

SYMONS'S

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SIGNAL OFFICE PUBLICATIONS.

We have already described two of the publications of the Washington Office—viz., “Daily U.S. Weather Maps” and “Daily Bulletin of International Meteorological Observations;” there remain many other forms in which the energy and power of the office is displayed, some of which we proceed to notice.

Monthly Weather Review.—We take as a specimen the latest number—that for May of the present year. Even the title tells a tale; it is as follows:—“Monthly Weather Review, May, 1879 (General Weather Service of the United States), War Department, Office of the Chief Signal Officer, Division of Telegrams and Reports for the Benefit of Commerce and Agriculture.” The absence of any technical word, even so popular a one as “meteorology” is noticeable; the title all through implies business; we have “weather,” not “meteorology;” we have no reference to scientific bodies; we are told that the object is to benefit commerce and agriculture, and evidently the office aims straight at that object. The Review is a quarto pamphlet of sixteen pages, with five beautifully-executed maps. The contents are as follows:—Introduction (details of the data employed); Barometric Pressure; Areas of High Barometers (not called anti-cyclones); Areas of Low Barometers (not called cyclones); International Meteorology (surely rather *too* International, for in little more than one page we have observations on various dates between December 7th, 1878, and April 13th, 1879, and scattered over the North Atlantic, South Atlantic, North Pacific, South Pacific, and Indian Ocean. We fear that no one will learn much from an undigested medley of this sort, and we do not know in what way it will benefit either commerce or agriculture); Unalaska Island, Alaska; York Factory, Hudson’s Bay; Paramaribo, Dutch Guiana. (These three localities are represented by abstracts of the results of observations during parts of 1878 and 1879. As regards the first, there seems to be a misprint as well as a practice of questionable expediency. We are told that the mean temperature is obtained by

" $\frac{1}{4}(7 + 2 + 4 + 9 + 9)$;" we assume that $\frac{1}{4}$ should be $\frac{1}{2}$, and that the hours of observation are 7 a.m., 9 a.m., 2 p.m., 4 p.m., and 9 p.m., but if so, what an unusual combination; we can understand 12-hour intervals, 9 and 9; 7-hour intervals, 7, 2, and 9; a combination of the two systems, 7, 9, 2, 9, or the same with a 6-hour interval, i.e., 9, 3, and 9, added to 7, 2, and 9, giving 7, 9, 2, 3, and 9; but what use the 4 p.m. readings can be we cannot guess. There is much valuable information in these three extracts, but surely it would have been better to keep them in the office until at least data for a twelvemonth had accumulated, and then to give them in regular form; the facts are very valuable, but unless the Signal Office intends to publish a very full index to its Review, fragments like these, in spite of their value, must of necessity be forgotten). Temperature of the Air, minimum and maximum temperatures are given for many stations; Ranges of Temperature; Frost injurious to Vegetation; Ground Frozen; Ice. A page and a half is devoted to Precipitation, with the following sub-headings:—Special Heavy Rains (the most noteworthy was 2.00 in. in 52 minutes at Woodstock, Maryland, on May 19th); Largest Monthly Falls (the largest 8.65 in. at Concord, Iowa); Smallest Monthly Rainfalls (in South-Eastern California, Arizona, and Western New Mexico no rain is reported); Rainy Days; Cloudy Days; Hail (several heavy storms are mentioned, e.g., at Graham, Texas, on the 30th, stones weighed an ounce; at Eagle Pass, Texas, on the 5th, they were 3 in. in circumference; 30 miles south of Corsicana, Texas, on 25th, a hail storm, whose track was $1\frac{1}{2}$ miles wide and 8 miles long, did great damage to wheat, corn, and cotton crops; and at Greenwood, Wisconsin, on the 3rd, stones were found $2\frac{1}{2}$ in. by $3\frac{1}{4}$ in.). Snow, depth of snow on ground at end of month; Droughts (complaints of droughts were general from all parts of the States. We quote three reports:—Campo, California: "Driest and coldest May for 20 years, springs drying up;" Missouri: "Eastern part of the State suffering greatly from lack of rain, small grain and fruit much injured;" and, lastly, Prof. Kingston reports that "the months of April and May were, in the vicinity of Lake Ontario, the driest on record." Floods (none reported); Relative Humidity; Winds; Total Movements of the Air; Local Storms. (We reprint the whole of this section in confirmation of the paragraph, which we gave in our last, extracted from *The Times* telegram:—

Local Storms.—*May 29th*, warm, moist southerly winds, with fair weather, prevailed over Iowa and southward to the Gulf States. About 5 p.m. a hail storm of great violence passed from the S.W. to the N.E., through Holt County, New Mexico, and then, developing into a tornado, passed eastward through the southern part of Nodaway Co., New Mexico, for about 16 miles, having a width of 300 to 3000 feet. It began near Smith passed south of Barnard and north of Bockolow [Bolockow?] and was last seen moving towards Conception, but apparently rose and was dissipated before reaching that place. The north side of the track was straight, clear and well-defined; the south side was jagged,

looped and curved. On the same afternoon heavy hail and rain-storms occurred in Lawrence Co. and Riley Co., and many other portions of Kansas.

May 30th, lower temperatures prevailed in Missouri and Kansas and the advancing edge of the area of cold N.W. winds passing eastward over western Nebraska and Kansas, was accompanied by severe local thunder and hail-storms, and in some places by tornadoes. At 4.35 p.m., Washington time (or 3.15 p.m., local time on the 97th meridian) an oval area extended for 300 miles from the west of Fort Sill to the south of Omaha, and having a shorter diameter of about 50 miles; towards this the winds were blowing from all directions, being warm, brisk S.W. on the east side, and cold, high N.W. on the west side. At 11 p.m. this area is represented by a smaller one of low pressure in southeastern Nebraska and two of converging winds respectively in S.E. Iowa and central Missouri. Severe tornadoes or equivalent local storms occurred between 3 p.m. and 11 p.m. as follows:—

- 1, Scardia, Republic County, Kansas.
- 2, at 4 p.m., tornado passed 4 miles north-west of Minneapolis, Ottawa Co., Kansas, path 10 to 15 miles long, 1000 feet wide; very violent at Delphos, Ottawa Co.; in all 18 persons reported killed.
- 3, between 6 and 6.30 p.m. tornado passed from Candreys house near county line between Riley and Clay Counties, Kansas, northeastward over or near Stockdale and Randolph, in Riley County; path [30 ?] miles long; very destructive; 3 persons killed.
- 4, From 7.45 to 8 p.m. tornado passed eastward over Blue Rapids, Irving and Frankfort, Marshall Co., Kansas, and Centralia, Nehema, Co., Kansas; very severe at Irving; high winds prevailed to long distances from central path, which was about 30 miles long; in all over 30 persons killed and over 50 severely injured.
- 5, Richardson Co., Nebraska, the preceding tornado reported to have reappeared in this county.
- 6, At 1 p.m. [10? p.m.] near Kirksville, Adair Co., New Mexico; 1 person killed.
- 7, Between 7 and 9 p.m., at Craig, Holt Co., New Mexico; this storm was seen by observer at Corning, Holt County.
- 8, About 6 p.m. tornado seen to form about 2 miles north of Lee's Summit, Jackson Co., New Mexico; passed near Blue Springs and Oak Grove, and was seen to dissipate near Judge Williams' House; passed northeastward, 10 miles long and 100 feet wide; 5 or 6 killed. This same storm was seen by observers at Independence and Buckner, New Mexico.
- 9, In Wayne Co., and at 9.10 a.m., local time, in Appanoose Co., Iowa, at a point 15 miles N.E. of Unionville, Putnam Co., New Mexico; 1 killed; (probably a heavy thunder and hail storm rather than a well developed tornado).

Verifications; Indications (Anglicè forecasts); Cautionary Signals; Navigation; Stage of Water in Rivers; Ice on Lakes and Rivers; High Tides; Temperature of Water; Atmospheric Electricity; Thunderstorms; Auroras; Telegraphic Communication interfered with by Atmospheric Electricity; Optical Phenomena; Solar Halos;

Lunar Halos ; Miscellaneous Phenomena ; Botanical ; Birds ; Fish ; Miscellaneous ; Meteors (Prof. G. Hinrichs, of Iowa, reports a "brilliant meteor in the northwest at 5 p.m. of the 10th ; detonations of extreme violence marked the end of its path over Dickinson and Emmet Counties, which were heard over 100 miles in every direction. Two large *meteorites*, of the class *syssideres* have thus far been found, weighing 460 and 150 lbs. respectively") ; Polar Bands ; Prairie and Forest Fires ; Mirage ; Zodiacal Light ; Earthquakes ; Sunsets (The characteristics of the sky at sunset, as indicative of fair or foul weather, for the succeeding twenty-four hours, have been observed at all Signal Corps stations. Reports from 131 stations show 4,034 observations to have been made, of which 53 were reported doubtful ; of the remainder, 3,354 or 84·2 per cent. were followed by the expected weather) ; Sun Spots ; Notes and Extracts (of these there are three, one refers to an irregular barometric curve, another to a cyclone which occurred in Switzerland, and the third to the Verglas mentioned on page 53 of this Magazine. This note we append :—

[*Note of Mr. E. Nouel, from Comptes Rendus.*]

In a note on the theory of hoar frost and *verglas*, (frozen rain,) printed in Vol. XI. (1863,) of the *Annuaire de la Société Météorologique de France*, page 26, I showed that the great verglas are not due, as is believed, to a rain *above zero* [centigrade], partly freezing by contact with objects whose temperature is below zero, but that they arise from a rain several degrees *below zero* [C.], in liquid state, falling through air *below zero* [C.], and congeal upon the surface of objects, in a continuous manner, through the effect of the surrounding temperature.

This theory has been twice strikingly confirmed this winter, at Vendome. 1st, During the night of January 7th and 8th, a storm accompanied by a rain of 23·5 millimetres (0·92 inch) of frozen water, and by a temperature varying between 0° and —1° centigrade, (32° and 30°·2 Fahrenheit,) caused a *verglas* of about 15 millimetres, (0·59 inch) in thickness, which greatly damaged the trees. 2nd, The 22nd and 23rd of January following, a rain which lasted 30 hours, scattered over a period of 40 hours, produced a coating of transparent ice which I estimated at 25 millimetres (0·99 inch), and the temperature of the air was on an average of —2° centigrade (28°·4 Fahrenheit) during all this time.

Several observers have addressed to the Academy (sessions of day January 27th and February 3rd) notes on the great *verglas* of January 22nd and 23rd, Messrs. Nasse and Godefroy have joined thereto, (*Comptes Rendus* p. 192 and 244), a theory as to its formation. This theory is only a reproduction of that which I had conceived on occasion of a like phenomena, December 25th, 1860, and which I published in the *Annuaire de la Société Météorologique* in 1863. It appears that it has remained unknown to physicists, whose attention has been awakened only this year by the exaggeration itself of the phenomena which has assumed proportions unheard of until now.

We have yet to notice the five maps which accompany this Review. No. 1, 2 and 3 are maps of North America, on the scale of about 330

miles to an inch. No. 1 is virtually a key to the tri-daily maps issued by the Department; each of the latter of course shows one or more localities where the barometric pressure is low. In this map these depression centres are joined so that one can follow them in their path across the States. No. 2 gives Isobars, Isotherms, and prevailing winds for the month. No. 3 is a tinted rain map with five gradations of 2 in. each—plain white indicating a monthly total under 2 in., and the deepest tint a total of 8 in. or upwards. It is a capital map, and nothing but the cost prevents our giving a similar one with each number of this magazine. There are also two international charts on the very small scale of which we issued a specimen with our May number—a scale of about a thousand miles to an inch. One gives Isobars, Isotherms, and prevailing winds; the arrows indicating the winds are so systematically arranged as to make one wonder very much upon what observations they can be based. The last map, representing ocean storm tracks, is similar to No. 1, but is on the smaller scale, so as to include both America and Europe, and represents four storms crossing the Atlantic in periods ranging between $3\frac{1}{2}$ and 6 days.

SOUTH AUSTRALIAN DROUGHT.

(Adelaide, May 17th, 1879).

The lengthened drought, which has caused so much anxiety and distress, has broken up, and very general rain in all the agricultural districts has been registered. The drought was so protracted, and the supply of water in the reservoirs near Adelaide was so reduced, that the residents in the city and suburbs had to be placed on short commons. The use of water for irrigating purposes and hydraulic lifts was forbidden; and had the dry weather continued much longer, a still further curtailment would need to have been made. Happily, however, the danger of something like a water famine has passed away. The rains have quite changed the aspect of affairs. So far the season has been favourable, and the young corn, which is springing up, seems vigorous and healthy.—*The Colonies.*

MEXICAN METEOROLOGY.

WE have been favoured with several publications lately from Mexico, and for the present notice have selected two. One is an octavo pamphlet*, the other is a yearly summary, so good and compact that we have translated it, converted the figures into English measures, and reprinted it at the end of this notice.

* *La Ley de Periodicidad de las Lluvias en el Valle de México*, por V. Reyes. Mexico, F. Diaz de Leon, 1879.

The pamphlet is a paper read at the February meeting of the Mexican Geographical Society. The most valuable part of the paper is a table which, converted into English measures, is as follows:—

Rainfall at San Nicolás Buenavista, Xochimilco, Mexico.

Year.	Depth. in.	Diff. from Mean. in.	Year.	Depth. in.	Diff. from Mean. in.
1855 ...	30·18	... + 6·41	1867 ...	29·33	... + 5·56
6 ...	23·05	... — 72	8 ...	19·86	... — 3·91
7 ...	19·59	... — 4·18	9 ...	17·33	... — 6·44
8 ...	19·88	... — 3·89	1870 ...	20·43	... — 3·34
9 ...	25·11	... + 1·34	1 ...	27·17	... + 3·40
1860 ...	13·98	... — 9·79	2 ...	21·42	... — 2·35
1 ...	29·44	... + 5·67	3 ...	22·27	... — 1·50
2 ...	25·16	... + 1·39	4 ...	26·57	... + 2·80
3 ...	21·77	... — 2·00	5 ...	20·39	... — 3·38
4 ...	28·91	... + 5·14			
5 ...	36·38	... + 12·61	Mean	23·77	
6 ...	20·95	... — 2·82			

Señor Reyes goes on to remark that in order to render the fluctuations in these amounts easily followed, he has laid them down on a diagram, and that inspection of it demonstrates—

“1° That from 1855 to 1871 the maxima are reproduced alternately, each four and each two years in the following order:—1855-59-61-65-67-71.

“2° That from 1857 to 1872 the minima occur each three years thus—1857-60-63-66-69-72.”

Señor Reyes has fallen into the error which so frequently attends those who are looking for cycles—that of extracting only the data which are favourable to his theory. We have sorted the years into those of excess and deficiency, and have prefixed an asterisk to those quoted by Señor Reyes:—

Rainfall above average.

	in.
* 1855	+ 6·41
* 1859	+ 1·34
* 1861	+ 5·67
1862	+ 1·39
1864	+ 5·14
* 1865	+ 12·61
* 1867	+ 5·56
* 1871	+ 3·40
1874	+ 2·80

Rainfall below average.

	in.
1856	— 72
* 1857	— 4·18
1858	— 3·89
* 1860	— 9·79
* 1863	— 2·00
* 1866	— 2·82
1868	— 3·91
* 1869	— 6·44
1870	— 3·34
* 1872	— 2·35
1873	— 1·50
1875	— 3·38

Hence it is clear that there is much support for his second rule, but the first breaks down in 1873, which ought to have been wet and was not. We do not understand why he did not include 1875 in the instances of fulfilment of his second rule, which certainly has remarkably strong support.

Central Meteorological Observatory of Mexico.

Lat. 19° 26' N. ; Long. 6^h. 36^m. 27^s. W. of Greenwich ; Altitude 7,431 feet.

General Summary for the Year 1878, drawn up by V. REYES, Civil Engineer.

Meteorological Elements.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Synopsis.
Barometer—Reduced to 32° ...	23·085	23·055	23·067	23·024	23·096	23·100	23·098	23·095	23·122	23·118	23·115	23·111	Annual Mean, 23·090 in.
" Absolute max.	23·226	23·241	23·282	23·161	23·219	23·219	23·213	23·204	23·213	23·284	23·254	23·232	Extreme Max., 23·284 "
" " min.	22·958	22·907	22·866	22·884	22·997	22·938	22·953	22·914	23·001	23·008	22·924	22·926	" Min., 22·866 "
{ Mean }	55·2	57·4	61·2	67·8	67·5	66·0	64·0	62·1	61·5	59·7	57·6	54·1	Annual Mean, 61·2° F.
{ Max. in shade }	77·0	77·5	83·8	88·9	85·1	84·2	82·4	81·0	76·1	75·2	73·6	71·6	Extreme Max., 88·9° F.
{ Min. in shade }	35·1	37·4	41·9	43·7	52·2	51·8	53·1	52·5	47·8	41·7	41·4	30·2	" Min., 30·2° F.
{ Max. in sun }	100·0	99·9	107·1	111·9	111·6	117·5	109·0	114·1	120·6	117·0	109·0	116·1	" Max., 120·6° F.
{ Radiation minimum }	24·1	28·4	32·0	34·9	38·5	43·9	47·1	45·3	41·0	30·0	34·9	19·0	" Min., 19·0° F.
{ Daily range of shade max. }	34·0	36·4	38·2	37·4	29·0	29·7	27·5	25·6	23·8	28·1	26·1	33·1	" Max., 38·2° F.
{ " " sun }	69·8	68·6	66·4	66·4	71·5	69·5	60·3	65·9	74·2	76·0	71·1	91·3	" Max., 91·3° F.
{ Soil at 2 ft. 9 in. deep ... }	57·6	56·3	57·6	59·4	62·4	63·9	63·9	63·5	63·0	62·1	60·3	58·3	Annual Mean, 60·6° F.
Humidity	53	40	42	33	49	60	72	78	72	70	63	53	" " 57.
Tension of vapour	·240	·191	·230	·220	·333	·889	·443	·452	·414	·372	·309	·237	" " ·319 in.
Vapour in 1 cubic metre	95	75	90	85	129	151	172	177	161	146	122	94	" " 125 grains.
Mean daily evaporation in sun	·22	·33	·34	·46	·37	·31	·24	·21	·23	·22	·21	·26	" " ·28 inch.
Days of rain	2	2	4	2	15	16	27	24	15	9	1	2	Total, 119.
Rainfall—Monthly total	·20	·02	·08	·00	3·11	2·78	7·76	13·60	5·38	2·16	·01	·02	" 35·13 inches.
{ Greatest daily fall. }	·20	·02	·05	·00	·95	·60	2·44	2·11	1·54	1·60	·01	·02	Greatest Daily Fall, 2·44 in.
Mean amount of cloud	2·6	2·0	3·2	1·5	4·6	5·7	7·3	8·2	6·6	5·3	3·9	2·2	Annual Mean, 4·4.
Prevailing direction	S.W.	S.W.	S.W.	S.W.	S.W.	N.E.	N.E.	E.	N.E.	N.E.	S.W.	S.W.	Mean Annual Direction,
Number of cloudy days	3	4	6	1	12	19	23	27	19	14	5	0	Total, 133. [N. ¼ N.E.
{ " cloudless*	18	22	21	23	11	7	0	0	3	9	16	22	" 152.
Wind—General direction	E.	S.W.	S.E.	S.W.	N.W.	N.W.	N.W.	N.W.	N.W.	N.W.	N.W.	S.E.	Prevailing Direction, N.W.
{ Mean hourly velocity. }	2·0	3·8	2·5	3·4	2·5	3·6	2·5	2·2	2·4	2·5	1·1	·9	Annual Mean, 2·5 miles.
{ Maximum	22	24	20	22	34	36	22	40	23	23	21	21	Extreme Max., 40 miles.
Mean amount of ozone	2·2	3·1	3·7	4·1	4·6	4·9	3·3	3·0	3·4	3·2	2·9	2·9	Annual Mean, 3·4.
Days with thunderstorms ...	1	0	0	0	15	19	26	18	20	14	2	3	Total, 118.

* Possibly this element is incorrectly described; we do not know the precise meaning of the word "despejados"—En.

REVIEWS.

Barbados Agricultural Gazette and Planters' Journal. Vol. I. Bridgetown; 4to.

THIS journal, published by the Barbados Agricultural Society, is to a certain extent a continuation of the *Agricultural Reporter*, the issue of which was stopped by the destruction by fire, of the offices, together with a great part of Bridgetown, in 1860. It contains returns of the rainfall of the island from 207 stations, compiled by Dr. Walcott, who has re-established the system of observation which was begun by the late Governor, Sir Rawson Rawson, and carried on by him till his administration ceased at the end of 1875. The stations are grouped into districts and parishes, and the mean rainfall of each is given, which is perhaps the most useful for agricultural purposes, but is not of so much scientific value as if the returns from each station were given separately.

The Meteorology of Croydon. A paper read before the Croydon Microscopical and Natural History Club. By MR. GEO. CORDEN. 8vo. Croydon, 1878.

This paper is a very full digest of Mr. Corden's observation at Croydon during the 10 years, 1867-1876. It is divided into seven parts—Temperature, Diurnal Range of Temperature, the Dew Point, Cloud, the Winds, Atmospheric Pressure, and Rainfall, and each part contains copious tables of the mean results and the extremes registered. Unfortunately, the thermometers were only placed in shade of a wall facing north, so that the observations are not comparable with those obtained from instruments mounted in properly exposed screens. The observations of temperature and rainfall are carried back to 1848 by the addition of the observations made by Dr. Westall.

Modern Meteorology. A series of Six Lectures, delivered under the auspices of the Meteorological Society in 1878. Illustrated. London: Stanford. Cloth, 8vo., xii., 186 pages.

The first time that we have an idle five minutes at the British Museum we will try to find under what name the authorities have catalogued this book; no names appear on the title-page, or one might expect to find it catalogued under the first name, and although there is a preface there is no signature to it. Of course this is not a matter of any moment, but we really do not know where to put it on our own shelves; perhaps the best place would be among the Gr's, since it was solely through the President of the Meteorological Society (Mr. Greaves) that the lectures were delivered; but his name is not mentioned, and therefore no foreign catalogue, and certainly not that of the British Museum, would place it in the same position. We give it up, and will be guided by the British Museum authorities.

The editor of this magazine having given one of the lectures, it

would be contrary to our practice to insert any opinion upon the work, but we cannot commit any impropriety in stating the titles of the lectures and by whom they were given, or in expressing our opinion that the "get up" of the book is extremely good.

LECTURE.	LECTURER.
1. The Physical Properties of the Atmosphere-	R. J. Mann, M.D., V.P.M.S.
2. Air Temperature, its distribution and range	J. K. Laughton, MA, F.M.S.
3. The Barometer and its uses, wind and storms	R. Strachan, F.M.S.
4. Clouds and Weather Signs (<i>illustrated</i>)	Rev. W. Clement Ley, M.A., F.M.S.
5. Rain, Snow, Hail and Atmospheric Electricity (<i>illustrated</i>)	G. J. Symons, F.R.S., Sec.M.S.
6. The nature, methods, and general objects of Meteorology	R. H. Scott, M.A., F.R.S., For Sec. M.S.

In conclusion, we advise the perusal of this work simultaneously with that of "Seven Lectures on Meteorology," by Luke Howard, F.R.S., published in 1837. The titles of the lectures were :—

1. Constitution and properties of the atmosphere.
2. Constant and variable winds, climates and seasons.
3. Cycles of temperature; increase and decrease of the heat through the seasons; mean and extreme temperatures of the years, months and climate.
4. The Barometer, its principal, construction and variations; relation of these to the weather and seasons; evaporation and the hygrometer; rain and its proportion in different seasons.
5. The Clouds: their varieties or modifications of form and structure; the manner of their production, suspension and resolution into invisible vapour, or descent in rain, snow, and hail; thunderstorms and their effects; whirlwinds, water spouts.
6. Electricity of the atmosphere, and of clouds, especially of the rain cloud; sparks from showers; corpusants; manner of the formation of rain, hail, and snow; the avalanche; dew and hoar frost; the iris, corona, halo; the anthelion, parhelion, paraselene; the rainbow and meteorological glory.
7. Colour of the sky, cyanometer; night, twilight, daylight; shooting stars and fiery meteors; meteorolites, or stones falling through the air; ignis fatuus so called; aurora borealis; conclusion.

On the Meteorology of Bute, for the year ending 31st December, 1878.

By JAMES KAY. 8vo. Rothesay: 1879.

A COMPACT 8vo. pamphlet, giving the results of careful observations in well-arranged tables of rainfall, temperature, direction of wind, and also notes on meteorological and phenological phenomena. The station does not, however, seem to be fully equipped with instruments, as there are no barometrical or hygrometrical observations.

On the Horizontal Visual Penetrability of the Atmosphere, or the Extreme Limits of View along the Earth's Surface. By ALEXANDER CRUICKSHANK, M.A., Aberdeen (From the "Journal of the Scottish Meteorological Society".—Vol. V.

THE observations on which the above paper is based are of a novel and very interesting character: the observer selected six elevated points at distances of about 5, 10, 20, 30, 40, and 50 miles from his

station, and by means of these estimated the extreme limits of view in the middle of each day for 21 years.

The paper concludes with a summary of the principal facts deduced from the observations, a few of which are well worth reproduction.

"The mean daily distance seen is only 25 miles.

"The mean number of days in the year on which a distance of 50 miles can be seen is 90.

"The greatest mean daily distance seen, increases for each month from January to July, and then decreases again from July to January. This monthly increase and decrease in the greatest mean daily distance seen, corresponds respectively with the monthly decrease and increase in the humidity of the air.

"There is no regular relation between the monthly variation in the mean distance seen, and the mean monthly amount of cloud in the sky."

STRATUS AND CIRROSTRATUS.

To the Editor of the Meteorological Magazine.

SIR,—There is, and a very excellent thing it is, a greatly increased interest in the movements of the clouds in the upper regions of our atmosphere. To the Rev. Clement Ley the honour of this is chiefly due; indeed clouds seem to exist, for him, too much for the sake of the upper currents, to judge from his lecture in the recently-published "*Modern Meteorology*." In consequence, the fact that clouds of the same modification are not found always at the same precise level is a great stumbling block in searching records for movements of clouds in the higher regions, and for this Mr. Ley has a remedy. Cirrostratus being a cloud appearing over a wide range of altitude, is only to be called by its own name in the very highest region, so high that, from the description, "interlacing fibres of more or less cirriform cloud," true cirrus is probably meant.* Stratus having been "unfortunately" ground fog from the beginning is to rise in the sky, and to do duty for any clouds which "tend to arrange themselves in a horizontal bed or layer."

Mr. Ley is "not attempting to reform," but avers that the varying habitat of Cirrostratus has made "confusion worse confounded." One thing is certain, that there is no better way to introduce confusion into a science than to take names already of universal application and pin to them new and widely different meanings. What is really required, and which would more than double the value of their work, is for observers to use words indicating the height of the modification in their registers—three terms, high, mid-region, low, would be sufficient.

Tottenham.

W. DILLWORTH HOWARD.

* Cirrus. Parallel, flexuous, or diverging fibres, extensible by increase in any or in all directions. Howard's "*Essay on the Modifications of the Clouds*." Edition, 1865; fol. 3.

EXCESSIVE RAINFALL.

To the Editor of the Meteorological Magazine.

SIR,—I have seen several paragraphs in the papers speaking of the excessive rainfall this season, and as these statements do not correspond with my experience here, I send you my record of the rainfall for the past six months as compared with the average of the previous seven years, and also with the wet year, 1872.—Yours truly,

SAMUEL KING.

	1879.		1872.		Average.
January	1·53	...	5·99	...	4·19
February	2·92	...	3·54	...	2·38
March	1·36	...	4·39	...	2·49
April	1·49	...	2·42	...	1·67
May.....	2·19	...	1·45	...	2·02
* June	3·61	...	4·94	...	3·22
	13·10		22·73		15·97

* ·88 registered in June, really fell on the morning of July 1st.

During the previous seven years, 1874 is the only one in which less rain fell in the first six months than in the present year.

Elswick Lodge, Lancashire, July 2nd, 1879.

WITH reference to the above subject we have been favoured with many notes and tables, but, unfortunately, we have not room to insert them. We have, therefore, prepared the following abstract, whence (and from additional evidence) we are induced to believe that the excess has been greater in London than in the country generally. In the North-Western counties and in the lake district, there has been a great deficiency :—

	London.		Maidstone.		Banbury.		Bodmin.		Orleton.		North Shields.		Seathwaite.	
	Total	Diff.	Total	Diff.	Total.	Diff.	Total.	Diff.	Total.	Diff.	Total.	Diff.	Total.	Diff.
Jan....	2·87	+·92	2·40	+·36	2·37	+·28	6·55	+1·36	2·31	—·22	1·29	—·82	3·34	—13·02
Feb....	3·77	+2·55	2·97	+1·75	2·89	+1·46	6·27	+3·48	3·35	+1·78	3·05	+1·52	7·93	—3·45
March..	·91	—1·17	·57	—1·59	1·02	—1·18	1·28	—2·47	·81	—1·61	·80	—1·55	12·14	—1·26
April..	2·72	+1·59	2·85	+1·70	3·01	+1·85	3·49	+1·79	2·96	+1·42	2·35	+1·04	4·76	—2·14
May...	3·46	+1·06	2·95	+·71	2·91	+·69	2·05	—·41	2·88	·00	2·28	—·36	4·67	—4·87
June..	4·76	+1·71	2·77	+·05	4·66	+1·38	8·54	+4·50	6·03	+2·51	3·64	+·90	9·93	—·58
Total..	18·49	+6·66	14·51	+2·98	16·86	+4·48	28·18	+8·25	18·34	+3·88	13·41	+·73	42·77	—25·32
Diff. per cent. of mean		+56		+25		+35		+42		+26		+6		—37

THE WEATHER IN JUNE.

The weather during the first week of the month partook of the same character as the last week of the preceding month, being unsettled and showery, but it was milder than it had been for many months. Throughout the week pressure was highest over the South of France, and numerous depressions passed from W. to E. over the West of Europe. Their courses lay generally over these islands, and on some occasions were even so far south as the North of France. The wind therefore blew from all quarters, and the weather was rainy or fair according to the distance of the several disturbances from these islands.

There was but very little change during the second week from the continuously unsettled weather which had prevailed for so long before. The barometer was as a rule high over Central and Southern Europe, and depressions, sometimes large and at others small, but on every occasion shallow, passed from S.W. to N.E. across our islands. The winds consequently ranged between S.E., S. and S.W. or W. The weather, though occasionally bright, was for the most part dull, rainy and foggy. A good deal of thunder was reported during the former half of the week.

From the 15th to the 18th the weather remained in the same unsettled state. Depressions of comparatively little importance with regard to the force of winds which accompanied them, passed across the British Isles, occasioning variable breezes, cloudy skies, and rain. On the evening of the 18th, however, a considerable fall of the barometer occurred in the W., and a much deeper depression than those which had preceded it, advanced to Ireland, causing moderate to fresh gales from S., and rain at many places in the West of England and Scotland.

On the 20th the depression passed away to N. or N.N.E., and a recovery in pressure took place generally with S.W. breezes and fair weather, but on the next day a fresh and brisk fall began, and another disturbance was shown to the westward of Ireland. During this day moderate to fresh gales with rain and sharp squalls were experienced in many parts of the country.

The remainder of the month continued in the same unsettled condition. On the 22nd a rather deep and well-marked depression passed away eastward over the North Sea, and fresh N.W. to W. winds prevailed, with cloudy squally weather. On the 23rd a brisk fall of the bar. was taking place, and fresh S. winds prevailed in the W. with generally cloudy skies and rain, while on the 24th and the early part of the 25th the weather was governed by a large shallow depression, which passed slowly across Scotland and the North Sea to Norway. On the 26th another disturbance passed northward along our western coasts, causing fresh S. to S.W. winds, while on the 27th a much larger and more important depression approached us from the Atlantic, bringing strong gales to Ireland and fresh winds and unsettled weather to most other places. On the 28th this disturbance was passing off; pressure was recovering generally; the wind veered to W., and the weather improved somewhat.

The weather was moderately fine on the 29th, but there was evidence in the west of the approach of another cyclone. This appeared on the last day of June, and had its centre (29.1) over Ireland on the 1st of July.

The general conditions of this month may be summed up in three words—squally, showery, cloudy. A low temperature has prevailed throughout the month; as regards England, the lowest temperatures were in the S.W. and W. Rain has been reported every day during the month, never from less than eleven stations in Western Europe, and this on but one occasion (19th). On the 8th, 12th, 16th, 17th, 20th, 22nd, 23rd, and 26th the falls were heavy at many places in these islands.

HORACE E. MILLER.

SUPPLEMENTARY TABLE OF RAINFALL IN JUNE, 1879.

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

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
II.	Margate, Acol	2·67	XI.	Port Madoc	4·87
„	Littlehampton	5·23	„	Douglas	4·41
„	Horsham, Swallowfield. ...	4·33	XII.	Carsphairn ...	6·29
„	Hastings, Manor House	3·70	„	Melrose, Abbey Gate ...	4·89
„	Hailsham	4·15	XIV.	Lanark, Baronald	3·25
„	I. of W., St. Lawrence.	4·91	XV.	Islay, Gruinart School..	3·55
III.	Strathfield Turgiss	5·50	XVI.	St. Andrew's, Cambo...	3·70
„	Great Missenden	4·95	„	Aberfeldy H.R.S.	3·20
„	Winslow, Addington ...	4·63	XVII.	Tomintoul	3·89
„	Oxford, Magdalen Col... ..	4·31	„	Keith H.R.S.	3·89
„	Northampton	5·42	„	Forres H.R.S.	2·07
IV.	Cambridge, Merton Vil.	4·33	XVIII.	Strome Ferry H.R.S....	2·09
„	Harlow, Sheering	3·37	„	Lochbroom	2·57
„	Diss	4·53	„	Auchnasheen H.R.S. ...	2·28
„	Swaffham	3·23	„	Tain, Springfield	4·52
V.	Hindringham	4·95	„	Loch Shiel, Glenfinnan.	8·26
„	Salisbury, Alderbury	5·20	XIX.	Dalwhinnie H.R.S.	2·45
„	Calne, Compton Bassett ..	7·27	„	Lairg H.R.S.	1·60
„	Beaminster Vicarage ...	15·89	„	Altnabreac H.R.S.	8·82
„	Dartmoor Prison	6·77	XX.	Watten H.R.S. ....	...
„	Langtree Wick	6·47	„	Fermoy, Glenville	6·76
„	Lynmouth, Glenthorne.	8·34	„	Tralee, Godfrey Place...	5·81
„	St. Austell, Cosgarne ...	5·50	„	Cahir, Tubrid	4·11
„	Taunton	5·20	„	Tipperary, Henry St....	3·49
VI.	Bristol, Ashleydown ...	6·25	„	Newcastle West	4·87
„	Wem, Sansaw Hall.	5·25	„	Kilrush	5·44
„	Cheadle, The Heath Ho.	4·19	XXI.	Corofin	5·55
„	Bickenhill Vicarage ...	4·09	„	Kilkenny, Butler House	4·62
VII.	Melton Mowbray	3·91	„	Ballymore, Eustace ...	6·25
„	Horncastle, Bucknall ...	3·58	„	Kilsallaghan	6·98
VIII.	Walton-on-the-Hill	3·90	„	Navan, Balrath	4·74
„	Broughton-in-Furness ..	4·24	„	Athlone, Twyford	7·70
IX.	Wakefield, Stanley Vic.	3·60	„	Mullingar, Belvedere ...	6·79
„	Ripon, Mickley	4·28	XXII.	Ballinasloe	5·51
X.	Gainford	6·19	„	Clifden, Kylemore	5·04
„	Haltwhistle, Unthank..	8·53	„	Crossmolina, Enniscoe..	5·78
„	Shap, Copy Hill	6·84	„	Carrick-on-Shannon ...	6·32
XI.	Llanfrechfa Grange	5·04	„	Dowra	5·00
„	Llandovery	6·30	XXIII.	Rockcorry	3·46
„	Solva	8·89	„	Warrenpoint	5·61
„	Castle Malgwyn	6·79	„	Newtownards .....	...
„	Rhayader, Nantgwillt..	4·02	„	Larne, Carnlough .....	...
„	Carno, Tybrite .....	...	„	Bushmills .....	...
„	Corwen, Rhug .....	...	„	Buncrana, Rockfort ...	...

ERRATUM.—In the Supplementary Table for May, on p. 77, the fall at Carno should have been 2·35 in., not 2·07 in.

JUNE, 1879.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.						Days on which "01 or more fell.	TEMPERATURE.				No. of Nights below 32°	
		Total Fall.	Differ- ence from average 1860-5	Greatest Fall in 24 hours.		Max.	Min.		In shade.	On Grass.				
				Dpth	Date.									
											Deg.	Date.		Deg.	Date.
		inches	inches.	in.					Deg.	Date.	Deg.	Date.		
I.	Camden Square	4.76	+ 1.71	1.07	24	22	74.0	14	40.6	4	0	0	0	0
II.	Maidstone (Hunton Court)...	2.77	+ .05	.50	2	16	...	...	...	...	...	...	...	...
III.	Selborne (The Wakes).....	6.80	+ 3.57	1.37	30	25	68.0	2	42.0	5	0	0	0	0
IV.	Hitchen	5.22	+ 2.58	.68	13	25	67.0	14*	42.0	1	0	0	0	0
V.	Banbury	4.66	+ 1.38	.66	30	26	70.0	20	39.0	5	0	0	0	0
VI.	Bury St. Edmunds (Culford)...	4.06	+ 1.48	.88	5	22	78.0	8	37.0	4	0	0	0	0
VII.	Norwich (Sprowston).....	...	...	...	...	...	...	...	...	...	...	...	...	...
VIII.	Bridport	5.93	+ 2.69	1.12	30	19	...	...	...	...	...	...	...	...
IX.	Barnstaple	5.74	+ 1.62	1.05	30	23	71.0	12†	41.0	4	0	0	0	0
X.	Bodmin	8.54	+ 4.50	1.48	30	25	67.0	20	45.0	7	0	0	0	0
XI.	Cirencester	4.87	+ 1.49	.91	30	23	...	...	...	...	...	...	...	...
XII.	Shifnal (Haughton Hall)	5.21	+ 2.10	.99	11	25	69.0	14‡	37.0	2¶	0	0	0	0
XIII.	Tenbury (Orleton)	6.03	+ 2.51	.98	30	26	69.8	20	35.0	5	0	0	0	0
XIV.	Leicester (Town Museum)	4.34	...	.79	7	24	68.3	28	39.5	2.5	0	3	0	0
XV.	Boston	4.18	+ 1.99	1.09	11	20	74.0	10	39.0	5	0	0	0	0
XVI.	Grimsby (Killingholme)	3.44	...	.77	7	18	69.0	19	40.5	5	0	0	0	0
XVII.	Mansfield	4.77	...	.76	7	23	69.7	20	36.1	5	0	0	0	0
XVIII.	Manchester (Ardwick).....	4.66	+ 1.58	.70	8	24	75.0	14§	39.0	5	0	0	0	0
XIX.	York	3.31	+ 1.21	.70	7	18	...	...	...	...	...	...	...	...
XX.	Skipton (Arncliffe)	6.44	+ 2.34	1.30	30	21	...	...	...	...	...	...	...	...
XXI.	North Shields	3.64	+ .90	.82	7	18	66.0	15§	39.8	1	0	0	0	0
XXII.	Borrowdale (Seathwaite).....	9.93	— .58	1.81	27	23	...	...	...	...	...	...	...	...
XXIII.	Cardiff	6.48	...	1.64	30	23	69.0	13	41.4	4	0	0	0	0
XXIV.	Haverfordwest	7.39	+ 3.74	1.25	30	17	68.0	15	36.4	1	0	0	0	0
XXV.	Aberdovey.....	...	...	...	...	...	...	...	...	...	...	...	...	...
XXVI.	Llandudno.....	3.26	+ .97	.80	7	18	67.8	19	41.8	5	0	0	0	0
XXVII.	Cargen	5.65	+ 2.21	.99	7	19	69.6	11	40.2	1	0	0	0	0
XXVIII.	Hawick (Silverbut Hall).....	3.74	...	.66	21	22	...	...	...	...	...	...	...	...
XXIX.	Annanhill .....	...	...	...	...	...	...	...	...	...	...	...	...	...
XXX.	Kilmory.....	4.03	...	.91	19	19	...	...	34.0	1,2	0	0	0	0
XXXI.	Mull (Quinish)	2.84	...	.85	27	16	...	...	...	...	...	...	...	...
XXXII.	Loch Leven	5.00	+ 2.15	1.00	8	17	...	...	...	...	...	...	...	...
XXXIII.	Tyndrum (Ewick) .....	...	...	...	...	...	...	...	...	...	...	...	...	...
XXXIV.	Arbroath	4.27	+ 1.74	.79	7	20	71.0	29	38.0	1	0	0	0	0
XXXV.	Braemar	3.23	— .21	.46	10	20	67.0	15	36.3	2	0	3	0	0
XXXVI.	Aberdeen	2.55	...	.67	21	20	69.1	28	40.4	1	0	0	0	0
XXXVII.	Portree	2.10	— 2.68	.67	27	14	...	...	...	...	...	...	...	...
XXXVIII.	Inverness (Culloden)	3.55	+ 1.63	1.01	4	15	70.8	19	39.0	14	0	0	0	0
XXXIX.	Dunrobin	2.95	+ 1.38	.63	8	17	64.5	30	39.5	1,2	0	0	0	0
XL.	Sandwick	1.38	— .16	.70	3	8	65.5	21	41.4	1	0	0	0	0
XLI.	Cork	4.88	...	.70	9,16	19	...	...	...	...	...	...	...	...
XLII.	Caherciveen Darrynane Abbey	4.32	...	.70	30	24	...	...	...	...	...	...	...	...
XLIII.	Waterford .....	...	...	...	...	...	...	...	...	...	...	...	...	...
XLIV.	Killaloe	5.62	+ 1.99	1.34	16	22	75.0	25	34.0	2	...	...	...	...
XLV.	Portarlington	5.20	+ 1.95	1.07	16	25	67.5	15	37.5	4	0	0	0	0
XLVI.	Monkstown, Dublin .....	...	...	...	...	...	...	...	...	...	...	...	...	...
XLVII.	Galway	5.67	...	.69	15	24	66.0	19	37.0	2	0	0	0	0
XLVIII.	Waringstown	4.54	...	.61	10	22	75.0	15	35.0	1	0	1	0	0
XLIX.	Edenfel (Omagh)	4.81	...	.62	30	21	66.0	19	37.0	1	0	0	0	0
L.	Ballyshannon .....	...	...	...	...	...	...	...	...	...	...	...	...	...

* And 17. † And 13. ‡ And 17, 20. § And 28. ¶ And 20, 28. ¶ And 4, 5.
 + Shows that the fall was above the average ; — that it was below it.

METEOROLOGICAL NOTES ON JUNE.

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.—The greatest number of wet days in June within my record or recollection.

HITCHEN.—The wettest June for 30 years, and the coldest except June, 1860.

CULFORD.—This month has been distinguished by a remarkable absence of sunshine, excessive rainfall, and comparatively cold and ungenial weather; mean temp. 58°·1 Easterly winds prevailed during 7 days, T on 5 days.

BODMIN.—The heaviest rainfall ever recorded in June; mean temp. 60°·1.

CIRENCESTER.—A cold wet ungenial month, not one real summer's day during the whole time. Everything very backward.

SHIFNAL.—A very wet month, R daily with five exceptions, T on 4 days, wind as persistent from S.W. and S.E. as from N. and N.W. in May. Temp. very low, the max. never exceeding 69°, and the min. only once being as high as 55°. Farmers on strong soils could not get in their swedes or cut their hay till the close. No butterflies except a few white and orange-tip. Ash only bursting into leaf on 5th. Apples, of which there was a great show, all falling off.

ORLETON.—A very cold and rainy month, only 4 days without a measurable quantity of R, and the largest total (6·03 in.) for the month during 49 years, except June, 1860. Heavy TS on 3rd, 11th, and 24th, and distant T on 6th, 12th, 13th, and 29th. Floods frequent on the brooks and river Teme; mean temp. about 3°·5 below the average, and lower than that of any June for 20 years, except June, 1871. Up to the 1st of July this year, the max. temp. in shade has never reached 70°, a case without parallel during the last 54 years.

BOSTON.—Rainfall about double the average, and after the heavy fall of 1·09 in. on the 11th, water was standing for several days on land where it is seldom seen even in the wettest winter. The river Witham has been very full, and several hundred acres in the upper valley flooded. All vegetation at least a month behind, prospect for fruit and corn very bad, gooseberry and currants which promised an abundant crop, are being destroyed by caterpillars, and slugs are very numerous and destructive.

KILLINGHOLME.—Month cold, wet, and cloudy, crops in field and garden extremely backward, and presenting a deplorable appearance; and slugs, which it was hoped would have been killed by the long winter, have been more destructive than ever.

MANSFIELD.—Thunderstorms on 8th, 12th, 17th, and 29th; T on 9th.

MANCHESTER.—A remarkably wet month, but on the whole a growing one, the season being late.

NORTH SHIELDS.—Thunderstorms on 2nd, 9th, 10th, 21st, and 25th.

SEATHWAITE.—Beginning and end of month cold, middle of month milder.

WALES.

HAVERFORDWEST.—A very wet month, the rainfall being 4·65 in. above the average of 31 years, and the greatest amount recorded in June during that period, the nearest approach to it being June, 1860. when the fall was 6·70 in. Temp. below the average, though there were several fine bright days, the R falling mostly in the night. Weather very wet and wild from 26th to end of month. Corn crops look yellow and tall, turnips cannot be sown, and there is no prospect of cutting hay yet.

LLANDUDNO.—Rainfall much above, and mean temp. 1°·5 below, the average. With the exception of the first five days, which were remarkably fine, the month was changeable, dull, and showery, there being only 12 fair days in all. Mountain Ash in flower on 3rd; TS on 8th, T on 11th.

SCOTLAND.

CARGEN.—Dull, overcast weather, with a rainfall much above the average, sunshine much wanted. Mean temp. 56°, nearly 1° below average; TS on 8th and 21st, T on 9th, 11th, and 25th.

SILVERBUT HALL.—Though the month was rather cold, and there was little sunshine, the country never looked more beautiful, the May flowers being in great profusion, and the blossom on the fruit trees very abundant. T and H on the 1st, 9th, and 21st.

QUINISH.—From 1st to 6th cold and dry, from 9th to 19th warm and dry, dry N. and E. winds prevailing until near the end of the month, with occasional sudden shifts to S.W. with R.

BRAEMAR.—S on hills on 1st, TS on 10th and 14th, and T on 15th and 24th.

PORTREE.—A very hot and dry month, vegetation made rapid progress.

CULLODEN.—Low temp. and want of sunshine. White and pink May, Rhododendrons, and all forest trees late in flowering.

DUNROBIN.—Weather cold and showery. Vegetation late.

SANDWICK.—The rainfall was much below the mean of the previous 38 years, only '39 in. having fallen since the 3rd, the farmers are longing for R. Weather generally fine during the latter part of the month. There was a gale of 40 miles an hour from noon to 1 p.m. on the 19th, and another of 40 miles from 1 to 3 p.m. on the 27th.

IRELAND.

DARRYNANE ABBEY.—First half of the month fine, but not warm, second half wild and stormy, crops looking well but are very backward.

KILLALOE.—All crops fully a month late, no hay cut by the end of the month.

WARINGSTOWN.—Wet and generally cold; much difficulty in handling the green crops, but the grain fields are still looking well and only want sun now to be a more than average crop.

OMAGH.—With the exception of the first week, which was dry and cold, the weather of the month was wet and inclement beyond precedent. All vegetation is a month late, and although fairly luxuriant, there is no appearance of the heat or sunshine necessary to bring it to maturity.

POLLEN SHOWERS.

To the Editor of the Meteorological Magazine.

DEAR SIR,—The accompanying letters, clipped from the *Dublin Daily Express* of June 19th and 20th, may prove interesting to the readers of the *Meteorological Magazine*, if you can find space for them. Pollen showers would seem to have been of frequent and widespread occurrence last month.—Yours truly, J. W. MOORE, M.D.

40, Fitzwilliam Square West, Dublin, July 2nd, 1879.

[We gladly insert Dr. Moore's letter in order once more to explain the cause of the "Showers of Sulphur" which were reported from various localities during June, but we have not space for the newspaper extracts. A very full description of a "Shower of Sulphur," together with the usual reference to the distance from Etna, appeared in the *Dublin Daily Express*, to which journal some of the "sulphur" was also sent. The Editor placed it in the hands of Dr. Moore for examination, and even with a low power microscope it was immediately seen to be merely pollen grains from (probably) some member of the Pine family.—ED.]

MISCELLANEOUS FOREIGN NEWS.—The heat is so great at Madrid, that the Deputies are taking flight, and the Session will probably be closed as soon as the address is voted.—Snow fell last week on the Jura, a circumstance at this time of the year almost unprecedented.—In a thunderstorm in Appenzel, a few days ago, a farmer and ten of his cows, one of which he was milking, were killed by lightning.—Paris, July 8th.