

school at Parkersburg. The talk was illustrated with a series of maps showing the origin and movement of the recent severe storm that passed from one end of the country to the other, and caused such a decided fall in the temperature. It was a practical talk, and gave much information upon a subject of universal interest.

Mr. A. F. Sims, Forecast Official, gave a lecture on January 20 before the normal school at Cooperstown, N. Y., in continuation of his extensive system of lecturing at all points easily accessible from Albany.

Mr. Maurice Connell, Observer Weather Bureau at Red Bluff, Cal., gave a talk on physical geography and the weather to the pupils of the high school at that place on January 15. He pointed out the causes that affect the climate of California, and explained the Weather Bureau system of symbols and forecasts.

LONG DRY SPELLS.

In the November number of the report of the Colorado section Mr. F. H. Brandenburg publishes an excellent piece of work, viz, a list of all dry periods of twenty days or longer, arranged by seasons, based, of course, entirely upon the records of the Denver station from November, 1871, to December, 1899, inclusive. He counts as a dry spell one in which nothing more than 0.01 inch of rain falls. Thirty-five such spells, of from twenty to forty-six days' duration, are enumerated during the fall months, from August to December; twenty-one cases, of from twenty to fifty-eight days each, during the winter months, from November to February; ten cases, of from twenty to twenty-eight days each, during the spring months, from February to May, and, finally, five cases, of from twenty-four to fifty days each, during the summer months, from May to September.

Since the distribution of barometric pressure, which brings about dry weather, is generally widespread, therefore these dry spells often prevail simultaneously over extensive areas.

In order to show that these long dry spells follow a law of distribution that agrees with the laws of probability or chance, the Editor submits the following enumeration:

Length of spell.	Number of cases.						
Days.		Days.		Days.		Days.	
20	10	28	2	36	0	44	0
21	12	29	0	37	2	45	0
22	8	30	1	38	0	46	1
23	5	31	1	39	1	47	0
24	5	32	4	40	1	48	0
25	8	33	3	41	0	49	0
26	1	34	2	42	1	50	1
27	2	35	0	43	1	58	1
Total							71

We can not too strongly recommend all observers to compile similar tables, as illustrative of the peculiarities of the local climate. It would also be well to show, not merely these absolutely dry spells, but, also, those in which a very small quantity of water falls. For instance, if at a given station the water supply for the use of a city runs dangerously short when twenty days go by without more than 1 inch of rainfall, it would, therefore, be important to know the number and lengths of intervals having 1 inch of rain. In another case, if the river attains an undesirable height and interferes with business when there has been 10 inches of rain within five days, therefore a record of the inter-

vals within which 10 inches of rain have fallen becomes interesting.

LECTURES AT FARMERS' INSTITUTES.

Mr. E. W. McGann, Section Director, New Brunswick, N. J., writes to the Editor as follows:

I have about completed arrangements with the Secretary of the State Board of Agriculture for a series of addresses to be delivered during the next fall and winter at the Farmers' Institutes held in each county of the State. The themes will be about as follows: What the United States Weather Bureau and the State Service have done, and are doing for the farmers; the principal features of the weather in the vicinity of each Institute; dry and wet seasons; fluctuations in temperature and rainfall, etc. A set of instruments will be on exhibition and fully explained at each Institute, as the Chief has promised me that assistance. * * * I think such a plan will bring the Service closer home to the people, especially the farmers, as very few of them have any idea of the magnitude of the work performed by the National Bureau.

Mr. S. S. Bassler, Local Forecast Official at Cincinnati, Ohio, delivered a talk on Weather Bureau matters to the Farmers' Institute which assembled at Blue Ash, Ohio, on Saturday afternoon, January 6. His address was well received.

CLIMATOLOGY OF SAN DIEGO, CAL.

In the November and December numbers of the California Section Mr. A. G. McAdie, Forecast Official and Section Director, publishes an extensive article by Ford A. Carpenter, Weather Bureau Observer, on the climatology of San Diego. The tables are too elaborate and extensive to be republished in the MONTHLY WEATHER REVIEW, but would make an admirable basis for a monograph or bulletin. The discussion begins with the records for July, 1849, as kept by the United States Army post surgeons, including those kept by the United States Coast Survey and the United States Signal Service, and thus gives a continuous record for fifty years. Owing to the great importance of the question of droughts and the fact that so many persons in southern California have appealed to the Weather Bureau to encourage artificial rain making, the Editor has made the following computation, based upon Mr. Carpenter's table of monthly precipitation after completing the table for the whole of 1899:

Monthly rainfall.

Months.	Number of cases having—				Total monthly (inches).
	0.00-0.10 inches.	0.11-0.50 inches.	0.51-2.00 inches.	2.00 or more inches.	
January	5	3	25	17	1.75
February	3	8	23	16	1.87
March	5	10	28	7	1.88
April	8	21	17	4	0.64
May	21	30	7	2	0.33
June	42	7	1	0	0.07
July	44	4	2	0	0.05
August	40	8	2	0	0.11
September	45	3	2	0	0.08
October	23	16	9	2	0.33
November	9	12	19	10	0.95
December	0	10	24	16	1.97
Total	245	122	159	74	9.58

It appears from this table that the rainfall for November, December, January, February, and March generally comes in showers sufficient for vegetation. During April, May, and October the rains are light showers that may be helpful to vegetation. During June, July, August, and September the showers are too light and infrequent to maintain vegetable life. If plants flourish during these months it must be by virtue of the water stored up in the soil. The rainy season is considered to include the eight months from October to May, inclusive. The following four months constitute the dry season of the agricultural year. The success of the crops

depends essentially on the rainfall of the wet season combined with the power of the soil to store it away at considerable depths, but to bring it to the surface by capillary action when needed. The normal rainfall of each month is given in the preceding table from which we see that the sum for October, November, and December is 3.25 inches, and for January, February, March, April, and May 5.97 inches, making the total for the wet season 9.22 inches. For the dry season, June-September, the total is 0.31 inches. The actual rainfalls for the successive wet and dry seasons have been as follows, according to Mr. Carpenter's table:

Wet season.		Dry season.	
October to May.	Rainfall.	June to September.	Rainfall.
	<i>Inches.</i>		<i>Inches.</i>
1849-50	8.41	1850	0.88
1850-51	9.88	1851	0.02
1851-52	10.84	1852	0.40
1852-53	10.90	1853	0.26
1853-54	12.17	1854	1.53
1854-55	9.85	1855	0.04
1855-56	4.78	1856	0.07
1856-57	7.56	1857	0.06
1857-58	6.59	1858	0.33
1858-59	7.70	1859	0.02
1859-60	15.75	1860	0.19
1860-61	3.70	1861	1.78
1861-62	5.25	1862	0.59
1862-63	9.63	1863	0.36
1863-64	11.63	1864	0.12
1864-65	13.93	1865	1.90
1865-66	11.44	1866	0.10
1866-67	11.32	1867	0.30
1867-68	5.54	1868	0.56
1868-69	5.06	1869	0.05
1869-70	7.96	1870	0.11
1870-71	8.18	1871	0.00
1871-72	15.07	1872	0.18
1872-73	5.82	1873	1.95
1873-74	9.99	1874	0.23
1874-75	3.66	1875	0.62
1875-76	16.10	1876	0.17
1876-77	7.88	1877	0.00
1877-78	14.77	1878	0.16
1878-79	9.26	1879	0.07
1879-80	9.50	1880	0.47
1880-81	4.92	1881	0.10
1881-82	25.97	1882	0.08
1882-83	8.80	1883	0.08
1883-84	16.83	1884	0.8
1884-85	8.39	1885	0.19
1885-86	9.82	1886	0.07
1886-87	11.05	1887	0.05
1887-88	14.98	1888	0.09
1888-89	10.47	1889	0.14
1889-90	8.65	1890	0.65
1890-91	9.21	1891	0.13
1891-92	5.01	1892	0.18
1892-93	11.86	1893	0.00
1893-94	6.84	1894	0.06
1894-95	11.66	1895	0.01
1895-96	4.98	1896	0.14
1896-97	5.31	1897	0.01
1897-98		1898	0.09
1898-99		1899	0.34
Average	9.61	Average	0.30

This table shows that there is a fair prospect of having 15 or 16 inches of rainfall during the wet season four times in fifty years, or once every thirteen years, but that rainfalls above that are much less likely. On the other hand, rainfalls of 3 and 4 inches occur on the average once in every ten years, and rainfalls less than that are about as likely to occur as the great rainfalls above 17 inches. There is no evidence of any periodicity except a slight tendency for the large and small rainfalls, respectively, to occur in groups. Eight of the larger rainfalls have occurred in isolated seasons, and ten of them in groups of three and four each. The small rainfalls have also occurred in groups of about three years.

There is nothing to show how local or general were the rains recorded by the San Diego gage, therefore any deductions from its records may not be strictly applicable to the surrounding district. It would, however, seem that there is very little likelihood that the rainfall for the season 1899-1900 will be smaller than 4 inches, so that the three seasons just past will represent nothing worse than has happened twice before within fifty years, namely, between 1855 and 1860 and between 1869 and 1872. It is now very easy for the planter to estimate how many bad seasons he will have in fifty years and what proportion of capital must be devoted to the storage of water in order to make agriculture profitable on the average of any given number of consecutive years at San Diego.

WIND-ROSES FOR OKLAHOMA.

In the January report of the Oklahoma section Mr. C. M. Strong publishes an extremely interesting bit of climatological work, namely, a so-called wind-rose for the prediction of rainfall. The ordinary wind-rose gives the total number of times of occurrence or the total amount of any meteorological phenomenon, in connection with the wind prevailing at that moment, and shows, for instance, that the northwest wind is cold, or that rainfall occurs with a southeast wind. But Mr. Strong's table shows what will follow a given wind within twelve hours, and that, too, for each month of the year. Apparently it is compiled by counting the number of times that rain fell as recorded at either 8 a. m. or 8 p. m., and accrediting this rain to the wind recorded at the preceding observation. It is based on the nine years 1891-99, inclusive, and we copy it as follows:

TABLE 1.—Showing the number of times precipitation followed the respective winds within twelve hours.

Direction.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Average per cent.
North.....	22	21	14	13	8	5	5	5	9	13	13	17	15
Northeast.....	10	10	12	7	15	11	19	11	4	6	16	13	13
East.....	3	2	10	5	11	7	6	7	5	4	3	7	7
Southeast.....	20	17	23	35	38	34	28	22	13	21	22	9	29
South.....	20	12	19	27	30	29	20	21	14	19	15	24	26
Southwest.....	5	0	7	0	7	5	4	5	2	2	2	6	5
West.....	0	0	0	0	1	0	2	1	0	0	0	0	1
Northwest.....	3	3	2	8	2	3	3	4	2	1	2	3	4

TABLE 2.—Showing total number of times each wind direction was observed for each year from 1891 to 1899, inclusive.

Year.	N.	NE.	E.	SE.	S.	SW.	W.	NW.	Calm.
1891.....	126	75	37	208	154	47	12	50	21
1892.....	128	73	39	195	148	53	18	59	19
1893.....	116	68	24	180	158	82	18	67	17
1894.....	119	75	21	131	197	102	22	47	16.
1895.....	152	57	16	138	199	81	18	65	9
1896.....	127	68	19	162	210	75	15	50	6
1897.....	126	69	32	110	231	83	20	57	2
1898.....	134	55	58	93	243	48	28	68	3
1899.....	128	66	68	80	270	46	17	52	3
Average per cent.....	18	9	5	20	28	9	2	8	1

This important table shows that there have been eighteen wet seasons in which rain has been abundant and five seasons in which the rainfall has been less than 5 inches, and therefore decidedly insufficient. The smallest amounts were 3.66 inches for the season of 1876-77, and 3.76 inches for that of 1862-63. The number of times that any given rainfall occurred is as follows:

Wet season.		Dry season.	
Rainfall.	No. of cases.	Rainfall.	No. of cases.
3.00-4.99.....	5	0.00-0.49.....	41
5.00-6.99.....	9	0.50-0.99.....	5
7.00-8.99.....	9	1.00-1.50.....	1
9.00-10.99.....	11	1.50-2.00.....	3
11.00-12.99.....	7		
13.00-14.99.....	3		
15.00-16.99.....	4		
17.00, etc.....	1		
Total.....	49	Total.....	50