*Meteorological record of voluntary observers, etc.*—Continued.

| Stations. | Temperature. Maximum. | Minimum. | Mean | Rainfall. |
|---|---|---|---|---|
| *Massachusetts—Con.* | ° | ° | ° | *Inches* |
| Princeton | 79 | 35 | 53.8 | 3.80 |
| Somerset * | 92 | 36 | 59.3 | 4.19 |
| Taunton | 89 | 32 | 56.8 | 4.26 |
| Westborough * | 86 | 32 | 59.0 | 3.01 |
| Williamstown | 77 | 34 | 56.7 | 4.77 |
| *Michigan.* | | | | |
| Birmingham | 87 | 32 | ..... | 2.97 |
| Brady, Fort | 80 | 29 | ..... | 1.92 |
| Harrisville * | 85 | 28 | ..... | 1.20 |
| Hudson | 87 | 33 | ..... | 4.03 |
| Kalamazoo | 81 | 37 | ..... | 3.64 |
| Lansing | 82 | 33 | 57.8 | 3.00 |
| Mottville * | 83 | 34 | ..... | 1.12 |
| Pontwater | 81 | 22 | 51.7 | 0.77 |
| Thornville | 84 | 36 | 58.4 | 3.45 |
| Traverse City * | 85 | 31 | ..... | 2.49 |
| *Minnesota.* | | | | |
| Minneapolis | 83 | 42 | 59.8 | 0.99 |
| Preston * | 86 | 41 | ..... | ..... |
| Snelling, Fort | 85 | 31 | 60.7 | 1.06 |
| *Missouri.* | | | | |
| Carthage | 98 | 45 | 73.6 | 1.12 |
| Central College * | 93 | 43 | 68.0 | 3.12 |
| Centreville | 101 | 33 | ..... | 2.89 |
| Conception * | 87 | 43 | 68.7 | 4.73 |
| Pierce City | 93 | 43 | 70.2 | 2.20 |
| Springfield * | 87 | 40 | 68.4 | 9.30 |
| Warrenton * | 88 | 48 | 66.7 | ..... |
| *Montana.* | | | | |
| Assinaboine, Fort | 91 | 11 | 60.3 | 0.54 |
| Ellis, Fort | 94 | 22 | 55.3 | 1.45 |
| Keogh, Fort | 101 | 24 | 64.6 | 5.82 |
| Missoula, Fort | 85 | 33 | 56.5 | 0.51 |
| Shaw, Fort | 92 | 23 | 58.0 | 0.63 |
| *Nebraska.* | | | | |
| Brownville | ..... | ..... | 66.1 | ..... |
| Crete | 91 | 39 | 65.3 | 3.39 |
| De Soto * | 95 | 36 | 65.1 | 2.16 |
| Fairbury | 94 | ..... | ..... | 4.66 |
| Fremont * | 93 | 41 | 64.6 | 3.41 |
| Genoa | 92 | 40 | 64.2 | 4.85 |
| Hay Springs * | 93 | 25 | 59.3 | 1.80 |
| Marquette | 90 | ..... | ..... | 6.27 |
| Niobrara, Fort | 101 | 34 | 64.9 | 1.14 |
| Sidney, Fort | 95 | 30 | 61.9 | 1.52 |
| Stockham | 96 | ..... | ..... | 4.30 |
| *Nevada.* | | | | |
| Carson City | 88 | 28 | 59.6 | 0.26 |
| Halleck, Fort | 87 | 20 | 57.2 | 0.29 |
| McDermit, Fort | 87 | 30 | 57.3 | 0.19 |
| *New Hampshire.* | | | | |
| Antrim | ..... | ..... | ..... | 3.60 |
| Ashland | ..... | ..... | ..... | 3.76 |
| Belmont | ..... | ..... | ..... | 2.81 |
| Berlin Mills | 79 | 37 | ..... | 1.65 |
| Bristol | ..... | ..... | ..... | 3.52 |
| Lake Village | ..... | ..... | ..... | 2.94 |
| Nashua | 85 | 29 | 56.1 | 2.70 |
| Wier's Bridge | ..... | ..... | ..... | 2.72 |
| Wolfborough | ..... | ..... | ..... | 3.18 |
| Woodstock | ..... | ..... | ..... | 3.48 |
| *New Jersey.* | | | | |
| Beverly * | 83 | 46 | 58.0 | 8.08 |
| Clayton * | 84 | 43 | 60.4 | 4.44 |
| Dover * | 84 | 36 | 57.3 | 6.07 |
| Egg Harbor City | 85 | 40 | 59.8 | 15.07 |
| Moorestown | 84 | 46 | 58.5 | 6.80 |
| Paterson * | 87 | 39 | 60.0 | 5.94 |
| Phillipsburg | ..... | ..... | ..... | 6.24 |
| Princeton | 82 | 41 | 59.3 | 5.58 |
| Readington * | 84 | 48 | 62.1 | ..... |
| Roseland | ..... | ..... | ..... | 6.01 |
| Upper Montclair | 81 | 40 | 58.2 | 6.20 |
| Vineland | 84 | 42 | 62.4 | 4.85 |
| *New Mexico.* | | | | |
| Bayard, Fort | 94 | 40 | 69.9 | ..... |
| Gallinas Spring | 91 | 45 | ..... | 0.31 |
| Puerto de Luna | 96 | 52 | 68.7 | ..... |
| Selden, Fort | 104 | 42 | 77.1 | 0.00 |
| Union, Fort | 89 | 23 | 62.7 | 0 13 |
| *New York.* | | | | |
| Auburn | 77 | 35 | 55.7 | 2.92 |
| Columbus, Fort | 80 | 45 | 58.4 | 5.08 |
| Cooperstown * | 75 | 40 | 54.0 | 2.50 |
| David's Island | 84 | 42 | 59.0 | 4.15 |
| Factoryville * | 82 | 34 | 56.2 | 1.42 |
| Humphrey * | 80 | 34 | 53.7 | 3.35 |
| Ithaca | 79 | 36 | 56.8 | 1.79 |
| LeRoy | 76 | 36 | 54.9 | 3.62 |
| Madison Barracks | 73 | 32 | 54.9 | 2.16 |
| Menand Station | 80 | 47 | 59.4 | 3.53 |
| Mountainville | 84 | 33 | 57.6 | 4.21 |
| Niagara, Fort | 78 | 35 | 53.7 | 1.14 |
| North Volney * | 79 | 42 | 54.1 | ..... |
| Palermo * | 80 | 38 | 52.6 | 1.07 |
| Palmyra * | 81 | 44 | ..... | ..... |
| Penn Yan | ..... | ..... | ..... | 1.67 |
| Plattsburg B'ks | 73 | 40 | 55.2 | 1.48 |
| Setauket | 80 | 43 | 57.0 | 3.13 |
| Syracuse | 80 | 42 | ..... | ..... |
| West Point | 85 | 39 | 59.6 | 4.16 |
| White Plains | 82 | 49 | 59.8 | 4.52 |

| Stations. | Temperature. Maximum. | Minimum. | Mean. | Rainfall. |
|---|---|---|---|---|
| *North Carolina.* | ° | ° | ° | *Inches* |
| Chapel Hill | 93 | 46 | 67.8 | 4.00 |
| Flat Rock | 87 | 40 | 62.1 | 9.47 |
| Lenoir | 85 | 42 | ..... | 6.20 |
| Lincolnton | 80 | 45 | 65.0 | 11.96 |
| Raleigh | 93 | 47 | 68.0 | 1.70 |
| Reidsville * | 90 | 34 | 63.0 | 6.57 |
| Statesville * | 91 | 49 | 66.6 | 8.91 |
| Wake Forest * | 91 | 45 | 68.0 | 3.87 |
| Weldon * | 88 | 48 | 63.9 | 2.11 |
| *Ohio.* | | | | |
| Cleveland | 80 | 36 | 58.1 | 1.97 |
| Elyria | 83 | 41 | ..... | 1.63 |
| College Hill * | 96 | 43 | 68.1 | 8.25 |
| Fostoria * | 90 | 44 | 61.4 | 3.07 |
| Garrettsville | 85 | 28 | 55.9 | 2.22 |
| Hiram | 82 | 32 | 58.5 | 2.58 |
| Jacksonborough * | 90 | 38 | 63.3 | 6.40 |
| Napoleon | 85 | 37 | 62.4 | 3.78 |
| North Lewisburg | 86 | 40 | 65.0 | 7.55 |
| Ruggles * | 80 | 40 | 57.6 | 3.15 |
| Tiffin * | 88 | 40 | 60.4 | 2.96 |
| Wauseon | 89 | 32 | 60.4 | 2.69 |
| Westerville | 84 | 38 | 61.4 | 4.75 |
| Yellow Springs | 86 | 40 | 63.1 | 6.27 |
| West Milton | 92 | 39 | 66.0 | 6.60 |
| *Oregon.* | | | | |
| Albany * | 84 | 40 | 58.8 | 1.79 |
| Bandon * | 63 | 32 | ..... | 1.00 |
| East Portland * | 88 | 36 | ..... | 1.08 |
| Eola * | 79 | 42 | 56.0 | 1.56 |
| Klamath, Fort | 83 | 11 | 51.5 | 0.90 |
| Pendleton * | 92 | 41 | ..... | 1.05 |
| *Pennsylvania.* | | | | |
| Bethlehem * | 86 | 47 | 61.3 | 5.59 |
| Blooming Grove * | 84 | 40 | 57.5 | 5.10 |
| Catawissa * | 84 | 42 | 63.2 | 7.19 |
| Drifton | 85 | 36 | 56.0 | 8.00 |
| Dyberry | 81 | 33 | 54.4 | 4.41 |
| Easton | ..... | ..... | ..... | 7.14 |
| Franklin * | 80 | 32 | 52.8 | 1.03 |
| Germantown * | 78 | 44 | ..... | 5.36 |
| Grampian Hills * | 84 | 40 | 61.5 | 3.87 |
| Philipsburg * | 79 | 35 | 56.6 | ..... |
| Quakertown * | 77 | 40 | 56.0 | 6.66 |
| Wellsborough * | 84 | 40 | 62.8 | 1.51 |
| West Chester | 82 | 39 | 59.1 | 7.00 |
| Wysox | 81 | 38 | 59.8 | 2.57 |
| Zionsville | 84 | 42 | ..... | 5.01 |
| *South Carolina.* | | | | |
| Kirkwood * | 88 | 52 | 69.9 | 5.66 |
| Pacolet | ..... | ..... | ..... | 13.23 |
| Spartanburg | 90 | 45 | 67.8 | 13.60 |
| Stateburg * | 94 | 49 | 71.5 | 3.13 |
| *Tennessee.* | | | | |
| Ashwood | 86 | 44 | 65.0 | 3.48 |
| Austin | 91 | 44 | 70.0 | 2.54 |
| Milan | 90 | 42 | 69.0 | 3.41 |
| Paris * | 90 | 54 | 72.0 | ..... |
| *Texas.* | | | | |
| Austin * | 98 | 60 | 80.0 | trace. |
| Cleburne | 94 | 52 | 64.0 | 0.00 |
| Comfort | ..... | ..... | ..... | 1.46 |
| Concho, Fort | 107 | 50 | 81.1 | 1.52 |
| Corsicana | ..... | ..... | ..... | 0.00 |
| McIntosh, Fort | 103 | 56 | 83.6 | 0.95 |
| Midland | 101 | 52 | 77.5 | 0.10 |
| Ringgold, Fort | 107 | 66 | 85.2 | 0.94 |
| New Ulm | 97 | 54 | 70.1 | 0.05 |
| Silver Falls | 100 | 44 | ..... | 0.01 |
| *Vermont.* | | | | |
| Brattleborough | 85 | 32 | 59.3 | 3.71 |
| Burlington | 77 | 40 | 58.0 | 2.61 |
| Charlotte * | 77 | 44 | 55.5 | 3.50 |
| Lunenburg | 76 | 39 | 52.3 | 2.37 |
| Newport * | 73 | 40 | 55.4 | 4.57 |
| Poultney | 83 | 34 | 55.5 | 2.87 |
| Post Mills Village * | 77 | 33 | 54.2 | ..... |
| Stowe | ..... | 32 | ..... | ..... |
| Strafford * | 78 | 40 | 55.7 | 2.90 |
| *Virginia.* | | | | |
| Accotink | 84 | 47 | 63.1 | 8.72 |
| Bird's Nest * | 87 | 51 | 66.8 | 7.70 |
| Dale Enterprise * | 88 | 43 | 67.3 | 12.66 |
| Monroe, Fort | 85 | 45 | 65.2 | 4.23 |
| Summit | 86 | 38 | 61.7 | ..... |
| Snowville * | 84 | 39 | ..... | 4.30 |
| University of Va | 85 | 41 | 62.7 | 9.66 |
| Variety Mills | 86 | 39 | 63.3 | 8.22 |
| Wytheville | 84 | 36 | 62.7 | 5.19 |
| *Washington Territory.* | | | | |
| Bainbridge Island * | 82 | 40 | 56.7 | 1.76 |
| Tacoma * | 74 | 39 | 57.3 | 1.84 |
| Townsend, Fort | 74 | 35 | 55.5 | 0.76 |
| Walla Walla, Fort | 90 | 31 | 64.2 | 0.48 |
| *West Virginia.* | | | | |
| Clarksburg | 84 | 35 | 65.7 | 4.54 |
| Helvetia * | 84 | 32 | 58.4 | 7.08 |
| Parkersburg | 86 | 39 | 62.7 | 5.29 |
| *Wisconsin.* | | | | |
| Embarras * | 88 | 36 | 60.5 | 2.05 |
| Evansville | 87 | 31 | 54.0 | ..... |
| Franklin | ..... | ..... | ..... | 1.68 |

*Meteorological record of voluntary observers, etc.*—Continued.

| Stations. | Temperature. Maximum. | Minimum. | Mean. | Rainfall. |
|---|---|---|---|---|
| *Wisconsin—Cont'd.* | ° | ° | ° | *Inches* |
| Fond du Lac * | 89 | 28 | 55.8 | 1.09 |
| Madison | 83 | 37 | 59.3 | 2.02 |
| Manitowoc | 86 | 31 | 55.6 | 1.39 |
| Neillsville * | 86 | 18 | 49.6 | 1.70 |
| Prairie-du-Chien | 85 | 41 | 62.3 | 2.86 |

| Stations. | Temperature. Maximum. | Minimum. | Mean. | Rainfall. |
|---|---|---|---|---|
| *Wyoming.* | ° | ° | ° | *Inches* |
| Bridger, Fort | 81 | 15 | 55.3 | 2.00 |
| Fred Steele, Fort | 94 | 17 | 58.7 | trace. |
| Washakie, Fort | 88 | 19 | 59.2 | 1.00 |
| Laramie, Fort | 94 | 34 | 63.6 | 0.14 |

## NOTES AND EXTRACTS.

**The following is an extract from the May, 1886, report of the "Alabama Weather Service," under direction of Prof. P. H. Mell, jr., of the Agricultural and Mechanical College, Auburn:**

The mean temperature of the state was 3°.2 below the normal.

Rains and thunder showers were frequent throughout the month, in some instances accompanied with brisk winds. There has been much complaint among farmers in some sections of the state on account of the rapid growth of grass in their crops, caused by the general fall of rain from the 15th to the end of the month. The average rainfall for the whole month was, however, 1.40 inches below the normal.

Some stations report that the fruit is falling from the trees, due to the cool weather in April and also to the attacks of insects.

*Summary.*

Mean temperature, 71°.4; highest temperature, 95°, at Selma, on the 28th; lowest temperature, 38°, at Gadsden, on the 2d; range of temperature, 57°; greatest monthly range of temperature, 52°, at Gadsden; least monthly range of temperature, 34°, at Greensborough; mean daily range, 17°; greatest daily range of temperature, 37°, at Gadsden, on the 3d; least daily range of temperature, 0°, at Union Springs, on the 26th.

Mean depth of rainfall, 3.50 inches; mean daily rainfall, 0.113; greatest depth of monthly rainfall, 7.97 inches at Roanoke; least depth of monthly rainfall, 1.01 inches, at Union Springs; greatest daily rainfall, average for state 1.12 inches, on the 18th; greatest daily local rainfall, 4.05 inches at Roanoke, on the 18th.

Average number of days on which rain fell, 6; average number of cloudy days, 5; average number of fair days, 11; average number of clear days, 15.

Warmest days, 13th, 14th, 28th, and 29th; coldest days, 1st and 2d.

Prevailing direction of wind, southwest.

Chattanooga reports that the greatest velocity of wind was 28 miles per hour from the northwest, Mobile 28 miles from the southeast, and Montgomery 28 miles from the west.

**The following meteorological summary for May, 1886, has been forwarded by Hon. J. T. Henderson, of Atlanta, Commissioner of Agriculture for Georgia:**

| Districts. | Temperature. Highest. | Lowest. | Mean. | Precipitation. |
|---|---|---|---|---|
| | ° | ° | ° | *Inches.* |
| Northern Georgia | 93.0 | 36.0 | 67.7 | 7.85 |
| Middle Georgia | 95.0 | 40.0 | 69.5 | 4.84 |
| Southwestern Georgia | 95.0 | 41.0 | 74.5 | 4.06 |
| Eastern Georgia | 92.0 | 47.0 | 71.6 | 4.35 |
| Southeastern Georgia | 99.0 | 56.0 | 75.1 | 3.15 |
| State | 99.0 | 36.0 | 71.7 | 4.85 |

The heavy rains in many localities have caused serious damage to corn and cotton, necessitating, in many instances, entire replanting of crops on bottom lands.

The crops are from ten to twenty days behind the usual stage of growth at this date.

**The following meteorological summary and accompanying remarks are from the May, 1886, report of the "Indiana Weather Service," under direction of Prof. W. H. Ragan, of De Pauw University, Greencastle:**

| Districts. | Temperature. Highest. | Lowest. | Monthly means. | Average precipitation. | Spring of 1866. Mean temperature. | Average precipitation. |
|---|---|---|---|---|---|---|
| | ° | ° | ° | *Inches.* | ° | *Inches.* |
| Northern counties | 88.0 | 34.0 | 64.0 | 4.98 | 51.7 | 9.62 |
| Central counties | 89.0 | 34.0 | 63.2 | 4.28 | 51.8 | 9.75 |
| Southern counties | 92.0 | 38.0 | 66.9 | 4.06 | 55.2 | 9.62 |
| State | 92.0 | 34.0 | 64.7 | 4.44 | 52.9 | 9.66 |

*Weather.*—At eight stations, averaged, 9 days were clear, 15 fair, 7 cloudy, and 0.01 or more rain fell on 10. Severe local storms and tornadoes occurred generally on the 10th, 11th, 12th, 13th, 14th and 23d. The severest occurred on the 12th, when several lives and hundreds of thousands of dollars worth of property were destroyed, principally in Attica, Tipton, Wilkinson, Lafayette, and Evansville. A hail-storm of extraordinary severity visited portions of Hendricks county on the 23d, doing much damage.

*Temperature.*—The temperature for the month and spring was above normal 2°.9 and — at Logansport; 2°.4 and 2°.7 at Spiceland; 0°.3 and 0°.7 at Indianapolis; 2°.5 and 2°.9 at Connersville; 1°.6 and 0°.3 at Mauzy; 2°.1 and 3°.2 at Sunman; 2°.0 and 3°.3 at Worthington; 1°.8 and 1°.1 at Vevay; and 2°.4 and 1°.5 at Blue Lick; and for the state it was higher, 5°.0 and 4°.6 than in 1883; 3°.2 and 2°.1 than in 1884; 4°.9 and 5°.6 than in 1885; and 3°.7 and 2°.8 than the four year normals. The range for the state during May was 58°, from 92° at Huntingburgh, to 34° at La Grange and Lafayette; the greatest station range, 54° at Lafayette; least, 36° at Terre Haute and Salem; average, 44°.6; average of highest temperatures, 86°.4; of lowest, 41°.8. The mean at La Grange was 7°.7 lower than at Degonia. The mean for the centre was 0°.8 lower than for the north, and 3°.7 lower than for the south. The warmest days were the 12th, 13th, 21st, 22d, 23d, and 30th; coldest, 1st, 2d, 16th, 17th, and 26th. At La Grange the temperature was below 50° on eight days, and above 80° on two; at Indianapolis twelve and ten, respectively; at Degonia two and ten, respectively.

*Precipitation (inches).*—The precipitation was unevenly distributed through the month and over the state, ranging from an aggregate of 24.75 (at twenty-two stations) on the 12th, to none on the 17th, 18th, 19th, 21st, 28th; and from 7.22 at Butlerville to 1.78 at Degonia Springs. There were some remarkable variations in the fall at adjacent stations. The days of greatest fall were the 10th (aggregate 10.46), 11th (12.37), 12th (24.75), 13th (11.21), 15th (10.46). Delphi reports 2.27 in sixty-five minutes on the 12th, in two showers. For the month and spring the fall was 0.77, and — above normal at Logansport; 0.27 and 2.36 below at Spiceland; 0.58 and 1.95 below at Indianapolis; 0.54 above and 2.25 below at Vevay; and for the state the average was 0.02 and 1.19 lower than in 1883; 0.08 higher and 0.12 lower than in 1884; 0.66 and 0.81 higher than in 1885; and 0.18 higher and 0.08 lower than the four year normals. Thunder-storms occurred in all sections on the 9th, 10th, 12th, 13th, 14th, 15th, 23d; centre and south on the 1st, 11th, 30th; centre 4th, south 6th. Hail is reported on the 1st, 6th, 10th, 11th, 12th, 13th, 23d; solar halos, 3d, 4th, 8th, 16th, 17th, 25th, 26th, 30th; lunar, 10th, 13th, 16th, 17th; frosts, 1st, 2d, 4th, 16th, 17th, 26th; auroras, 8th, 25th; rainbows, 15th, 23d.

## The following summary and remarks are from the May, 1886, report of the "Indiana Weather Service," under direction of Prof. H. A. Huston, of Purdue University, Lafayette:

| Districts. | Temperature. | | | Average precipitation. |
|---|---|---|---|---|
| | Highest. | Lowest. | Monthly means. | |
| | ° | ° | ° | *Inches.* |
| Northern counties | 92.0 | 34.0 | 62.5 | 5.44 |
| Central counties | 89.0 | 34.0 | 63.6 | 4.07 |
| Southern counties | 92.0 | 41.0 | 66.4 | 3.89 |
| State | 92.0 | 34.0 | 64.2 | 4.47 |

The mean temperature of the state for May, 1886, was 2°.5 above the mean of May for the past four years; 0°.2 above the mean of fifteen years at Indianapolis; 0°.4 above the mean of thirty years at Logansport; 1°.2 below the mean of twenty-one years at Vevay; 2.°6 above the mean of thirty-two years at Spiceland; 3°.8 above the mean of six years at Mauzy; 0.3 below the mean of nine years at Blue Lick; 1°.5 below the mean of four years at Worthington; 2°.9 above the mean of four years at Connersville; 1°.5 above the mean of seven years at Lafayette, and varied less than 0°.5 from the normal. The mean temperature at the various stations varied from 1° to 3° above the average.

The mean rainfall for the state was 0.21 inches above the mean of the past four years; 0.17 above the mean of fifteen years at Indianapolis; 0.64 above the mean of thirty years at Logansport; 0.60 above the mean of twenty-one years at Vevay; 0.88 above the mean of twenty-seven years at Spiceland; 0.14 below the mean of six years at Mauzy; 0.27 above the mean of twenty-seven years at Blue Lick; 0.14 below the mean of four years at Worthington; 0.16 above the mean of four years at Connersville, and 0.90 below the mean of seven years at Lafayette. The rainfall was very unequally distributed over the state and throughout the month. The heavy rainfall from the 9th to the 15th caused many rivers and streams to overflow their banks, and did considerable damage to crops and bridges. The heavy hail and wind storm of the 23d did considerable damage to wheat in western-central counties.

Frosts are reported quite generally on the 16th, 17th, and 26th; no damage.

Solar halos are reported on the 4th, 7th, 8th, 17th, 24th, 25th, and 30th; lunar halos, on the 9th, 14th, 16th, 17th, and 18th; aurora, on the 8th and 25th.

Thunder-storms have been unusually frequent and severe. The heaviest occurred from the 9th to the 15th, and in many places were accompanied by hail and very heavy rainfall.

At about six o'clock on the evening of the 12th, a tornado formed north of Williamsport, and about two miles southwest of Attica and moved northeast across the Wabash bottom land and river, raising the water of the river to an estimated height of two hundred feet, destroying the heavy wooden carriage bridge, and demolishing all buildings in its path. The motion about the tornado centre was against the hands of a watch, and observers agree that the centre advanced about thirty-five miles per hour. Several walls of brick falling outward gave evidence of a greatly reduced pressure on the outside. The path of the tornado on entering the city was about four hundred feet wide, and on leaving, about seventy-five feet wide. The distance travelled in the city was about one-half mile. The losses were estimated at $200,000. A tornado cloud was seen near Thorntown on the same evening, but no damage reported.

## The following is an extract from the "Kansas Weather Observer," published by John H. Wolfe, of Wellington:

Reports for May were received from eleven observers.

Mean temperature for the month over the area of the state as a whole was 69°.1, which is a general average of 3°.5 above the normal. The warmest periods during the month occurred between the 9th and 14th, 20th and 23d, 26th and 31st, reaching the highest temperatures on the 22d, 26th, and 29th. The coldest days were the 1st and 15th.

The precipitation was the heaviest over the area located east of a line drawn from where the Republican River crosses the northern boundary of the state to Baxter Springs. The month's rainfall over this area was from four to six inches. Over the area west of this line the rainfall averaged less than one inch.

## The following is an extract from the May, 1886, report of the "Minnesota Weather Service," under direction of Prof. Wm. W. Payne, Carleton College, Northfield:

The average temperature of Minnesota for May, as reduced from reports received from the stations of the Minnesota Weather Service is 58°.9. This is 11°.4 warmer than the preceding month of April. The warmest station was La Crosse, where the average for the month was 62°.6. The highest temperature reported was at Spring Valley, 88°.0, on the 24th. The lowest was Saint Vincent, where the temperature fell 10° below the freezing point on the morning of the 15th. At the following stations the minimum temperature was below 30°, viz.: Grand Forks, 25°.0; Moorhead, 26°.7; Wadena, 24°, all on the 15th, and Park Rapids, 23°.4 on 16th. Maximum temperatures at all stations were above 80°.0, and occurred during the last decade of the month. Cool weather, with occasional light showers, was the principal feature of the weather in all districts during the first half of the month, culminating in a sharp and general frost in all parts of the state on the 15th and 16th, which cut down all early vegetables and did much injury to fruit trees which were in bloom. Strawberries in the southeastern part of the state were in many cases seriously injured. After the 16th the weather became much warmer and continued so until the end of the month. An interesting and unusual fact was that the highest temperatures at all stations from the 16th to 31st were at 70°.0 or above.

The precipitation has been noticeably below the normal amount for May at all stations in the state. The largest amount was at Wadena, where 3.85 inches were measured, but three other stations recorded more than 2 inches, viz., Spring Valley, 2.38; Moorhead, 2.51, and Park Rapids, 2.09 inches. Five stations reported less than one inch, La Crosse, 0.89; Saint Paul, 0.82; Bird Island, 0.31; Morris, 0.66, and Grand Forks only 0.20 inch. The greater amount of the precipitation for the month occurred in the form of light showers from the 1st to 15th, after which there was almost absolutely no rain at any place in the state until the 30th and 31st, when heavy showers fell along the line of the Northern Pacific Railway from Wadena to Moorhead. Snow, in amounts too small to measure, was noted at Spring Valley and Saint Vincent. The high temperatures and absence of rain during the last half of the month has been decidedly unfavorable to the growing crops which have made rather slow growth, and in many sections were suffering decided injury from lack of moisture, with prospects that late sown grain would be a partial failure unless general and heavy rains come at an early date.

## The following is an extract from the May, 1886, report of the "Missouri Weather Service," under direction of Prof. Francis E. Nipher, Washington University, Saint Louis:

The mean temperature for May, 1886, has been 3°.1 above the normal temperature. The minimum and maximum reached during the month was 48° on the 2d and 88° on the 23d, neither being an uncommon temperature for May.

The month has been remarkable for its great rainfall, it being 3.21 inches in excess of the normal, 4.72. Nearly one-half, 3.53 inches, fell during two hours on the night of the 14th during a violent storm, which lasted about thirty minutes. Another heavy rainfall of 2.12 inches, accompanied by heavy thunder and lightning, occurred on the 7th. The total fall during each decade was, respectively, 2.87, 3.61, and 1.45 inches, the latter falling all in one day, viz., on the 23d.

In the state the highest mean temperature was 74°.3 at Protem, 72° at Greenfield, 69°.1 at Sedalia, and 68.1 at Oregon and Chamois. The lowest mean reported was 62°.6 at Ironton and 63°.9 at Mound City. The highest temperatures reported are, 100 at Protem, Taney county, 98° at Greenfield, and 92° at Laflin and Mexico; lowest temperatures, 34° at Ironton, 39° at Springfield; the highest minimum reported was 50° at Pleasant Hill.

## The following is an extract from the May, 1886, report of

## the "Nebraska Weather Service," under direction of Prof. Goodwin D. Swezey, of Doane College, Crete, Nebraska:

The opening of the season of 1886 has been peculiar. The prophecy of "a late season, because Easter came late," seemed likely to be verified, but the month of May, following upon an March and April of unprecedented snowfall, has been the warmest May since 1881, and has seemed like the coming of summer upon the heels of winter without an intervening spring.

The latest frost of the season came with an area of high barometer that overspread the country, passing eastward on the 15th and 16th. The frost was light, doing no particular damage. It was reported from the western part of the state (Hay Springs, Stockham, and Beaver Creek,) on the morning of the 15th, and from the eastern (Fairbury, Weeping Water, and DeSoto,) on the 16th, on which date frost also occurred in Wisconsin and Michigan.

The month has been, on the average, five degrees warmer than the normal temperature for May. Rainfall has been about normal.

CONVENTION.

At the convention of this service held in Lincoln two years ago it was decided to hold a meeting annually; various obstacles prevented the holding of such a convention last year. It is proposed that such a meeting be held this season and there seems to be no time so favorable as in connection with the coming State Service Assembly at Crete, on Tuesday afternoon and Wednesday forenoon, July 6th and 7th. Railroads give reduced rates to the assembly. Many will wish to attend some of the meetings on the assembly grounds, especially, perhaps, on Monday.

Accordingly all observers of this service, and all others interested in the meteorology of this state are invited to meet at Boswell Observatory at 3 o'clock, July 6th. The objects of the convention will be—

1. Better acquaintance and fellowship.
2. Mutual information as to the use of instruments and best methods of observing.
3. Discussion of projects for the better advancement of our work.

Persons expecting to attend are asked to send word before, and to the director.

## The following is an extract from the May, 1886, "Bulletin of the New England Meteorological Society," under direction of Prof. Winslow Upton, Providence, Rhode Island:

Reports for the month were received from one hundred and forty-seven observers.

*General conditions.*—The month was an average May in nearly every respect. Both temperature and rainfall were nearly normal, and there were no violent winds nor severe frosts. A goodly number of thunder-storms were reported. The only unusual feature noted was the low barometric pressure, the monthly average falling below the usual value by nearly one-tenth of an inch. This was due chiefly to the continued low pressure which prevailed during the closing decade of the month. The general history of the month can best be traced by following the course of the barometric pressure.

*Pressure.*—The month began with a low pressure; from the 1st to the 3d it rose slowly to its normal value, with fair, cool weather. The minimum temperature of the month, with light frosts, were usually reported during this interval. On the 5th and 6th a depression (29.7 inches) moved from the lakes down the Saint Lawrence Valley, attended by general rain. The pressure rose on the 7th, with cooler, fair weather, but again fell as a second depression (29.5 inches) moved up the Atlantic ocean on the 8th, causing heavy general rains. The greatest wind velocities were usually reported on the 8th or 9th. From the 10th to the 15th continued cloudy weather, with occasional showers and generally easterly winds, prevailed, the pressure being below the normal, and a depression remaining during the whole period in the western states, with slight changes in position. On the 15th this depression increased in depth (29.5 inches) and moved down the Saint Lawrence Valley as a well-defined cyclone (this term being the general frame for storms characterized by a barometric depression with inblowing winds and improperly applied to those violent local disturbances known as tornadoes). Light general rains again occurred. The barometer rose on the 18th to 30.3 inches, attended by cool, fair weather. Light frosts were again numerously reported, but did scarcely any damage except at a few northern towns. On the 20th and 22d, two more cyclones passed north of the district, attended by light rains. For the rest of the month the pressure remained below its normal value. A depression (29.6 inches) existed south of New England on the 25th, possibly passing northerly across the district on that date, and moving thereafter northeasterly. On the 28th the pressure was lowest in Maine (29.7 inches). On the 29th another well-defined cyclonic depression moved down the Saint Lawrence Valley, and on the 30th, the eighth depression of the month moved easterly in the middle Atlantic states south of this district. Partly cloudy weather with frequent showers occurred in this interval, which was ended by a rise of pressure to 30.0 inches on the 31st.

The rainfall attending the general pressure movements above noted, was marked by the usual characteristics of the summer season—frequent showers rather than heavy rains, with considerable thunder and lightning. The relation of the thunder-storms to the pressure movements is one of the most interesting features of the month, and can be readily seen by comparing the above dates with those in the following paragraph:

*Thunder-storms.*—These were numerously reported on the 5th, 20th, 22d, 30th, and 31st. On the 5th several storms were developed; of these, one prevailed principally in northeastern Massachusetts, at about 3 o'clock, and a second in Connecticut, Rhode Island, and southeastern Massachusetts, at about 5 o'clock. At Essex, Massachusetts, the first of these was unusually severe, very large hail and a violent wind doing considerable damage. The storm of the 20th was reported from all parts of the district; rain began in the northwestern corner of Vermont at 8 a. m., and reached Rhode Island at 7 p. m. In southern New Hampshire and northern Massachusetts no rain fell, but rain again occurred until the storm was dissipated in northern Connecticut and Rhode Island. The rainfall was everywhere light, amounting to 0.5 inch as a maximum in the hilly region of western Massachusetts. On the 22d there were several very severe local showers, and one moved from the Connecticut River easterly in Massachusetts, from 8 to 10 p. m. This storm was most severe near Ludlow. On the 30th there was a succession of showers over the whole district at various hours in the afternoon. Damage from hail is reported from Rutland, Vermont, and from lightning at Deerfield and Groton. On the 31st, in the early morning, a thunder-storm moved easterly in Connecticut, Rhode Island, and southeastern Massachusetts. Besides the above, thunder and lightning were reported in the general storm of the 8th, and at a very few stations on the 4th, 10th, 11th, 12th, 13th, 19th, 21st, 23d, 24th, 26th, 27th, 28th.

*Advance of the season.*—The season continues forward and the promise of full crops remarkably good.

*Auroras.*—A brilliant aurora was generally observed on the 8–9th, in spite of moonlight. Other dates are: Eastport, 1st, 12th, 17th, 21st, 26th; Kent's Hill, 5th, 21st; Mount Washington, 21st; Cambridge, 1st, 11 p. m., (suspected); Newburyport, 21st, 25th, 28th (suspected), 31st (suspected); Parker's Ridge, 10th; Saint John, 17th, 8.12 p. m.

## The following summary is made from reports furnished in advance of the regular monthly report, by Prof. B. F. Thomas, of the Ohio State University, Columbus, director of the "Ohio Meteorological Bureau:"

*State summary.*

*Temperature.*—Mean, 62°.7; highest, 90°.0, at Ohio State University, Columbus, on the 22d; lowest, 32°.0, at Hiram, on the 17th; greatest monthly range, 56°.3, at Wauseon; least monthly range, 41°.4, at Cincinnati; greatest daily range, 44°.5, at Newcomerstown, on the 14th; least daily range, 4°.0, at Hiram, on the 9th.

*Precipitation.*—Average monthly precipitation, 4.37 inches; greatest monthly rainfall, 7.55 inches, at North Lewisburg; least, 1.99, at Oberlin. Average number of days on which rain fell, 11.7; clear days, 10.0; fair days, 13.1; cloudy days, 7.9.

Prevailing direction of the wind, west.

## The following is an extract from the "Tennessee State Board of Health Bulletin," for May, 1886, prepared under the direction of J. D. Plunkett, M. D., President of the State Board of Health. The weather report is prepared by Major H. C. Bate, in charge of the State Meteorological Service:

The mean temperature for May was 67°.04, 2°.51 above the mean for May, 1885, and only a fraction above that for May of the year previous. The highest temperature, 91°, recorded on the 13th, was 3° below the maximum of May, 1885, and 1° above that of May, 1884. The lowest temperature, 36°, recorded about the 1st and 3d, was, respectively, 3° above and 3° below the minimums of the corresponding periods of 1885 and 1884. The monthly range of temperature 55°, 6° less than in 1885, and 4° more than in 1884.

The mean precipitation was 4.42 inches, a fraction over the means for May of the two preceding years. Of this amount the eastern division received about five and a half inches, the middle division received about three and a half inches, and the western division received nearly four and three-quarter inches. The greatest rainfall occurred on the 6th, and was generally heavy throughout the state, the average being eight-tenths of an inch. It was heaviest in the eastern and western divisions, and continued through the 7th day. The greatest local daily rainfall, 6.80 inches, was reported on the 28th at Greenville, and was the greatest reported since the organization of the State Weather Service. Other heavy local rains were reported, at Savannah, 3.40 inches, on the 6th; at Covington, 3.00 inches, on the 7th; at Bolivar, 2.50 inches, on the 19th; and at Waynesborough, 2.00 inches, on the 20th. From the 8th to the 14th, inclusive, there was almost an entire absence of rain throughout the state, but from the 18th to the 31st, except two or three days, rain fell daily. The least monthly rainfall was reported from Nashville, being only 2.08 inches. There were nine days during the month on which no rain was reported, viz., 3d, 4th, 10th, 11th, 12th, 13th, 16th, 17th, and 26th. Many of the rains during the month were local in their character. Some of them were accompanied with severe electric storms.

There were a few frosts during the month, and were reported as follows: Nashville, Hohenwald, and Bolivar, on the 1st; Ashwood, 2d; Farmingdale, 3d and 16th; Andersonville, 15th and 16th; Waynesborough, 16th and 17th; Cookville, 17th. These were reported very light and did no damage.

*State summary.*

Mean temperature, 67°.04; highest temperature, 91°, on the 13th, at Chattanooga, Austin, and Nashville; lowest temperature, 36°, on the 1st, at Hohenwald, and on the 3d, at Farmingdale; range of temperature, 55°; mean monthly range of temperature, 44°.47; greatest monthly range of temperature, 54°, at Hohenwald; least monthly range of temperature, 34°, at Covington; mean daily range of temperature, 16°.97; greatest daily range of temperature, 39°,

on the 3d, at Farmingdale, and on the 31st, at Fostoria; least daily range of temperature, 2°, on the 1st, at Cookville, on the 20th, at Greeneville, and on the 24th, at Manchester; mean of maximum temperatures, 88°.13; mean of minimum temperatures, 43°.07.

Mean depth of rainfall, 4.42 inches; mean daily rainfall, 0.142 inch; greatest rainfall, 7.80 inches, at Greeneville; least rainfall, 2.08 inches, at Nashville; greatest local daily rainfall, 6.80, inches, on the 28th, at Greeneville; days of greatest rainfall, 6th, 7th, 15th, 19th, 24th: day of greatest rainfall, 6th.

Average number of days on which rain fell, 10; average number of clear days, 10.9; average number of fair days, 12.8; average number of cloudy days, 7.3; days without rainfall, 3d, 4th, 10th, 11th, 12th, 13th, 16th, 17th, 26th.

Warmest day, 13th; coldest days, 1st, 3d.

Prevailing wind, southwest.

## The following additional data in reference to the flood in the Cumberland River during the first half of April, 1886, is furnished by the Signal Service observer at Nashville, Tennessee:

In this report it is proposed to show, as accurately as possible, the amount of damage which would have been caused from overflow if no warnings had been given, also the actual loss experienced with the aid only of special river stations on the upper Cumberland.

The Chief Signal Officer announced in a special bulletin dated March 26, 1886, that "severe local storms will occur in the Ohio Valley and Tennessee during the next succeeding twenty-four hours." Heavy rains occurred in East Tennessee and on the upper Cumberland during the last six days of March.

The river at Nashville rose rapidly thereafter until April 1st, at 2 p. m., when it became stationary. It was then thought that the river would fall. Heavy rains occurred again on the upper Cumberland, and from that time until April 10th, the rise varied from one-tenth to one and one-half inches per hour. Prompt and timely warning was given to the lumber, steamboat, and other interests in this city and at Clarksville, Tennessee, forty miles below Nashville.

The water reached the danger-line at 6 a. m., April 6.

Following the issue of a few special river bulletins, the entire population seemed to place entire confidence in the system of river reports, and great demand was made for them.

The losses to the business interests were comparatively light owing to the timely warnings sent out by the observer. Those families who resided on low ground sustained heavy losses. Though warned in time, many neglected to remove their household effects to higher ground.

On the west side of the river there were four separate areas under water. The first area extended from Madison street through North Front and College streets northward to the city park; thence northwestward beyond the city limits for a distance of three and a half miles, overflowing the country west of the river for one and a half miles. The second overflown area on the west side of the river embraced that territory near the centre of the city, from Lick Branch culvert southwestward along Jefferson to Warren street; thence southward beyond the Nashville, Chattanooga, and Saint Louis railroad trestle-work, describing a circle to Pearl street; from Pearl street the backwaters extended through to McLemore street, cutting off travel by street railway (the water was three and three-fourths feet deep here); from McLemore street the water found its way to Crawford street, running parallel with this street to Cherry street; then, in a northeasterly direction, back to the river. By actual count there were six hundred and forty-eight houses submerged in this district, causing much hardship and distress among the colored population. The water was twenty-two feet deep at different places within this region.

The third overflown area on the west side of the stream took in a portion of the city wharf through Market, Cherry and College streets in a southwesterly direction to Sumner street, down Sumner on the east side to Cherry street; thence through Franklin and Mausker streets eastward back to the river. There are many business houses in this district. The damage to the business interests here was trifling ($1,750). Household goods were much damaged in this area.

The fourth area overflown on the west side of the river included a line drawn from the City Water Works around to South Sycamore street eastward to Gordon street; thence southeastward over the Lebanon Turnpike, back again and northeastward for a distance of two miles beyond the city limits. In this territory there were only a few houses under water. Six brick yards and three lumber mills are located upon these lowlands. The brick companies lost their entire stock of bricks.

The overflown regions east of the river (on the Edgefield side) were in three districts. The first territory extended within the line drawn from the river parallel with the Louisville and Nashville railroad track, curving northward toward Oldham street over to Spring street; thence northwestward to Cowan avenue, and from Cowan avenue northeastward beyond the corporation. The Indiana Lumber Company's plant is situated within this overflown area. Their damage was very slight. Many houses were submerged in this region, the losses being severely felt.

Area number two, on the east side of the river was, virtually, a continuation of area number one, except that the Louisville and Nashville Railroad bed intervened. A swift current ran through First street under the railroad trestle. The water ran parallel with the railroad track until Spring street was reached, inundating the most of Lonely street, passing over Foster street, then through Bienville street, southwestward to Lake street, across Factory street diagonally through (southwestward) the square bounded by Sycamore, Main, Cottonwood and Fourth streets to South Fourth street; from here it extended to and over South First street, through the northern portion of the Edgefield and Nashville Manufacturing Company's Lumber Yard. The chief damage in this region was mostly confined to dwellings. Within this area, Wm. Sutherland and Company, with their usual forethought, wisely erected a large and elevated dyke before their plant, which was five and one-half feet below the water. They saved their entire stock.

Area number three on the east side of the river reached from Bridge avenue to North Second street; it ran parallel with North Second street to Fatherland street, thence eastward over the Shelby bottom lands, beyond the corporation. This region contained but few houses which were inundated. Prewitt, Spurr & Co.'s lumber yard and planing mill was entirely surrounded by water. Their works were securely protected by booms. Much of their lumber, however, was upset by the rising water. A gauge reading of 49.3 feet was reached at 7 a. m. of the 10th; the rise was scarcely appreciable at 8.30 a. m.; the water remained stationary until 4.35 of the 11th, when it began receding slowly. On the 15th the river was again within its banks. The injury to farming lands in the upper counties was considerable. The damage would have been twice as great had not timely warning been given. In many cases the wheat crop became a total loss. Much fencing was destroyed.

The following practical illustration may tend to show the great usefulness to which the Cumberland River service has attained in this community; the total expense incurred during the floods at the special river stations from March 31st to April 15th, was:

| | |
|---|---|
| Burnside, Kentucky: | |
| Services of special observer | $7 00 |
| Expense of telegraphing | 3 00 |
| Carthage, Tennessee: | |
| Services of special observer | 10 00 |
| Expense of telegraphing | 7 80 |
| Total cost | 27 80 |

This total cost of the special river service is an insignificant sum in comparison to the money value of property saved here and at Clarksburg, forty miles below.

The following table shows the amount of damage, expressed in money value, which occurred in and around Nashville during the floods of March 31 to April 15, 1886, estimated with great care and accuracy:

| Name. | Business. | Actual loss. | Estimated loss if warnings had not been given. |
|---|---|---|---|
| Prewitt, Spurr and Company | Lumber, hard woods, buckets, &c. | $550 | $10,000 |
| Edfield and Nashville Manufacturing Company. | Doors, veneering, and fancy wood work. | 200 | 700 |
| William Sutherland and Company | Lumber and planing mill | | 4,000 |
| Nashville Cooperage Company | Barrels and buckets | 350 | 900 |
| B. S. Rhea and Son, grain elevator | Corn, oats, and wheat | | 500 |
| Indiana Lumber Company | Straight lumber | 350 | 800 |
| Leibmann, Lovemann and O'Brien | Lumber, doors, sash, and blinds | | 400 |
| Steamboat interests | | | 1,100 |
| Nashville Lumber Company | Lumber and hard woods | | 600 |
| City water-works | | 200 | 3,000 |
| Nashville Blood Horse Association | Stables, &c | 300 | 2,000 |
| Cooper and Company | Lime, plaster, cement, &c | 250 | 5,000 |
| B. G. Wood | Boilers and smithing | 25 | 200 |
| Brick yards | | 5,000 | 9,000 |
| Miscellaneous household goods, street-car obstruction, &c. | | 35,000 | 90,000 |
| Total | | 42,225 | 128,200 |

The two years' experience with the river system has already fully demonstrated that it is practicable for the prediction of rises to within one and two feet at this point. The greatest difficulty to be overcome is the uncertainty in regard to the time which it takes the waves to reach Nashville from the headwaters. This rate of progress varies with different stages of the water. If the water is at a low stage at Carthage and Nashville the waves travel slower from Burnside downward; should the water be moderately high, say fifteen to twenty feet, at Nashville and Carthage, the rate of flow is faster.