, and of the working capability of which Capt. St. John speaks in satisfactory terms in the annexed extract from his letter.

Extract from Register of Marine Rain Gauge, H.M.S. SYLVIA, (Surveying Vessel) Capt. H. C. ST. JOHN, England to China.

1874. Date.	Lat.	Long.	Rain.	Locality.	Miles sailed.	Rate per diem.	Esti- mated winds.
Feb. 10	36 9 N.	5 19 W.	in. nil.	Gibraltar .....	...	...	W.
17	37 34 N.	9 29 E.	·010	Cape Spartivento, Mediterranean...	760	100	N.W.
18	36 50	12 47	·105	Sciacca, Sicily, do...	180	180	
19-22	35 54	14 31	nil.	Malta	110	110	
23-26	...	...	nil.	Mediterranean.....	...	...
27	31 57	30 7	·115	Alexandria, do.	(Alx)(Sd) 830+120	166+120	
28-Mar. 6	31 20	32 20	nil.	Port Said—Suez Can- nal to Suez	90	17	
7-17	12 46	45 50	nil.	Red Sea to Aden.....	1385	126	S.E.
18-Apr. 8	6 3	80 13	nil.	Arabian Sea to Point de Galle	2333	106	N.E.
9	5 32	81 55	·020	Dendra Head, Bay of Bengal	130	130	N.E.
10	4 0	84 27	·116	Do.	185	185	
11-14	Equator	...	nil.	Do. ....	...	...
15	2 5 S.	95 47 E.	·020	Sumatra, do.	926	185	S.E.
16-20	...	...	nil.	Sunda Straits .....	...	...	S.W.
21	6 10	106 51	·025	Batavia Bay.....	720	120	
22-23	...	...	nil.	Do. ....	...	...
24	...	...	·025	Do. ....	...	...
25	...	...	nil.	Java Sea .....	...	...	S.E. & N.W.
26	3 50	108 16	1·230	Do., Biliton Straits..	180	90	
27	3 21	108 35	·090	Do.	35	35	
28	3 19	108 38	·180	Do.	4	4	
29-30	Equator	...	nil.	Do. ....	...	...
May 1	31 N.	108 16 E.	·020	China Sea	210	70	S.S.W.
2	2 35	109 58	·650	Do., Natuna Island..	180	180	
3	3 59	112 27	·500	Do.	175	175	
4	4 59	114 40	1·700	Do.	150	150	
5	5 15	115 7	·280	Labuan Island.....	30	30	
6	...	...	·550	Do. ....	...	...
7	7 47	116 47	·780	China Sea—Palawan Island, South Point	180	180	
8-13	2 12	114 15	nil.	Do., Hong Kong ..	900	150	S.S.E.

TOTALS : Days, 96 (stopped 10) ; miles, 9,735 ; rate mean, 113 per diem ; rain, 6·460 in.

[Extract from Letter.]

H.M.S. *Sylvia*, Hong Kong, June, 1874.

DEAR SIR,—I enclose the results of your rain gauge during our route from England to Hong Kong. My own impression is, it (the gauge) works well, where properly placed. I think a very good idea of what rain may be expected between any sea ports, when making a passage, could be come at, particularly by mail steamers. With the working of the gauge I am quite satisfied.

(For reference only).

H. C. ST. JOHN, Capt.

This return is intended only to serve as a sketch of what might be probably required to give prominence, and institute comparisons with, such data as may be collected on the subject of rain at sea.

These observations in the *Sylvia* denote amount of rain collected for the 24 hours previous to the registration, and the position will represent the point attained at the end of that time, probably 9 a.m. each day, and the intervals between these are the miles sailed per diem.

These two data must be considered as final anywhere, and at all times, and should be found in all ship's log-books. But other important items will be required to be appended to them—as the direction of the wind, for the noting of wet and dry winds, and the rate of the ship's sailing, or miles run per diem, for correction of rainfall collected.

There does not seem to be any definite relation in this abstract, to be detected between the rate of the sailing of the *Sylvia* and the quantity of rain collected on board, as in some instances the highest speed shows little rain; the greatest amounts were obtained at a medium speed, and the least at the highest rate of sailing, as may be imagined. The faster a ship sails or steams, the less rain will she collect in passing through a given area, of, say, a square degree; and the slower a ship proceeds, the nearer will it represent a stationary rain gauge, and the record in that area in a day, so that the rate of sailing becomes of importance to note for these observations.

These daily amounts of rain may be considered to be represented on a chart, as having fallen on a certain longitudinal space traversed, say, 100 miles, by 6 in. broad, and that the rain fell all the time in it of 24 hours.

This space again may be represented by concentrating the 100 miles, multiplied into 6 in. = 38,017,800 square inches, into a square figure of 175 yards, or the 1-hundredth of a square mile.

It may be imagined to be analogous, if the ship were stationary, and the atmosphere moved past it at the rate of the ship's sailing at this particular spot.

The following day the position of the rain gauge may be supposed to be moved to another specified spot of area corresponding to miles travelled, and which would be temporarily placed in the middle of the course sailed, and would remain another 24 hours there to collect the passing showers. In this view it may be proposed to consider the rainfall as having fallen at one spot for the 24 hours, and that this spot would be changed every day for fresh registration.

Any particular position in the ocean can, therefore, only probably receive one registration of its rainfall, but these may accumulate in the course of years in the area, of, say, a square of 5-10 degrees, so as to lead to some notion being obtained of the rainfall there.

An estimation of the probable rainfall in a certain space of a square degree for 24 hours previous, may be approximately obtained by ascertaining the time passed in sailing through it and dividing this into the amount of rain collected, and the quotient multiplied by the 24 hours required for the product.

If $\cdot 021$ inches of rain be collected for 24 hours, and the ship has sailed 240 miles, or 10 miles an hour, this will give 4 hours for passing through the square degree = to 1-6th of the whole time.

Then $\cdot 021$ divided by 4 and multiplied by 24 will give $\cdot 126$ in., the quantity that may be supposed to have fallen in that square degree, in the longitudinal space traversed if the ship had remained there an entire day.

It might conduce to simplify one's notions of rainfall at sea, and render such returns from ships more available, if we proposed to discard all references to localised showers, whether heavy or light, or of small or great extent, and adopt means and averages for realising our results, so that they may be uniformly placed on charts and tables of registration.

W. T. BLACK.

DIRECTION OF WIND.

To the Editor of the Meteorological Magazine.

SIR,—I fully agree with your correspondent, Mr. Robson, that the subject of "Direction of Winds" has not, so far as I have observed, obtained due attention. I have for some time past been engaged in researches on the subject, with a view of ascertaining whether anything like a definite rule can be laid down, for expecting a greater or less prevalence of Polar or equatorial winds during any coming month, season, or year. There is no doubt a general impression exists, that during a certain period we get something like a regular proportion, say, of N.E. winds. I have heard it said that the second three months of the year will make up in this respect for the first three, and to some extent this would appear to be so. However, the only test is an appeal to facts, and, with your permission, I will lay the following before your readers.

Since 1869 I have kept a monthly register of prevailing winds, deduced from the weekly Greenwich report.

A glance at this document will show that this is no easy matter, as four or five different directions are frequently given for one day. I can, therefore, only register what appears on the whole to have been the prevailing wind. Still, a register so obtained, if carefully compiled, would probably be more accurate than one obtained from any other

source, where the observations have probably been much fewer and less accurate.

My register so obtained for 1875 differs very materially from Mr. Robson's, which I think I may say is palpably incorrect in setting down 119 days to the S. & S.E.—two points of *least frequent* prevalence. The "Greenwich return" would indicate as follows :—

	1875.	Average for 6 years, 1870-75.		1875.	Average for 6 years, 1870-75.	
S.	30	..... 28	|	N.	39	..... 30½
S. W.	102	..... 108½	|	N. E.	63	..... 53½
W.	55	..... 65	|	E.	40	..... 30½
N. W.	16	..... 24½	|	S. E. ...	20	..... 24½

I now give the number of days of Polar (N., NE., and E.) Winds for each successive half-year of the above period, with a view of showing whether or not there is any tendency to *equilibrium*, i.e., whether the succeeding six months, or the corresponding six months in the next year rectifies the excess or deficiency of any one season. it is, perhaps, needless to remark that an excess of Polar Winds implies a deficiency of those from the opposite quarters, and *vice versa* :—

	1st 6 months.	2nd 6 Months.	Total for year.
1870.....	63	..... 81	..... 144
1871.....	64	..... 60	..... 124
1872.....	38	..... 41	..... 79
1873.....	78	..... 31	..... 109
1874.....	60	..... 41	..... 101
1875.....	75	..... 68	..... 143
Average...	63	..... 54	..... 117

The average prevalence of Winds in each month, 1870-75 was as follows :—

	Polar.	Equatorial.		Polar.	Equatorial.	
January	6	..... 20	|	August	10	..... 17
February ...	11	..... 14	|	September..	8	..... 19½
March	13	..... 13	|	October ...	6	..... 2½
April	12	..... 13½	|	November..	11	..... 14½
May	13½	..... 14½	|	December...	10	..... 18
June	8	..... 17	|			
July	6	..... 20	|			
			|	114½	..... 201½	

The inference from the above would seem to be that we have a right to expect only a moderate prevalence of Polar Winds during the current year, 1875 having been considerably in excess. The prevalent winds are unquestionably the SW., W., and NE., and those of least frequent occurrence the NW. and SE. And perhaps the only clear and unmistakeable fact to be noted in connection with the subject is the prevalence of Polar Winds during the months of March, April, and May.—I am, Sir, your obedient servant,

F. TAYLOR.

19. Canonbury Park Square, N., March 25th, 1876.

THE THUNDERSTORM SEASON.

To the Editor of the Meteorological Magazine.

SIR,—Our thunderstorms are divisible into three classes, which merge, indeed, by gradations into each other, but which are in their typical forms, such as I am about to describe, essentially distinct.

Those of the first class predominate in the winter months. They are far the most numerous on the western shores of Europe. They occur with low, or very low, barometrical pressure, and most commonly with steep gradients and strong winds, and are almost confined to the southern segments of depressions. They rarely take place when there is any very great difference between the direction of the upper and under currents. They are equally common by night and by day. The altitude of the storm-clouds in this class is seldom so great as in the other two classes. Hail or snow frequently accompanies them. They are eminently local, and may, I think, be conveniently distinguished as *thunder squalls*.

Storms of the second type are very rare, except in the warmer months. They are least common upon our western coasts. They predominate with light winds, with moderately low pressure, and in the southern segments of depressions, but they are not at all particular as to the amount, or as to the distribution, of pressure. They are local in character, but may be very severe. They occur almost exclusively by day. Their formation may often be readily watched; cumulus, frequently under a sky devoid of upper cloud, swells to cumulonous; the summit of the latter assumes the cirri-form aspect, and a massive local nimbus is developed. I would denominate them *thunder-showers*.

The third class are *thunder-storms, par excellence*. They belong to the warm season. They are remarkably rare on our extreme western coasts. They are uncommon with pressures above 30·2, or below 29·4. They are most common when pressures are higher in the north than in the south of our islands, and when the isobars show local irregularities. But their most distinctive characteristic is the presence of an extensive and generally rapid southerly upper current (with more or less antagonistic surface-winds), carrying cumulo-stratus over a wide area, especially to the northward and eastward of the storms. Storms of this class are as common by night as by day. They are usually less local than the others. They travel at a great altitude, are often exceedingly intense, and afford the grandest electrical display, but are productive of remarkably few accidents in proportion to the number of discharges. Their first development can rarely be watched to advantage, but the process appears to be the reverse of that which occurs in the "thunder-showers," the aggregation commencing in the higher regions of the atmosphere, and being propagated downwards.

It may possibly interest some of your readers to compare the last 23 seasons with regard to the period of commencement, and relative frequency of the *last-mentioned type* of storms, in England.

1852. Commenced late: extremely abundant and severe, especially in July and August.
1853. Third week in May (heavy); a good deal below the average.
1854. Fourth week in July (?); scanty during the season generally.
1855. Fourth week in May (very slight); none of importance till June 6th; rather frequent and severe until August.
1856. Fourth week in April; very scarce throughout the season.
1857. Second week in April; frequent and very severe, especially in August.
1858. Third week in April; numerous and intense during the season.
1859. Last week in April (slight); numerous and heavy until August.
1860. Third week in May (?); very scarce throughout the season.
1861. First week in April; considerably below the average.
1862. Fourth week in March (slight); much below the average.
1863. Second week in April (slight); a good deal below the average.
1864. Second week in May (slight); extremely scarce throughout.
1865. Second week in May; moderate in extent, numbers, and intensity.
1866. Third week in March (slight); slightly below the average.
1867. Fourth week in April; above the average, and in many cases very severe.
1868. Fourth week in April; moderately numerous, but slight, considering the heat of the season.
1869. First week in June (slight); somewhat below the average.
1870. End of May (very slight); frequent in end of July; otherwise, scarce and slight.
1871. Commenced rather late; moderately numerous, and in several cases very intense.
1872. Fourth week in May (slight); exceptionally abundant and severe.
1873. Third week in April; rather frequent, but generally of moderate extent and severity.
1874. Fourth week in May; somewhat below the average, but rather numerous.
1875. Third week in May (?); of average numbers and severity.
1876. Slight storms of this type occurred in the northern and midland counties as early as the last week in March.

I am, Sir, yours very truly, W. CLEMENT LEY.
Ashby Parva, Lutterworth, April 4th.

LONG WET PERIOD.

To the Editor of the Meteorological Magazine.

SIR,—The *distribution* of the rain which fell between the 13th of February and 29th of March inclusive, 46 days, appears worthy of notice. The aggregate amount, though above the average, can hardly be considered very excessive, being 4·90 (or ·107 per diem), an amount which was exceeded in the 31 days of October 1872, 5·80 (or ·187 per diem), and July 1875, 5·20 (or ·168 per diem). The fall of rain has been recorded here since the beginning of 1872, the very wet year, but in that time, four complete years, I do not find so large a number of consecutive days on which rain fell. The nearest approach to it was in January last year, from the 8th to 27th inclusive, or 20 consecutive days; but in this year rain has been recorded every day from the 20th of February to the 15th of March inclusive—25 consecutive days—whilst from the 13th of February to 15th of March, it fell on 31 days out of the 32, and from the 13th of February to 29th of March, 40 days out of the 46.

Of course, by the term rain I include snow as well as rain—water in the gauge, in fact.—I am, Sir, yours faithfully, J. W. SCOTT.
Muswell Hill, Middlesex, N., April 1st, 1876.

REVIEWS.

Meteorologisk Aarvog for 1874, udgivet af det danske Meteorologiske Institut. Annuaire Météorologique pour l'année, 1874. Publiée par l'Institut Météorologique Danois. Sm. fol. Copenhagen: J. H. Schultz.

THIS is a capital work, quite equal to Capt. Hoffmeyer's usual high standard; for its contents, arrangement, printing, paper, language and illustrations we have nothing but praise, and yet in one respect we do not like it. We may be in error, but are certainly under the impression that one of the points settled by the Leipzig and Vienna meetings was that all ordinary meteorological publications were to be either large 8vo. or 4to. In the face of this, we have a member of the Permanent Committee issuing a book of which the pages are 11 in. long and $7\frac{1}{2}$ broad, and which, therefore, hardly ranges with any meteorological publication yet issued.

Having entered our protest against this departure from uniformity, nothing remains but the pleasureable duty of explaining as briefly as may be the nature of the volume. It consists of about 200 pages, mostly tabular matter, with an introduction, description of the stations, instruments, observations, &c., notes on the state of the sea, upon rainfall, &c. It is also well illustrated by numerous and readily intelligible maps, and also by an interesting series of monthly charts of isobars, isotherms and rainfall. The text is mostly printed in duplicate Danish and French; indeed, the only important exception is the article, "Oversigt over Vejrforholdene i 1874," or Summary of the Weather in 1874, and the capital little charts given with it, render it easy for anyone having a general acquaintance with the languages of North-West Europe to follow the text and profit by it.

The general scope of the work is well described in the introduction, of which the spirit is as follows. (We do not translate literally, as space necessitates extreme brevity).

"Conformably to the resolutions of the Vienna Congress and of its Permanent Committee, a new form has been adopted for the present work, not merely externally, but also as regards its interior arrangement. Moreover, we have tried the autographic method, both for the tables and maps, on account of its greatly reduced cost as compared with printed tables and engraved maps. The publication will in future be issued in two parts, that relating to the kingdom of Denmark as soon as possible after the close of each year, and the other embracing the returns from Faroe, Iceland and Greenland at a later date, viz., after the records arrive at Copenhagen.

In other respects the organization of the Danish system, and the mode of publication agree in almost all respects with the rules laid down by the Congress, for although sometimes tempted to travel a little beyond the rules laid down, the Institute recognizing the immense importance of a uniform mode of publication has subordinated everything to the attainment of that object."—N. HOFFMEYER.

After giving maps showing the distribution of the stations of the various classes, Capt. Hoffmeyer gives a very clear account of their organization, equipment and arrangements. There are 8 principal

stations, 27 climatological stations (thermometers and rain gauges only), and 87 stations for rainfall alone, so that altogether there are 122 rain fall stations, or about one gauge to each 121 square miles.

A supplementary set of maps and notes describe the 5 stations in Iceland, 4 in Greenland (one, the most northerly regular station in the world, Upernavik, in N. lat., 72°47'), and 7 in the Faroe Isles, and thus completes a book which is a credit to every one concerned with its production.

Water Analysis as it should, and as it should not, be performed by the Medical Officer of Health, by CORNELIUS B. FOX, M.D., M.R.C.P. Lond., &c. 2nd edition, with illustrations, post 8vo. Churchill.

DR. FOX is so thoroughly a writer after our own heart, he goes so straight to the point at which he aims, and so shuns redundant verbiage, that our best plan in noticing this work is to give one or two extracts, and merely a line or two of our own in comment. The Preface to the first edition was as follows :—

“The following paper was read by me, in the Public Medicine Section, at the Meeting of the British Medical Association, held at Norwich in August, 1874, to the principal Medical Officers of Health throughout the country, who, in a discussion that followed, endorsed its recommendations.

“It was not written for the instruction of *dummy* or *sham* Medical Officers of Health, who receive £5 or £10 a year as a salary, with the understanding that they are to do nothing.

“It was written: (1) for the purpose of inducing all *real* Medical Officers of Health to adopt some one reliable method of Water Analysis, so that the results of the examinations of all might be comparable; (2) to demonstrate to them the superiority of the Nessler process to any other for employment by the Health Officer; and (3) to give to them some of the results of my experience in the examination of potable waters.

“In order to make the paper useful to Sanitarians in general, several additions have been made to it, so as to render its contents a digest or *précis* of the most approved, and most rapid, reliable method of water analysis, freed altogether from lengthy and technical details, and illustrated with wood engravings.”

“The elementary principles on which the greater part of the work of the Medical Officer of Health is based, may be truly said to be the prevention of water pollution, and of air pollution, with the products of decomposing filth. The examination of drinking waters form a very important portion of his duty in his crusade against preventable disease. He should not only be prepared to answer such a question as ‘Does a water contain a deleterious amount of organic matter?’ but should be able to reply to such interrogations as ‘Is this water wholesome and good?’ ‘Which of several specified wells furnishes the purest water?’ &c.”

After some general remarks, Dr. Fox (who is himself Medical Officer of Health for E., Central, and S. Essex) proceeds to note the methods hitherto adopted, as follows :—

“Seven methods have been employed by different Medical Officers of Health throughout the country, in their attempts to pronounce on the quality of water. The practice of these methods has led, I am compelled to add, to most contradictory results.

1. By noting the presence or absence of any smell in the air with which the water has been violently shaken.
2. Heisch's Test.

3. The Zymotic or Microzyme Test.
4. The Permanganate of Potash Test.
5. The Horsley Test.
6. The Nessler Process.
7. Frankland and Armstrong's Process."

We can hardly indicate the straightforward plainness of language better than by extracting part of the author's remarks upon—

"1. *Smell of Water*.—The most rough-and-ready way that has been employed for ascertaining whether or not a water is polluted with organic matter, is to partly fill a clean bottle with a sample of it, and, having violently shaken the same, to take a hearty sniff at the air of the bottle which has been agitated with the water. If the air smells sweet and fresh, the absence of an injurious amount of organic matter is inferred and *vice versa*. There is no doubt but that much may be learnt in this way by those who do not blunt their sense of smell by smoking, especially if they frequently practise this primitive test. It is very easy to distinguish thus between river water and spring water; and a very impure water, which may exhibit no fault to the eye, may frequently disclose to the olfactory nerves the fact of its pollution."

¶ This is not the place, nor are we competent, to cross swords with Dr. Fox respecting his views of Dr. Frankland's process, but we do not share them.

In conclusion, we need only state that we should not have quoted so largely from Dr. Fox's work had we not thought it a good one, and a manual which should be on the shelves of all his brother officers who are not "dummies."

The Geographical Distribution of Heart Disease and Dropsy, Cancer in Females, and Phthisis in Females, in England and Wales, by ALFRED HAVILAND, M.R.C.S., &c. Imp. 4to. Smith, Elder & Co.

THIS is a very sumptuous work by another well known Medical Officer of Health. The first part of it was reviewed in these pages* some years back, and, with respect to the complete work, we have little to add to and nothing to retract from what we then said. The work is not quite within our province, yet it abounds with suggestive remarks on all kinds of subjects—medical, meteorological, social, architectural, geological, &c. By the bye, there is an amusing slip of the pen respecting a geological map, which on p. 80 is stated to be "on a scale of a mile to an inch," instead of "an inch to a mile." The following extract is a fair specimen of the original thoughts profusely scattered through this work:—

"The artificial granite formation is of high sanitary value, and the extent to which it has been laid on in the older parts of London, where the traffic is greatest, has, undoubtedly, had a wonderful influence on the local climate, and, therefore, on the public health; it is evident that the hygrometric and electrical condition of the atmosphere above a granite area, which favours the ready disappearance of the rainfall through the drains into the river, must be widely different from that floating over a macadamised clay area, or the air wafted from extensive enclosures of unmitigated and badly drained London clay, such as Regent's Park and Primrose Hill; spaces that might be made sources of health to the neighbourhood, instead of the birthplace of mists and fogs with their attendant evils."

* *Met. Mag.*, 1871, vol. vi, p. 120.

JOTTINGS ON NATURAL PHENOMENA IN 1875.

The following scraps have been extracted *verbatim* from the remarks upon the annual rainfall returns, and seem better adapted for insertion here than in *British Rainfall*. Many other items will be found in the remarks published monthly in these pages.

January.—13th. (XII.) Melrose : starlings seen in flock.—19th. Melrose : starlings disappeared.—20th. (IX.) Stanley : a frog seen.

February.—1st. (XVI.) Leny, Callander : heard thrush.—14th. (IX.) Stanley : fine day, sparrows pairing.—15th. Stanley : beautiful day, crocus in full bloom, and lark singing.—15th. (XII.) Melrose : starlings in flocks.—18th. Melrose : starlings disappeared.—17th. (IX.) Stanley : thrush singing.

March.—24th. (III.) Cambridge : butterflies first seen.—26th. Cambridge : apricot blooming well.—30th. (V.) Alderbury : thorn in green leaf.

April.—13th. (V.) Tytherton : Cuckoo first heard.—14th. (III.) Addington : swallow appeared.—15th. (II.) Bleak Ho., Hastings : cuckoo first heard.—16th. (I.) Pinner Hill : swallows came.—(V.) Alderbury : wryneck heard.—17th. Pinner Hill : nightingale, wryneck and cuckoo came.—(IV.) Diss : swallows first seen.—(V.) Alderbury : cuckoo heard, and swallow seen.—18th. (II.) Bleak Ho., Hastings : swallow first seen.—(III.) Addington : cuckoo appeared.—(III.) Cambridge : queen wasp seen.—19th. (III.) Cambridge : nightingale arrived.—(IV.) Diss : cuckoo first heard.—20th. (II.) Bleak Ho., Hastings : nightingale first heard.—(III.) Cambridge : swallow and cuckoo arrived.—22nd. (XVI.) Leny, Callander : sand swallows, and on 23rd, heard cuckoo.—29th. (XII.) Melrose : swallows appeared.

May.—1st. (XII.) Melrose : cuckoo arrived.—3rd. Melrose : land-rail heard.—16th. (XVI.) Leny, Callander : heard landrail.

June.—4th. (VII.) Calcethorpe, wheat in ear.—10th. (IX.) Stanley : corn shot.—18th. (II.) St. Lawrence, Isle of Wight, carted hay.—19th. (IX.) Stanley, hay making commenced.—22nd. (III.) Addington : haymaking general in this neighbourhood.

July.—31st. (IV.) Diss : wheat commenced, oats were cut some days previously.

August.—2nd. (IX.) Beverley : patches of wheat cut, but the general harvest delayed by the rain till the 16th.—5th. (II.) Swallowfield : harvest commenced.—10th. (IX.) Stanley : corn beginning to grow where it is laid.—(X.) Chester-le-Street : harvest became general towards the end of August, with a crop decidedly below the average ; fogs (the after-crop of hay) most excellent.

September.—5th. (II.) Swallowfield : oats still standing.—20th. (II.) Swallowfield : gathered some strawberries.

October.—3rd. (I.) Harrow : martins, after their early departure, returned, and stayed till the 18th.—9th. (VII.) Calcethorpe: swallows departed.—14th. (IX.) Stanley: swallows left.—21st. Stanley: two swallows seen here.—31st. (I.) Harrow: swallows were seen on this day.

November.—1st. (XVI.) Leny, Callander : a greater foliage on trees than I ever remember at same date.—2nd. (II.) Swallowfield : swallows left.—3rd. (IX.) Stanley : starlings singing.—8th. (I.) Harrow: fieldfares seen.—12th. Harrow : larks singing.—13th. Harrow : thrushes singing.—19th. (IX.) Stanley : thrush singing.

December.—9th. (IX.) Stanley : moths out and starlings singing.—12th. Stanley: hedge sparrow singing.—19th. Stanley : thrush singing.—25th. Stanley : Christmas rose, polyanthus, and jasmine in flower.—27th. (III.) Addington : jasminum nudiflorum beautifully in flower on the open walls.

SUPPLEMENTARY TABLE OF RAINFALL IN MARCH, 1876

[For the Counties, Divisions, Latitudes, and Longitudes of these Stations, see *Met. Mag.*, Vol. XI., p. 28.]

Station.	Total Rain.	Station.	Total Rain.
	in.		in.
Acol	2·33	Llanfrechfa	5·39
Hailsham	2·72	Castle Malgwyn	3·37
Andover	3·08	Heyope	4·59
Strathfield Turgiss	3·28	Rhug, Corwen	4·45
Addington Manor	3·60	Port Madoc	3·52
Oxford	3·27	Melrose	3·81
Cambridge	2·19	Cessnock, Glasgow	5·84
Sheering	2·63	Gruinart	4·28
Ipswich	2·75	Keith	4·01
Diss	3·24	Strathconan	11·58
Swaffham	2·70	Springfield, Tain	3·76
Compton Bassett	4·02	Skibbereen	2·59
Dartmoor	6·30	Glenville, Fermoy	4·99
Teignmouth	3·92	Tralee	4·72
Torrington (Langtree) ..	5·81	Newcastle W., Limerick	4·82
Trevarrick, St. Austell..	5·44	Kilrush .....	...
Taunton	4·61	Kilkenny	3·18
Bristol .....	...	Kilsallaghan	2·27
Sansaw	2·16	Twyford, Athlone	4·07
Cheadle	3·66	Ballinasloe	3·68
Ashby-de-la-Zouch	3·24	Kylemore	8·24
Coston, Melton Mowbray	2·68	Bangor	7·13
Bucknall	2·53	Carrick on Shannon	4·13
Walton, Liverpool	2·18	Rockcory	3·87
Broughton-in-Furness ..	3·94	Warrenpoint	3·43
Stanley, Wakefield	3·41	Bushmills	4·49
Gainford	3·18	Buncrana	5·27
Shap	5·34		

MARCH, 1876.

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 1860-5	Greatest Fall in 24 hours.		Days on which >1 or more fell.	Max.		Min.		In shade	On grass
				Dpth.	Date.		Deg.	Date.	Deg.	Date.		
		inches.	inches.	in.								
I.	Camden Town	2.96	+ .88	.74	12	22	63.3	31	26.4	22	8	16
II.	Maidstone (Linton Park).....	2.65	+ .16	.52	12	19	66.0	31	23.0	19	10	...
III.	Selborne (The Wakes).....	3.86	+ 1.26	.61	11	26	56.0	31	26.0	21	8	12
IV.	Hitchin	2.97	+ .80	.79	12	20	56.0	31	22.0	21	18	...
V.	Banbury	3.40	+ 1.20	.66	12	24	60.0	31	24.5	22	15	...
VI.	Bury St. Edmunds (Culford). N rwich (Sprowston).....	2.10	- .10	.56	12	18	61.0	31	21.0	21	12	20
VII.	Bridport	2.92	...	.55	12	21	...	...	...	...	...	...
VIII.	Barnstaple.....	3.10	+ .23	.61	11	21	56.0	6	22.0	19	13	...
IX.	Bodmin	5.40	+ 2.25	1.40	11	21	56.5	4	28.5	23	...	...
X.	Cirencester	4.51	+ .76	.76	30	25	56.0	28	29.0	19	4	11
XI.	Shifnal (Haughton Hall) ...	1.39	+ 1.79	.92	9	20	...	...	...	...	...	...
XII.	Tenbury (Orleton)	2.45	+ .51	.33	14*	18	55.0	3	22.0	20	14	21
XIII.	Leicester (Belmont Villas) .	3.32	+ .90	.56	30	25	57.7	3	22.5	22	10	17
XIV.	Boston	2.81	...	.52	27	24	63.5	31	25.2	19	11	...
XV.	Grimsby (Killingholme)	2.42	+ .63	.62	27	17	64.0	31	25.0	19	11	...
XVI.	Mansfield	3.32	...	.99	27	25	58.0	31	24.0	19	10	...
XVII.	Manchester	3.04	...	.44	8	24	63.2	31	24.6	19	15	17
XVIII.	York	3.70	+ 1.01	...	...	22	...	...	...	...	...	...
XIX.	Skipton (Arncliffe)	3.23	+ 1.24	.63	29	24	60.0	31	24.0	18	12	...
XX.	North Shields	8.10	+ 3.29	1.15	8	23	...	...	...	...	...	...
XXI.	Borrowdale (Seathwaite).....	2.02	- .33	.27	14*	23	55.0	3	25.0	22	11	22
XXII.	Cardiff (Ely)	12.80	- .60	2.86	2	23	...	...	...	...	...	...
XXIII.	Haverfordwest	3.57	+ .12	.73	5	17	52.0	1+	25.0	22	13	18
XXIV.	Machynlleth	5.89	...	2.12	5	21	54.0	29	20.0	19	7	...
XXV.	Llandudno.....	2.89	+ .63	.60	5	16	56.6	3	26.2	18	...	...
XXVI.	Dumfries (Crichton Asylum) Hawick (Silverbut Hall).....	3.59	+ .99	.48	2	17	52.8	1	22.0	20	18	19
XXVII.	Kilmarnock (Annanhill).....	3.82	...	.76	14	18	...	...	...	...	...	...
XXVIII.	Castle Toward	5.12	...	.87	9	22	55.0	4	22.0	20	14	18
XXIX.	Mull (Quinish)	5.83	+ 1.24	.90	3	19	48.0	1, 3	25.0	23	14	...
XXX.	Leven (Nookton).....	7.24	...	.84	25	23	...	...	...	...	...	...
XXXI.	Grandtully.....	4.57	...	.63	3, 14	18	...	...	...	...	...	...
XXXII.	Braemar	4.31	+ 2.10	.57	3	24	50.4	3	11.3	21	20	27
XXXIII.	Aberdeen	4.51	...	.70	10	27	52.2	3	22.4	13	10	23
XXXIV.	Loch Broom	6.75	...	.92	9	28	...	...	...	...	...	...
XXXV.	Portree	7.89	- 1.15	1.37	3	26	...	...	...	...	...	...
XXXVI.	Inverness (Culloden)	4.01	+ 2.05	.64	10	27	56.0	3	21.5	17	11	26
XXXVII.	Helmsdale	7.32	...	2.00	10	27	...	...	...	...	...	...
XXXVIII.	Sandwick .....	...	...	...	...	...	...	...	...	...	...	...
XXXIX.	Caherciveen Darrynane Abbey	4.48	...	.86	21	14	...	...	...	...	...	...
XL.	Cork	3.63	...	.45	12	24	...	...	...	...	...	...
XLI.	Waterford	3.67	+ .78	.56	20	24	61.0	12	28.0	13	10	...
XLII.	Killaloe	6.08	+ 1.76	.80	5	20	59.0	30	24.0	23	11	0
XLIII.	Portllington	3.00	- .31	.33	3	27	54.0	2	28.0	18	14	...
XLIV.	Monkstown, Dublin	2.47	- .11	.54	8	19	...	...	...	...	...	...
XLV.	Galway	4.78	...	.73	4	24	55.0	2, 3	28.0	9	7	...
XLVI.	Ballyshannon	3.16	...	.55	7	18	...	...	...	...	...	...
XLVII.	Waringstown	3.08	...	.39	5	26	59.0	3	26.0	11	19	23
XLVIII.	Edenfel (Omagh)	3.63	...	.42	2	25	50.0	30	22.0	9	16	...

* And 29. † 16 & 31. ‡ 19.
 +Shows that the fall was above the average; --that it was below it.

METEOROLOGICAL NOTES ON MARCH.

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.—Certainly the most inclement March I have ever recorded. Very little work either in fields or gardens. Prevailing winds the first fortnight, S. W., then variable W. and N. to N. E., last few days S. W. T with violent wind from S. W. on 4th; 9th, bar. fell $\cdot 971$ of an inch in 36 hours, followed on 10th by T, L, R, H & S, with high wind, all within ten minutes, at 9 a.m.; 17th, biting N. E. wind; a little S and H, frequent fog at the beginning and end of the month.

HITCHEN.—11th and 12th, the deepest fall of S we have ever recorded; S on 19th and 27th.

BANBURY.—High wind on 3rd, 5th, 8th, 14th and 18th, and soft H on 17th and 22nd; H on 6th, 7th, 8th, 15th and 29th; S on 9th, 18th, 19th, 21st and 27th.

CULFORD.—A month of exceedingly wintry weather with a mean temp. barely exceeding that of February, viz., $40^{\circ}\cdot 4$; easterly winds prevailed only on 8 days, but S fell more or less on 9 days; very high wind, accompanied by T, on 14th; T again on 28th; the lowest temp. was $21^{\circ}\cdot 0$, and occurred on 21st. A favourable change set in on the 30th, the max. temp. of the month $61^{\circ}\cdot 0$ being attained on 31st.

SPROWSTON.—A very wet month, nearly double the average, a large proportion of which fell as S; land so wet that barley sowing did not commence (except on the very highest soils) till the 27th; bar. very low from 8th to 12th; T clap and H at 1 p.m., and gusty on 6th; high wind on 10th, especially at 2 and 3; gale all day on 15th; snowstorm daily from 17th to 22nd inclusive.

BODMIN.—Heavy westerly gales on 9th and 12th; S daily 17th to 21st, inclusive.

SHIFNAL.—This has been a genuine March and unpleasant beyond measure, the whole of it after the first 5 days having been a combination or interchange of frost and snowstorms, wind and R. The ther. which stood at $55^{\circ}\cdot 0$ on the 3rd never reached that afterwards, and the frosty nights (14) and 21 on grass retarded vegetation, putting the farmers to great straits for keep and withering the young wheat crop. On the 28th thick fog came on, followed by heavy R at night; the temp. then rose from 42° to 49° , and finishing on the 31st at 54° . Gooseberry bushes burst on 5th, apricot in blossom on 12th, celandine in flower on 22nd, willow in bloom on 26th; humble bee first seen on 31st.

ORLETON.—R or S fell every day, with temp. generally low, and a cloudy sky till the 18th, then severe frosts and dry winds to the 28th, when a sudden rise of temp. took place, and the remaining days were wet and warm. The ground was frequently covered with S, and the bar. very low throughout the month; at 9 a.m. on 10th it stood at $28\cdot 42$ uncorrected. The mean temp. of the month was about the average. The rough dry winds enabled the farmers, between the 21st and 28th, to plant wheat on the soil that was too wet in the autumn.

LEICESTER.—A cold month, with the exception of a few days at the beginning and end; more frost and S than usual; bar. frequently very low; mean temp. $39^{\circ}\cdot 9$, being $0^{\circ}\cdot 6$ below that of February; owing to the heavy R of 27th and 28th, much land in the neighbourhood has again been flooded. Much T on 21st, at 6.35 p.m.

BOSTON.—One of the stormiest months known for many years; a gale raged almost continuously from the 3rd to 17th; the bar. has not reached to 30.00 since the 4th February; several very strong frosts. Heavy R towards the end of the month, causing the river to rise very high.

GRIMSBY.—A severe and stormy month, with very low bar., only four days that could be called pleasant. "March dust" almost unknown; scarcely any spring corn sown. T and L at 11.15 a.m. on 6th, at 4.50 p.m. on 11th, at 7.15

p.m. on 28th, and T at 2.30 p.m. on 29th. Yew began to shed pollen on 1st, apricot began to flower on 3rd, violet on 8th, peach on 13th, and marsh marigold on 23rd. Frogs spawning on 20th.

MANSFIELD.—A cold, wretched month, the last day being the only really pleasant day in it; T, H and S at 1.30 on 15th.

ARNCLIFFE.—Loud peal of T on 10th, and frequent peals of T on 31st; a remarkable gloom on 29th.

NORTH SHIELDS.—Frequent S during the month; fog on 28th and 29th; T and L on 31st. White crocus in flower on 1st, purple and white saffrage on 10th, and double red hepatica on 11th.

SEATHWAITE.—Though R fell on 23 days, exceeding 1.00 in. on 4 days and 2.00 in. on 2 days, the max. fall being 2.86 in. on the 2nd, the total fall (12.80 in.) was rather *below* the average.

WALES.

HAVERFORDWEST.—A very rough, cold month; bar. very low from the 8th to the 12th; corrected reading, 9 p.m. on 9th, 28.6. Precelly range covered with S on 10th; several heavy snowstorms; violent gale from N., and blinding S shower on the night of 18th; much L on the night of 9th. The most severe March in this county since 1865.

MACHYNLETH.—A very wet, cold and stormy month up to the 19th; very cold and dry with sharp frosts from that time to the 28th, then fine, but with white frosts in the mornings; T at 3 p.m. on 15th.

LLANDUDNO.—T and L with H at 7.45 p.m. on 6th; T and L with S during the night of 18th; jargonel pear in blossom on 21st, plum in bloom on 24th. S showers almost daily, and lying on the distant hills during the whole of the month. First two days fine, thence to the 21st cold and stormy; from 22nd to the end on the whole fine, the last four days especially so; nights of 18th, 19th and 20th frosty, being preceded by a heavy fall of S.

SCOTLAND.

DUMFRIES.—A very stormy month; rainfall above the average. The snowfall in this district comparatively light; the reading of the bar. on the 9th lower than any recorded at this station for 12 years; mean temp. 37°·7, one degree lower than last year; last two days much milder.

HAWICK.—A very stormy month; the 14th was a terrible day for R, H, S, frost and wind. The S and frost have retarded farming operations.

ANNANHILL.—Month very boisterous; several gales; prevailing winds westerly; great storm on 9th, with T and L; great fall of S during the month; from 17th to 29th, a period of easterly winds and frost; S and large H on 7th; showers of H and sleet on several days; ozone well developed, mean amounting to 6.9 and the max. recorded on 8 days.

CASTLE TOWARD.—The stormy weather of this month is quite unprecedented; S fell frequently, was deeper, and continued on the ground longer than during the winter months; frosts also were frequent, but were not of long continuance; altogether it has been a severe month, and promises a late spring. No seed yet sown; the ground being too wet. Grass is looking very brown, and there will be but little food for the cattle for some time to come.

BRAEMAR.—Bar. 27.126 in. on 9th, nearly two-tenths lower than I have recorded since I began to take observations (20 years). A most severe month, with S and drift.

ABERDEEN.—Mean bar. 29.328 in. or .474 in. below the mean of 19 years, and (except December, 1868,) the lowest mean for any month during the last 20 years; on 9th it fell to 28.035 in. corrected; mean temp. 1°·2 below the average; rainfall considerably above the average. A month of unusually stormy weather; agricultural operations are very far behind.

LOCHBROOM.—Scarcely one fair day ; all outside work much retarded ; sheep, &c., much reduced.

PORTREE.—A cold, stormy month ; S from 12th to 18th ; such a fall of S at this season of the year is unprecedented in this island ; a fresh fall of S (3 inches) took place on 27th ; gale from 7 a.m. till 11 p.m. on the 4th, from S.W. to N.W. ; the weather is still very cold, and outdoor work backward.

CULLODEN.—On the 8th, 9th and 10th, great depressions of the bar. took place, particularly on the 9th, when the mercury (corrected to 32° Fahr., at 104 ft. above the sea) sank by 7 p.m. to 27·966 in., having ranged below 28 in. for five hours previously. The following are the several corrected readings below this point :— 4.30 p.m., 27·990 in. ; 5 p.m., 27·980 in. ; 5.15 p.m., 27·973 in. ; 6 p.m., 27·972 in. ; 7 p.m., 27·966 in., which was the minimum, and the greatest depression that has occurred since the 27th of December, 1852, when the extraordinary low reading of 27·872 in. was reached. On the 18th of January, 1872, however, there was a depression *nearly as great as on the 9th inst., namely, 27·968 in.* Fieldfares last seen on 23rd.

IRELAND.

DARRYNANE.—March has kept its proverbial character : it came in like a raging lion, and went out like a lamb ; from 1st to 11th inclusive it blew a gale of wind, with B, H, S and a very heavy sea ; on the 9th the low grounds were covered with S, which is very rare here ; from 11th to the end the wind was moderate, and sea calm ; 30th and 31st, very fine and warm ; winds first part S.W. to N.N.W. ; last part very variable. Farming operations much delayed at first, but now being rapidly carried on ; H daily from 6th to 10th inclusive.

MONKSTOWN.—The early part of the month very severe ; cold winds and frequent showers of S prevailing ; the last few days were milder.

GALWAY.—T and L on 2nd and 3rd ; S on 9th.

BALLYSHANNON.—The month, with the exception of the last three days, has been an unusually severe one. There was an extraordinary fall of R between 10 and 11 p.m. on the 7th, which but for its short duration might have caused serious damage ; the low temp. and frequent falls of H have kept back vegetation, and up to the close of the month little has been done towards potatoe planting ; high tides on 10th ; gale from W. with S and H on 12th, and again on 14th ; loud T at 7 a.m. on 15th ; H and S, with high winds N.N.W., on 16th.

WARINGSTOWN.—Very wet, cold and backward, hardly any signs of spring.

EDENFEL, OMAGH.—Weather of the month (except the last few days) extremely wet, cold, stormy and inclement, with more S than at any period of the winter, and without any of the usual easterly winds ; as a consequence, vegetation and agriculture are more backward than for many years at the same period.

APRIL SNOW IN THE ISLE OF WIGHT.

To the Editor of the Meteorological Magazine.

SIR,—Last night and this morning there was a fall of snow to the depth of about an inch, or rather more, the water in the gauge registering about 0·20 in. The trees were thickly covered, and presented a most enchanting appearance, and a most unusual one for the season. Maximum temperature, 45°. The snow did not fully melt for several hours. At 4.15 p.m., heavy fall of soft hail ; temperature, 39½°.

E. G. ALDRIDGE.

Newport, Isle of Wight, 12th April, 1876.