

at Fort Macon to 33° at Kittyhawk; Eastern Gulf States, 14° at Key West to 27° at Montgomery; Western Gulf States, 19° at Galveston to 33° at Little Rock; Ohio valley and Tennessee, 26° at Indianapolis to 37° at Morgantown and Pittsburg; Lower Lake region, 32° at Oswego to 39° at Toledo; Upper Lake region, 26° at Milwaukee and Chicago to 36° at Alpena and Port Huron; Upper Mississippi valley, 25° at Champaign and 28° at St. Paul to 38° at Keokuk; Missouri valley, 27° at Omaha to 40° at Ft. Buford; Red River of the North Valley, 35° at Moorehead to 37° at St. Vincent; Texas, 31° at Laredo to 55° at Stockton and 62° at El Paso; Eastern Rocky Mountain Slope, 34° at Ft. Gibson to 42° at Deadwood; Rocky Mountain, 25° on summit of Pike's Peak to 30° at Ft. Missoula and 41° at Cheyenne; Southern Plateau, 35° at Yuma to 49° at Prescott; Middle Plateau, 25° at Salt Lake City to 39° at Winnemucca; Southern Pacific coast region, 15° at San Francisco and 19° at Sacramento to 49° at Campo; Middle Pacific coast region, 15° at San Francisco to 33° at Red Bluff; North Pacific coast region, 23° at Lewiston and Olympia to 26° at Roseburg.

**F.** *Frost*—was reported on nearly every day throughout the month from stations north of the 36th parallel and east of the 114th meridian. Beyond these boundaries to the south and west it occurred in the various states on the following dates: North Carolina, 2nd to 8th, 11th, 13th to 18th, 20th to 24th; South Carolina, 12th to 15th; Georgia, 3rd to 5th, 13th to 15th, 22nd, 23rd; Florida, north of the 28th parallel, 3rd, 4th, 5th, 13th, 14th, 15th; Alabama, 3rd, 14th, 15th, 16th, 22nd; Mississippi, 3rd, 12th to 15th, 20th, 21st, 22nd, 28th; Louisiana, 2nd, 13th, 14th, 15th, 21st, 22nd; Arkansas, 2nd, 3rd, 13th, 14th, 15th, 20th, 21st; Texas, 1st to 3rd, 5th to 8th, 10th to 16th, 18th to 23rd; southern New Mexico, 1st, 4th, 6th, 11th, 12th, 13th, 15th, 16th, 18th to 23rd; southern Arizona, 1st to 3rd, 5th, 6th, 7th, 10th, 12th to 28th; California, (southern portion,) 6th, 7th, 10th to 15th, 19th, 20th, 21st, 24th, 25th, (northern portion,) 9th, 10th, 11th, 18th; Oregon, 6th, 7th, 8th, 12th, 13th, 14th, 16th, 17th, 18th; Washington Territory, along coast, 14th, 17th, 18th.

*Ice*—in the northern sections of the country is more properly exhibited elsewhere in the REVIEW under the head of "*Ice in Rivers and Harbors.*" Along the southern boundary of the country ice was reported from the following stations: Campo, Cal., 10th, 11th; Eagle Pass, Tex., 12th, 13th; Melissa, Tex., 11th, 12th; Indianola, 13th; Fayette, Miss., 13th, 14th, 15th; Mobile, 14th; Montgomery, 13th.

## PRECIPITATION.

The general distribution of rain fall (including melted snow) for February, 1881, is shown on Chart No. III, from the reports of over 500 stations. From the table in the left-hand corner of the chart is obtained a monthly average for each of the various districts, determined from the records (covering a period of several years) of Signal Service stations, and also a comparison of the present month with such averages. The regions of greatest rain-fall are to be found along the Pacific coast north of parallel 40°, in northern Texas, northern Illinois, in the Western Gulf States and western North Carolina. The region of no precipitation, covering a territory of about 200 miles square, embraces a portion of southeastern California and southwestern Arizona. As compared with the mean of past years the rain-fall for the month is in general considerably above the average. The most marked departures occurred in the Middle and Northern Pacific Coast regions, Lower Missouri valley, Upper Lake region, Middle Atlantic States and in the central portion of the Western Gulf States. Departures of excess at particular stations were most marked in these districts. In southern Florida, southern Dakota and along the California coast south of parallel 40°, individual deficiencies were quite prominent. The rain-fall of the Rocky Mountain and Plateau districts, nearly always comparatively low, was quite evenly distributed, except in a narrow region extending northward from Salt Lake City.

In connection herewith the following notes from voluntary observers may be of interest. Riley, Ill., monthly rain-fall 4.05 inches above the average of February for the past 18 years and 1.77 inches greater than the largest amount ever recorded in February during the past 20 years. Lawrence, Kan., monthly rain-fall 2.37 inches above the mean of the past 14 years and much the largest of any February in that period. Gardiner, Me., monthly rain-fall 2.55 inches above the mean of the past 45 years; smallest in that period, 1.11 inches in 1844, largest 9.47 inches in 1853. The Missouri State Weather Service, Prof. F. E. Nipher, reports that the rain-fall has been quite uniform over the State, being on the average about four inches. This amount has been exceeded at the St. Louis station five times since 1839. North Volney, N. Y., monthly rain-fall 0.69 inches above the mean of the past eight years.

*Special Heavy Rains.*—1st, Galveston, 3.62 inches. 1st and 2nd, Albany, Or., 4.96; Portland, Or., 4.11; Neah Bay, Wash. Ty., 4.93; Ft. Stevens, Or., 3.30; Olympia, 3.74. 2nd and 3rd, Mt. St. Helena, Cal., 4.37; Ft. Gaston, 6.41. 3rd and 4th, Yosemite valley, Cal., 3.31. 4th, Eagle Rock, Mont., 1.98. 5th, Melissa, Tex., 5.00. 5th and 6th, Pilot Point, Tex., 2.51; Clarksville, Tex., 2.50; Logan, Ga., 4.00; Fayette, Miss., 3.00; Ft. Leavenworth, Kan., 3.10. 6th, Ft. Barancas, Fla., 6.93. 6th and 7th, Mt. Ida, Ark., 3.20; Independence, Kan., 3.90. 7th, Mobile,

3.72. 7th and 8th, Ellsworth, N. C., 8.50; Montgomery, 3.11; Franklin, N. C., 6.00; Highlands, N. C., 6.30. 8th and 9th, Forsyth, Ga., 3.80; St. Meinrad, Ind., 2.80; Atlanta, Ga., 4.81; McPherson Barracks, Ga., 4.03. 9th and 10th, New Corydon, Ind., 4.04; Wellsboro, Pa., 4.12. 10th, Williamstown, Mass., 2.80. 10th and 11th, Murphy, N. C., 4.00; Melissa, Tex., 3.00. 11th, Ellsworth, N. C., 2.00; Atlanta, 2.92; Auburn, Ala., 3.06; Franklin, N. C., 2.50; Highlands, N. C., 2.90; McPherson Barracks, Ga., 2.40. 12th, Auburn, N. H., 2.25; Paterson, N. J., 3.20 in 6 hours. 17th and 18th, Pilot Point, Tex., 2.80; Mt. Ida, Ark., 3.50; Melissa, Tex., 10.00. 18th, Nashville, 2.57; Little Rock, 2.83. 18th and 19th, Quitman, Ga., 3.00; New London, 2.65; Newport, 2.70. 20th and 21st, Clarksville, Tex., 2.75. 21st and 22nd, Neah Bay, Wash. Ty., 4.69. 23rd and 24th, Neah Bay, Wash. Ty., 3.64. 26th and 27th, Mobile, 2.62. 27th and 28th, Mammoth Cave, Ky., 4.70; Albany, Or., 3.73; Portland, Or., 3.34. 28th, Auburn, N. H., 2.50; Wellsboro, Pa., 4.45.

*Largest Monthly Rain-falls.*—Neah Bay, Wash. Ty., 21.01 inches; Melissa, Tex., 18.11; Olympia, Wash. Ty., 16.28; Ft. Stevens, Or., 15.00; Ellsworth, N. C., 14.75; Albany, Or., 13.08; Portland, Or., 13.36; Ft. Gaston, Cal., 13.46; Eort Canby, Wash. Ty., 13.38; Highlands, N. C., 12.95; Alta, Cal., 11.80; Franklin, N. C., 10.90; Atlanta, Ga., 10.41; Ft. Barrancas, Fla., 10.16; Wellsboro, Pa., 9.97; Cisco, Cal., 9.61; Colfax, Cal., 9.30; Pensacola, Fla., 8.99; Fayette, Miss., 8.50; New Uly, Tex., 8.33; Galveston, 8.29; Newport, 8.28; Auburn, Cal., 8.20; Roseburg, 8.19; New Corydon, Ind., 8.03; Mobile, 8.00.

*Smallest Monthly Rain-falls.*—Wickenburg, Yuma, Texas Hill, Maricopa, Pantano and Benson, Ariz., Mojave, Boca and Mammoth Tank, Cal., and Toano, Nev., none; La Mesilla, N. M., trace; Sorroco, N. M., 0.01 inch; Florence, Ariz., 0.03; Deer Lodge, Mont., 0.05; Newhall, Cal., 0.06; Prescott, Ariz., 0.10; Stockton, Tex., 0.13; Davis, Tex., 0.14; Hot Springs, Nev., 0.15; Ravenna, Cal., 0.18; McKavitt, Tex., 0.19; Phoenix, Ariz., 0.20; Wadsworth, Nev., Cheyenne and Santa Fe, 0.22; El Paso, 0.24; Ft. Wingate, N. M., 0.25; Anaheim, Cal., 0.28; Pioche, 0.29; Wells, Nev., Rock Creek, Mont., and Laredo, Tex., 0.31; Golconda, Nev., and Ft. Snelling, Minn., 0.32; Ft. Grant, Ariz., 0.33; San Fernando, Cal., and Eagle Pass, Tex., 0.34; Key West, 0.35; Ft. Keogh, Los Angeles, and Portland, Or., 0.36; Brackettsville, Tex., 0.39; Elko, Nev., 0.41; Ft. Wallace, Kan., and San Diego, 0.45; Ft. Garland, Col., 0.46; Browns, Cal., 0.47; Ft. Shaw, Mont., 0.49; Ft. Custer and Concho, 0.51; Punta Bassa, 0.52; Campo, Cal., 0.53; Lemoore, Cal., 0.54; Ft. Hartsuff, Neb., 0.66.

*Rainy Days.*—The number of days on which rain or snow has fallen varies as follows: New England, 9 to 18; Middle Atlantic States, 10 to 15; South Atlantic States, 7 to 12; Eastern Gulf States, 5 to 12; Western Gulf States, 10 to 12; Ohio valley and Tennessee, 12 to 20; Lower Lake region, 15 to 22; Upper Lake region, 11 to 20; Upper Mississippi valley, 10 to 18; Missouri valley, 11 to 16; Valley of the Red River of the North, 12 to 19; Texas, 1 to 9; Rocky Mountains, 2 to 10; Middle Plateau, 3 to 16; Southern Plateau, 0 to 5; California, 3 to 14; Oregon, 6 to 14; Washington Territory, 7 to 19.

*Cloudy Days.*—The number varied in New England from 2 to 13; Middle Atlantic States, 3 to 13; South Atlantic States, 5 to 13; Eastern Gulf States, 2 to 12; Western Gulf States, 8 to 12; Ohio valley and Tennessee, 10 to 16; Lower Lake region, 12 to 19; Upper Lake region, 11 to 16; Upper Mississippi valley, 12 to 15; Missouri valley, 9 to 12; Valley of the Red River of the North, 10 to 12; Texas, 1 to 10; Rocky Mountains, 3 to 15; Middle Plateau, 8 to 19; Southern Plateau, 0 to 5; California, 2 to 12;

*Rain or Snow from a Cloudless Sky.*—Colorado Springs, Col., 17th.

*Snow.*—No precipitation of this nature was reported from the country to the south and east of the 35th parallel and the 104th meridian, respectively, except in extreme northern Texas on the 11th and 15th, and the extreme western portion on the 6th and 10th. In California none was reported except along the mountain ranges to the northeast of Los Angeles and east of Sacramento. In the various other districts snow fell on the following dates: *New England*, 1st to 5th, 11th to 28th; *Middle States*, 1st, 2nd, 13th to 25th; western *North Carolina*, 3rd, 12th, 13th; *Tennessee and the Ohio valley*, 1st to 5th, 12th to 28th; *Lower Lake region*, 1st to 5th, 8th, 9th, 12th to 28th; *Upper Lake region*, 1st to 28th; *Upper Mississippi valley*, 1st to 28th; *Missouri valley*, 1st, 2nd, 4th to 28th; *Indian Territory*, 10th, 11th, 15th, 18th, 20th; *Rocky Mountains*, from southern New Mexico to northern Montana, 1st to 28th; *Arizona*, (central part), 9th, 17th, 18th; *Middle Plateau*, 5th, 7th to 18th, 25th, 26th; *Northern Plateau*, 1st, 2nd, 8th to 16th, 18th, 20th, 26th, 27th; *Northern Pacific Coast region*, 8th, 12th to 18th, 26th to 28th.

*Largest Monthly Snow-falls.*—Mt. Washington, 56 inches; Beloit, Wis., 42; Little Mountain, Ohio, 38; Cisco, Cal., 33; Sterling, Ill., 32; Rockford, Ill., 31.5; Geneseo, Ill., 30; Elmira, Ill., and North Volney, N. Y., 29; Coldwater, Mich., 28; Friendship, N. Y., and Olivet, Dak., 26; Bloomfield, Wis., Marshall, Mich., and Cleveland, 25; Belvidere, Ill., and Corning, Mo., 24.5; Neillsville, Wis., Niles and Northport, Mich., 23; Minneapolis, Minn., and Pierce City, Mo., 22; Deer Park, Md., 21.

The following items regarding the remarkably severe snow-storms of the month will be found of interest: *Dakota*: Fort Bennett, 12th, snow-fall unprecedented; cattle suffering dreadfully; travel of all kinds almost impossible throughout month. Yankton, 7th, heavy blockade; business almost suspended; great suffering among people in interior towns for want of food and fuel; 25th, all roads again blockaded. *Illinois*: Morrison, month characterized by an unusual fall of snow and consequent heavy blockades. *Iowa*: Nora Springs, 4th to 7th, worst snow blockade experienced in this section for past 15 years. Logan, 5th, 6th, terrible snow-storm, worst in 20 years. Burlington, 12th, 18th, all roads blockaded; heaviest for many years. Keokuk, 12th, 14th, railroads blockaded; much damage to property. Dubuque, 7th to 13th, telegraph wires down in all directions; streets impassable; all travel ceased; the worst blockade for many years. *Kansas*: Creswell, 11th, snow blockade most severe for 10 years; travel of all kinds impossible. Wellington, 10th, 11th, heaviest snow-storm ever experienced. Dodge City, 11th, very severe "blizzard," stopping travel of all kinds; cattle suffering severely; 14th, trains blockaded; all travel ceased; thousands of starving and freezing cattle found along the railroad; large herd of antelopes forced into town in search of food. Leavenworth, 11th, heaviest snow-storm for many years; streets impassable. *Michigan*: Northport, 27th, 16 inches fell and drifted terribly; travel impossible; worst ever experienced. Marquette, 12th to 28th, heaviest storm for years; telegraph lines all down; blockade still continuing. *Minnesota*: New Ulm, 27th, heaviest snow blockade ever experienced; hundreds of families suffering for want of food and fuel; travel impossible. St. Paul, 1st, to 16th, one continuous and uninterrupted blockade; much damage and suffering; violent blizzards. *Nebraska*: North Platte, 14th, heaviest storm for years; cattle dying from cold and starvation. Omaha, 6th, most violent storm for many years; telegraph wires all down; trains blockaded; all travel ceased; much damage to buildings; 12th, all railroad travel blockaded by heavy drifts. *New York*: 3rd, railroads on Long Island blockaded; storm very violent. *Ohio*: Sandusky, 1st, trains blockaded and business entirely suspended for the day. *Wisconsin*: Embarrass, 27th, worst snow blockade ever experienced; no mail; no trains; no travel of any kind. La Crosse, 7th to 17th, all communication seriously obstructed; heaviest storm for many years; great suffering and much loss to property.

*Snow on Ground at End of Month.*—North of the 37th parallel the following depths in inches were reported in the various States and Territories: *Maine*, 3 to 18; *New Hampshire*, 8 to 24; *Vermont*, 1 to 20; *Massachusetts*, 3 to 18; *Connecticut* and *Rhode Island*, trace to 2; *New York*, trace to 22; *New Jersey*, trace to 28; *Pennsylvania*, 5 to 16; *West Virginia*, trace to 3; *Ohio*,  $\frac{1}{4}$  to 25; *Indiana*, trace to 4; *Michigan*, lower peninsula, 3 to 48, upper peninsula, 12 to 36; *Illinois*, 1 to 18; *Wisconsin*, 16 to 38; *Missouri*, trace to 5; *Iowa*,  $\frac{1}{4}$  to 26; *Minnesota*, 24 to 36; *Kansas*, drifts; *Nebraska*, trace to 12; *Dakota*, 3 to 33; *Colorado*, only 2 inches on summit of Pikes Peak, trace to 12 in lower surrounding country; *Montana*, 2 to 22; *Wyoming*, trace to 12; *California*, on mountain ranges.

### RELATIVE HUMIDITY.

The percentage of mean relative humidity for the month ranges, as follows: New England, 65 to 78; Middle States, 66 to 84; South Atlantic States, 58 to 81; Eastern Gulf States 51 to 75; Western Gulf States, 62 to 79; Ohio Valley and Tennessee, 64 to 74; Lower Lake region, 72 to 79; Upper Lake region, 66 to 83; Upper Mississippi valley, 71 to 78; Missouri valley, 66 to 87; Valley of the Red River of the North, 75 to 91; Texas, 61 to 72; Middle Plateau, 43 to 74; Southern Plateau, 30 to 47; California, 62 to 82; Oregon, 80 to 82. *High stations* report the following percentages not corrected for altitude: Mt. Washington, 78.9; Pike's Peak, 62.3; Denver, 56.0; Cheyenne, 50.4; Eagle Rock, 78.5; Santa Fe, 56.8.

### WINDS.

The prevailing winds during the month of February, 1881, at Signal Service Stations, are shown on chart No. II, by arrows which fly with the wind. Along the Atlantic coast, from Maine to North Carolina, in the interior of the Middle Atlantic States, throughout the Upper Mississippi and Missouri valleys and in the Middle Eastern Rocky Mountain slope they were *northwesterly*. In the South Atlantic and Gulf States and in the interior of Texas and New Mexico, *north to east*. In the Lake region, Tennessee and the Ohio valley, *south to east*. In the Pacific coast and Plateau regions, *southeast to southwest*.

*Total Movements of the Air.*—The following are the largest total movements at Signal Service stations: Mt. Washington, 27,190 miles; Pike's Peak, 18,109; Cape May, 13,118; Portsmouth, N. C., 13,041; Kittyhawk, 12,464; Cape Hatteras, 12,158; Delaware Breakwater, 12,046; New Shoreham, 11,056; Chincoteague, Va., 10,963; Thatcher's Island, 10,782; Cape Henry, 10,459; Wood's Holl, 9,981; Indianola, 9,912; Sandusky, 9,873; Barnegat, 9,784; Ft. Macon, N. C., 9,783; Milwaukee, 9,172; Champaign, Ill., 9,109; Cheyenne, 9,061. The *smallest* are: Roseburg, Or., 1,722 miles; Silver City, N. M., 1,980; Visalia, Cal., 2,011; Phoenix, Ariz., 2,066; Salt Lake City, 2,072; Memphis, 2,092; Florence, Ariz., 2,115; Ft. Missoula, Mont., 2,240; Deadwood, 2,348; La Mesilla, 2,400; Lewiston, Idaho, 2,493; Lynchburg, 2,588; Helena, 2,843; Laredo, Tex., 2,932; Uvalde, Tex., 3,017; Spokane, Wash. Ty., 3,254; Olympia, 3,261.