

northwest part of Washington, Neah Bay and Tatoosh Island having an average interval of three months. Exclusive of the north Pacific coast stations excessive monthly rainfalls have not been reported at intervals of less than one year, save at points along the North Carolina and Florida coasts, and at Mount Washington, N. H. In Arizona, Colorado (except at Pike's Peak), Dakota, Idaho, Indian Territory, Montana, Nevada, New Mexico, Utah, Vermont, and Wyoming, no monthly rainfalls of ten or more inches have been reported at regular stations of the Signal Service. Among the longer intervals noted are, nineteen years at Chicago, Ill., Baltimore, Md., Saint Paul, Minn., Buffalo and Oswego, N. Y., and Philadelphia, Pa.; eighteen years at Saint Louis, Mo.; seventeen at Escanaba and Marquette, Mich.; fourteen at Dodge City, Kans., and Eastport, Me.; eleven at Rio Grande City, Tex., and ten at Sandusky, Ohio, and Roseburgh, Oregon. The table of data made up from long-period records furnished by voluntary observers, shows an interval of eighteen years at Marengo, Ill.; seventeen at Laconia, Ind.; twenty-nine and one-half at Troy, N. Y.; twelve and one-half at Philadelphia, Pa., and ten for Kirkwood, S. C.

Rainfalls to equal or exceed two and one-half inches in twenty-four hours have occurred most frequently at stations along or near the south Atlantic and Gulf coasts, in Florida, and at Tatoosh Island, Wash., where they have been reported at intervals of two and three months. At points in Alabama,

Arkansas, at Los Angeles, Cal., Connecticut, Florida, Georgia, Illinois, Iowa, Indian Territory, Kansas, Kentucky, Louisiana, Maryland, Massachusetts, Mississippi, Missouri, North Carolina, Rhode Island, South Carolina, Tennessee, Texas, and Virginia the intervals varied from four to twelve months. In Idaho, Nevada, Utah, Vermont, and Wyoming excessive daily rainfalls have not been reported. At Bismarck and Fort Buford, Dak., Fort Supply, Ind. T., Eastport, Me., Port Huron, Mich., Mount Washington, N. H., Santa Fé, N. Mex., El Paso, Tex., and Cape Henry, Va., daily rainfalls of two and one-half or more inches have been reported at intervals of from ten to twenty years.

Rainfalls to equal or exceed one inch an hour have been most frequently reported at Titusville, Fla. (with a record of two years), and at the Central Park Meteorological Observatory, New York City (with a record of sixty-six years), where the interval has been two and three months, respectively. At stations in Arkansas, Florida, Indiana, Iowa, Louisiana, eastern Nebraska, North Carolina, western Pennsylvania, South Carolina, Tennessee, and Texas the intervals have varied from four to twelve months. In Nevada, New Hampshire, Oregon, Utah, Vermont, and Washington, no rainfalls of one inch, or more, have been reported at Signal Service stations. At Red Bluff, Cal., New Haven, Conn., Fort Buford, Dak., Boston, Mass., and Rochester, N. Y., excessive hourly rainfalls have been noted at intervals of from ten to twenty years.

WINDS.

The prevailing winds during February, 1889, are shown on chart i by arrows flying with the wind. In Canada, the Lake region, and generally in districts east of the Mississippi River, westerly winds were most frequently noted, except along the east and middle coasts of the Gulf of Mexico, where they were northeasterly. In Texas, the lower Mississippi valley, the Rocky Mountain regions, and the middle and southern Pacific slopes they were variable. On the north Pacific coast south to west winds predominated.

HIGH WINDS (in miles per hour).

Maximum velocities of fifty miles, or more, per hour, other than those given in the table of miscellaneous meteorological data, have been reported as follows: Fort Assinaboine, Mont., 56, nw., 4th; 66, nw., 3d; Whipple Barracks (Prescott), Ariz., 54, sw., 16th.

LOCAL STORMS.

The following reports generally refer to storms incidental to the passage of areas of low pressure of pronounced strength whose paths are plotted on chart i:

4th. Nebraska.—Omaha: a severe storm began at 6.30 a. m. and continued without cessation until about 7 p. m., causing loss of life and considerable damage to property in this city. Maximum velocity of wind, sixty miles per hour. Reports indicate that the storm was of unusual severity in neighboring towns.—*Report of Signal Service observer.*

13th. Oregon.—Shedd's, Linn Co.: a heavy hail storm prevailed for a short time; hail fell to a depth of one inch; some of the stones were one-fourth of an inch in diameter. Lebanon, Linn Co.: quite a hail storm, a few miles in width, was experienced; very little damage was done.—*Oregon Crop-Weather Bulletin.*

16th. Michigan.—Sault de Ste. Marie: a severe sleet storm, accompanied by high wind, occurred in the afternoon. Telegraph and telephone wires became heavily coated with ice, cutting off communication with Detroit. Houses on the west side of the street were coated with ice half an inch thick, and all outside business was abandoned during the storm.—*Report of Signal Service observer.*

16-17th. Tennessee.—The (Nashville) "Daily American,"

of February 18th, contains the following: a terrific rain storm prevailed between Dark's Mill, Maury Co., and Pulaski, Giles Co., the night of the 16th; it was almost equal to a water-spout in that region. Streams were filled to overflowing, and, in many cases, out-houses in close proximity to the creeks were swept away by the torrents of water. The false work under the proposed new and heavy iron bridge over Rutherford Creek, on the Decatur division, ten miles south of Columbia, was partially swept away.

17-18th. Tennessee.—Knoxville: a heavy thunder-storm began 10.30 p. m., 17th, and ended 4 a. m. the following day. The storm was attended by very heavy rain, and the overflow of creeks inundated streets, flooded cellars, etc., in this city.—*Report of Signal Service observer.*

18th. Alabama.—Birmingham: about 2 a. m. a storm swept over the lower end of Shelby county, about thirty miles from this city. Many houses were blown down or unroofed; a number of persons were killed and many injured. The storm moved from southwest to northeast, through a thickly populated section.—*The New York Times, February 19th.*
Georgia.—Harmony Grove, Jackson Co.: about 4.30 a. m. a terrible storm swept across the southeast corner of Banks county, and for violence and damage it was perhaps the most fearful wind storm ever experienced in this section. Houses and trees were driven before the wind like chaff; several persons were killed and a large number injured. The course of the storm was from southwest toward northeast. Persons on the Elberton Air Line state that it crossed that road between Bowersville, Hart Co., and Toccoa, Habersham Co. It is a singular fact that this storm passed in the track of one which occurred in 1846; a hurricane, as it was then called, swept through a large forest and tore up many trees.—*Athens (Ga.) Banner-Watchman.* Griffin, Spaulding Co.: a storm struck this place at 5 a. m., and did considerable damage; it came from the west, and was about three hundred yards wide. At a farm two miles west from here five houses were blown down, and a large barn filled with forage was twisted around.—*Atlanta (Ga.) Constitution.* Eatonton, Putnam Co.: a terrific storm passed a few miles from this place at 7 a. m. The funnel-shaped cloud, as far as can be learned, did its greatest damage in the neighborhood of Nona, this county, on the

Milledgeville and Eatonton Railroad, causing loss of life and considerable injury to property. After leaving Nona the cloud moved in an easterly direction.—*Atlanta (Ga.) Constitution.* South Carolina.—Pacolet, Spartanburgh Co.: about 6 a. m. a tornado passed about a half a mile from this place, and all houses, crops, and lumber over a stretch of country about one-fourth of a mile wide suffered from its ravages.—*Charleston (S. O.) News and Courier.* North Carolina.—Wilmington: a high northwest gale began 9.10 a. m. and ended 1.45 p. m.; maximum velocity of wind, thirty-six miles per hour at 12.10 p. m. Several trees and one frame building were blown down.—*Report of Signal Service observer.*

21st. Georgia.—Augusta: a severe snow storm prevailed steadily all day, followed at night by rain and sleet. The approximated depth of snow, which melted as it fell, was about six inches.—*Report of Signal Service observer.* South

Carolina.—Columbia: snow began at 8.20 a. m. and ended 6.30 p. m., followed by sleet and rain, which ended during the night. It was the heaviest fall of snow within the recollection of citizens.—*Report of Signal Service observer.* Gaffney City, Spartanburgh Co.: the deepest snow here in twenty years fell this date; depth twelve to fourteen inches.—*Charleston (S. C.) News and Courier.*

21st-22d. Michigan.—Sault de Ste. Marie: high wind, accompanied by blinding snow, began the evening of the 21st, and continued throughout the following day. Maximum velocity of wind one hundred and thirty-two miles per hour from the northwest, at 5 p. m., 22d. The wind was the severest ever experienced at this place, and caused much damage to the telegraph, telephone, and electric light wires. Trains due here from various points were blockaded by the drifting snow.—*Report of Signal Service observer.*

INLAND NAVIGATION.

STAGE OF WATER IN RIVERS AND HARBORS.

In the following table are shown the danger-points at the various stations; the highest and lowest depths for February, 1889, with the dates of occurrence and the monthly ranges:

Heights of rivers above low-water mark, February, 1889 (in feet and tenths).

Stations.	Danger-point on gauge.	Highest water.		Lowest water.		Monthly range.
		Date.	Height.	Date.	Height.	
Red River:						
Shreveport, La.	29.9	3	31.9	28	20.5	11.4
Arkansas River:						
Fort Smith, Ark. ...	22.0	1	9.0	18, 19	3.7	5.3
Little Rock, Ark. ...	23.0	1	13.4	19	6.8	6.6
Missouri River:						
Leavenworth, Kans. ...	20.0	20, 21	4.8	12	3.0	1.8
Kansas City, Mo. ...	21.0	24-28	5.7	6, 7, 13-16	5.1	0.6
Mississippi River:						
Saint Paul, Minn. ...	14.5					
La Crosse, Wis. ...	24.0					
Dubuque, Iowa ...	16.0					
Davenport, Iowa ...	15.0					
Keokuk, Iowa ...	14.0	23	3.3	6, 13	0.8	2.5
Saint Louis, Mo. ...	32.0	19	6.7	27	2.7	4.0
Cairo, Ill.	40.0	26, 27	32.7	17	13.8	18.9
Memphis, Tenn. ...	34.0	28	25.4	19	11.0	14.4
Vicksburg, Miss. ...	41.0	1	33.2	24	20.8	12.4
New Orleans, La. ...	13.0	15, 16, 17	12.4	26, 27	8.9	3.5
Ohio River:						
Pittsburgh, Pa.	22.0	18	18.0	16	2.9	15.1
Parkersburg, W. Va. ...	38.0	21	22.2	16	5.9	16.3
Cincinnati, Ohio ...	50.0	22	38.3	16	13.4	24.9
Louisville, Ky.	25.0	23	13.9	16	6.9	7.0
Cumberland River:						
Nashville, Tenn. ...	40.0	21	35.6	15	6.0	29.6
Tennessee River:						
Knoxville, Tenn. ...	29.0	19	15.0	15	1.9	13.1
Chattanooga, Tenn. ...	33.0	18	29.6	15	6.2	23.4
Monongahela River:						
Pittsburgh, Pa.	29.0	18	18.0	16	2.9	15.1
Savannah River:						
Augusta, Ga.	32.0	18	33.3	14	9.8	23.5
Willamette River:						
Portland, Oregon ...	15.0	23, 24	3.5	11	0.0	3.5

*Frozen.

ICE IN RIVERS AND HARBORS.

The following reports relative to ice in rivers and harbors have been made by Signal Service observers:

Thames River.—New London, Conn.: the river froze over on the 25th, the ice being sufficiently strong to interrupt navigation. Floating ice in harbor, 26th and 27th.

North (Hudson) River.—New York City: floating ice in river, 10th to 15th, 25th, 26th.

East River.—New York City: floating ice in river, 10th, 25th.

Monongahela River.—Pittsburgh, Pa.: floating ice in river, 6th, 18th, 24th to 27th. The river was frozen over and navigation closed to points above Lock No. 1 on the 7th; navigation was again resumed on the 20th.

Allegheny River.—Pittsburgh, Pa.: ice in river, 1st to 5th, 7th to 9th, 18th, 21st, and 27th.

Ohio River.—Parkersburgh, W. Va.: floating ice in river, 2d to 16th, 20th. Ice caused a partial suspension of navigation from the 6th to 9th.

Saint Clair River.—Port Huron, Mich.: the steamer "Mary," plying between this port and Marine City, Saint Clair Co., Mich., discontinued her regular trips on the 6th, this being the latest date in six years that the steamer has been compelled to lay up on account of ice; floating ice in river, 10th; the river froze for the first time this winter on the 14th.

Mississippi River.—Keokuk, Iowa: floating ice, 5th. River froze over for the first time this season on the 24th and 25th.

Missouri River.—Leavenworth, Kans.: floating ice in river, 1st, 6th, 7th, 18th to 23d. The river froze over for the first time this season on the 24th.

Lake Michigan.—Milwaukee, Wis.: 28th, navigation between this and the east shore ports, by the regular line steamers, has been interrupted considerably during the month by ice. Milwaukee Bay has been blocked with ice several times, and at the close of the month there were large fields of floating ice in the southern part of the lake.

FLOODS.

Chattanooga, Tenn.: the heavy rains from the 14th to 17th caused the Tennessee River to rise above the danger line on the 18th. A portion of the city was inundated and considerable damage was done to foundations of buildings, causing walls to cave in, etc. Train men reported high water and land slides along the various railroads.

Augusta, Ga.: the Savannah River continued to rise very rapidly during the 18th, attaining its highest point at 11 p. m. A number of streets in the lower portion of the city were submerged and all the mills were compelled to close. The river began to fall after midnight.

ATMOSPHERIC ELECTRICITY.

AURORAS.

Faint auroral displays were reported as far south as Egg Harbor City, N. J. West of the Atlantic coast no auroras were reported south of the fortieth parallel. The only notable displays reported during the month are described as follows:

Saint Vincent, Minn.: aurora began 8.30 p. m., 26th, and ended during the night. The display was in the form of an arch; azimuth 90°; altitude 8° to 10°. Maximum brilliancy about 1 a. m., 27th. Quite a brilliant aurora began 9 p. m., 28th, and ended during the night. It was in the form of an