

12 to 46 miles per hour. The gale continued until 6.30 p. m. A second thunderstorm, with rain, prevailed from 5.55 to 7.30 p. m.

**26th.**—An exceptionally severe thunderstorm from the southwest prevailed at Jupiter, Fla., from 6.32 to 7.05 p. m.; 2.95 inches of rain fell in 33 minutes. At Titusville, Fla., a thunderstorm from the northwest occurred in the morning,

and heavy rain and wind squalls occurred at intervals until 11 p. m.

**27th.**—During a thunder and hail storm in the afternoon at Emporium, Kans., a barn was struck by lightning and a horse killed. A hailstorm was reported about 5 p. m. 3 miles southwest of Rome, Kans.; several outbuildings were destroyed.

INLAND NAVIGATION.

STAGE OF WATER IN RIVERS.

The following table shows the danger-points at the various river stations; the highest and lowest stages for the month, with the dates of occurrence; and the monthly ranges:

Heights of rivers above low-water mark, March, 1893.

Stations.	Danger-point on gauge.	Highest water.		Lowest water.		Monthly range.
		Height.	Date.	Height.	Date.	
<i>Red River.</i>						
Shreveport, La.	29.9	20.7	25-27	15.0	7	5.7
<i>Arkansas River.</i>						
Fort Smith, Ark.	22.0	12.1	11	3.5	27	8.6
Little Rock, Ark.	23.0	16.9	11	8.3	23	8.6
<i>Missouri River.</i>						
Fort Buford, N. Dak.	14.0					
Pierre, S. Dak.	18.7	14.0	12	3.4	17, 18	10.6
Sioux City, Iowa	21.0	14.2	16	6.0	1	8.2
<i>Mississippi River.</i>						
Saint Paul, Minn.	14.0					
La Crosse, Wis.	11.8					
Dubuque, Iowa	16.0					
Davenport, Iowa	15.0	13.1	13	5.8	22, 23, 30, 31	7.3
Keokuk, Iowa	14.0	13.3	17	8.1	31	5.2
Hannibal, Mo.	17.0	13.7	19	4.5	8	9.2
Saint Louis, Mo.	30.0	22.1	19, 20	12.0	1	10.1
Cairo, Ill.	40.0	44.9	1	28.6	10	16.3
Memphis, Tenn.	33.0	33.1	3	24.1	13, 14	9.0
Vicksburg, Miss.	41.0	42.4	13-15	38.3	1	4.1
New Orleans, La.	13.0	13.9	18-21, 27	12.8	1	1.1
<i>Ohio River.</i>						
Parkersburg, W. Va.	38.0	26.1	14	9.0	23	17.1
Cincinnati, Ohio	45.0	36.9	16, 17	18.8	27	18.1
Louisville, Ky.	24.0	12.7	17	7.9	28	4.8
<i>Cumberland River.</i>						
Nashville, Tenn.	40.0	24.0	15	7.7	26	16.3
<i>Tennessee River.</i>						
Chattanooga, Tenn.	33.0	12.0	14	5.7	31	6.3
Knoxville, Tenn.	29.0	6.5	12	2.5	23, 26	4.0
<i>Monongahela River.</i>						
Pittsburg, Pa.	29.0	16.6	13	5.5	8	11.1
<i>Savannah River.</i>						
Augusta, Ga.	32.0	21.0	1	8.0	23, 24, 31	13.0
<i>Willamette River.</i>						
Portland, Oregon	15.0	6.0	31	2.4	15	3.6
<i>Susquehanna River.</i>						
Harrisburg, Pa.	17.0	14.6	14	2.5	6, 7	12.1
<i>Alabama River.</i>						
Montgomery, Ala.	48.0	19.5	5	6.6	23, 24, 31	12.9
<i>James River.</i>						
Lynchburg, Va.		4.0	5	1.1	29-31	2.9
<i>Sacramento River.</i>						
Red Bluff, Cal.		18.6	11	4.2	2	14.4
Sacramento, Cal.		26.5	22	20.0	8	6.5

\* River frozen. † For 20 days. ‡ For 19 days. § For 23 days.

ICE IN RIVERS AND HARBORS AND OPENING OF NAVIGATION.

Navigation opened on the Connecticut River between Hartford and Saybrook on the 14th.

**Hudson.**—Ice opposite Albany moved down the night of the 12th, and the river rose rapidly from 3 a. m. to 12.30 p. m., 13th, at which time the gorge which had formed below the city, gave way. During the 14th the river continued high at Albany, and the ice was firmly gorged and piled to a depth of 20 to 30 feet on the overslaugh. The river was reported open from Newburg to New York on the 13th, and from New York to Poughkeepsie on the 17th. The afternoon of the 13th an ice gorge in the creek above Rondout, N. Y., broke and carried 35 boats into the Hudson River, where a number were sunk and others damaged. On the 15th the river was high and the ice firm between Coeymans and Sing Sing. On the 23d the river opened at Albany and closed between Castleton and Poughkeepsie. Heavy ice was running in the river at Albany

on the 24th. On the 25th the ice gorge below Albany moved, and the river was reported clear to New York. On the 31st the first through boat of the season, the steamer "Dean Richmond," arrived at Albany from New York.

Floods, caused by ice gorges, occurred in the smaller rivers and streams of New York and Pennsylvania. On the 10th ice was running in the Genesee River at Rochester, N. Y. The West Branch of the Susquehanna River was frozen at Lock Haven, Pa., on the 1st; 9th, ice moving; 13th, slush ice running. Ice passed out of the Susquehanna River at Wilkesbarre, Pa., on the 10th; 13th, river rising, with large quantities of floating ice. Steamboats resumed their trips on the Delaware River at Beverly, N. J., on the 1st. At Sellen Grove, Pa., the river was full of floating ice and drift on the 13th. At Towanda, Pa., running ice was noted on the 10th, 12th, and 13th. On the 10th heavy ice passed down the Raritan River at New Brunswick, N. J. Heavy ice gorges were reported in the Maumee River, Ohio. Ice passed out of the Illinois and Fox rivers at Ottawa, Ill., on the 8th. Ice passed out of the Illinois River at Hennepin, Ill., on the 8th, and at Havana, Ill., on the 9th. On the 12th the first boat of the season passed Havana. On the 9th and 10th ice passed out of the Fox River at Oswego, Ill. Ice gorges flooded streams in Michigan, Wisconsin, and Nebraska. Ice broke up in the Rock River at Beloit, Wis., on the 11th. Ice began to break up in the Des Moines River at Des Moines, Iowa, on the 10th; the river was almost clear of ice at that point on the 18th. Ice broke up in the Cedar River at Cedar Rapids, Iowa, on the 13th. Ice broke up in the Loup River near Genoa, Nebr., on the 10th, damaging many bridges. The Little Missouri River opened at Medora and Yule, N. Dak., on the 28th. Ice began to run out of the Powder River at Powder River, Mont., on the 26th. At Miles City, Mont., ice in the Tongue River broke up on the 27th. Ice broke up in the Yellowstone River at Glendive, Mont., on the 28th.

**Mississippi River.**—At the close of the month the river was open near each bank at Red Wing, Minn.; in mid-stream the ice was solid. At Dubuque, Iowa, ice broke up below the bridge and gorged at the bend on the 13th; 20th, ice above the bridge broke; 23d, river clear of ice; 25th, navigation resumed. At Davenport, Iowa, the ice began to break up on the 12th; 13th, ice moved out at 10 a. m., but gorged below the city, and the river rose rapidly; at Rock Island, Ill. (opposite Davenport), considerable damage was caused by ice; 14th, first steamer of the season passed down the river; 15-17th, river full of floating ice; 27th, several steamers from up and down the river arrived, and navigation opened. The first steamer of the season passed down the river at Keokuk, Iowa, on the 20th. The first up-river boat of the season passed Hannibal, Mo., on the 14th.

**Missouri River.**—Ice from the Yellowstone River caused a rise in the Missouri River of 10 to 12 feet at Fort Buford, N. Dak., on the 30th. On the 29th ice began to run out in a narrow channel on the west side of the river at Yankton, S. Dak. Ice broke up near Santee Agency, Nebr., on the 9th. At Sioux City, Iowa, ice ran out on the 12th; running ice was noted from the 13th to the 15th. At Leavenworth, Kans.,

the river was rising rapidly and full of floating ice on the 15th; from the 16th to the 18th large quantities of floating ice were noted.

Large fields of floating ice were reported in the river at Buffalo, N. Y., on the 30th. Lake Erie was free from ice at Erie, Pa., on the 25th. On the 28th a steam barge left Cleveland, Ohio, for Kellys Island; this was the first departure of the season. On the 29th the "City of Detroit" arrived at Cleveland from Detroit, Mich.; this was the first arrival of the season. Ice in the Maumee River began to move at Toledo, Ohio, at 5 a. m. of the 10th; at 10 a. m. a small gorge formed at the lower end of the city. On the 11th the gorge broke, and the ice passed out. On the 21st a steamer arrived from Monroe, Mich.; this was the first arrival of the season at Toledo. Floating ice was noted in the river at Detroit, Mich., on the 18th to 21st, 26th, and 27th. The "City of Detroit" cleared for Cleveland on the 29th; this was the first departure of the season. At the close of the month the western part of Lake Saint Clair was reported clear of ice. On the 1st a steamer broke the ice between Port Huron and Sarnia and resumed her trips. On the 9th the Saint Clair River was open from Lake Huron to Marysville; 14th, Saint Clair River open from Lake Huron to Saint Clair; 21st, 22d, and 25th, large quantities of floating ice in the river at Port Huron; 25th, the American shore of Lake Huron free from ice about Port Huron; on the Canadian shore the ice was firm. On the 25th a steamer left Manistee, Mich., for Frankfort, Mich.; this was the first departure of the season. On the 31st very little ice was visible from Manistee. On the 8th a brisk easterly wind drove the ice out of the harbor at Grand Haven, Mich., and a steamer which had been fast in the ice several days left for Milwaukee. On the 15th the harbor continued open, but an immense field of ice extended off the piers. On the 30th the

harbor was blocked by ice. On the 31st southerly winds drove the ice northward, and the harbor opened. An enormous ice gorge was reported in the river above the dam at Milwaukee, Wis., on the 13th.

#### FLOODS.

Destructive floods resulted from ice gorges in rivers and streams in New York, Pennsylvania, Michigan, Wisconsin, and Nebraska. The night of the 12th ice in the Hudson River broke and gorged at Albany, N. Y. The water rose rapidly, reaching a higher point than in 1861, and rose 2 feet above the high water mark of 1887. During that date streets in low-lying parts of Albany and low lands about the city were flooded, and large quantities of goods stored in cellars and the lower floors of mercantile houses were damaged. The afternoon of the 10th ice in the Genesee River broke and gorged near Mount Morris, N. Y., and parts of that village and adjacent low ground were submerged. On the 13th cellars along the Genesee River in Rochester, N. Y., were flooded. The water ceased to rise at Rochester the early morning of the 14th. On the 10th water from the Susquehanna River covered the flats between Wilkesbarre and Kingston, Pa. From the 13th to the 19th floods occurred in the rivers and streams of Lower Michigan. At points along the Grand River the water was reported the highest in many years. Destructive floods were also reported in Wisconsin. In Nebraska streams overflowed their banks, many bridges were washed away, and washouts on railroads interrupted railroad traffic. During the early part of the third decade of the month streams in the San Joaquin Valley and in southwestern California were swollen to a dangerous height. Towns and villages and large tracts of cultivated land were submerged.

### ATMOSPHERIC ELECTRICITY.

#### THUNDERSTORMS.

Description of the more severe thunderstorms reported for the month is given under "Local storms."

Thunderstorms were reported as follows: East of the Rocky Mountains they were reported in the greatest number of states, 22, on the 23d and 24th; in 16 on the 8th; in 15 on the 22d; in 14 on the 14th; in 11 on the 3d, 9th, and 11th; in 10 on the 2d and 10th; in 9 on the 20th and 21st; in 8 on the 27th; in 7 on the 13th, 15th, 25th, and 26th; in 6 on the 12th and 16th; in 5 on the 17th and 28th; in 4 on the 4th and 7th; in 3 on the 30th; in 2 on the 1st and 31st; and in one on the 5th, 6th, 18th, and 29th. The 19th was the only date on which thunderstorms were not reported.

East of the Rocky Mountains thunderstorms were reported on the greatest number of dates, 15, in Florida and North Carolina; on 14 in Mississippi; on 13 in Texas; on 11 in Missouri; on 10 in Arkansas, Louisiana, and Virginia; on 8 in Illinois, Kansas, Michigan, and Tennessee; on 7 in Alabama, Georgia, Indiana, Iowa, Kentucky, Ohio, and Wisconsin; on 6 in Minnesota and New York; on 5 in Nebraska and West Virginia; on 4 in Connecticut and South Carolina; on 3 in New Hampshire, New Jersey, North Dakota, Oklahoma, and Pennsylvania; on 2 in Indian Territory, Maine, Massachusetts, and Vermont; and on one in Delaware, District of Columbia, Maryland, Rhode Island, and South Dakota.

West of the Rocky Mountains thunderstorms were reported in Arizona on the 6th; in California on the 8th to 11th, 18th, and 20th; in Colorado on the 7th and 22d; in Nevada on the 20th and 21st; in Oregon on the 5th, 7th, 8th, 10th, 11th,

15th, 20th, and 27th; in Utah on the 21st. In states and territories other than those named no thunderstorms were reported.

#### AURORAS.

Auroras were reported as follows: 6th, Crook, Oregon; 7th, Fergus Falls, Minn.; Mingsville, Mont.; Fort Buford, N. Dak.; Medford and Shawano, Wis. 8th, Havre, Mont. 13th, Galva, Ill.; Turin, N. Y.; Appleton, Wis. 14th, Amana and Cresco, Iowa; Morton, Kans.; Sault Ste. Marie, Mich.; Clear Lake, Collegeville, Fergus Falls, Maple Plain, Saint Olaf, and Wilmer, Minn.; Havre, Mont.; Santee Agency, Nebr.; Ashley, Bowdle, Fort Stevenson, Grand Forks, Napoleon, Sykeston, and Woodbridge, N. Dak.; Barron, Butternut, Grantsburg, Haywards, Medford, Reedsburg, and Valley Junction, Wis. 15th, North Billerica, Mass.; Sault Ste. Marie, Mich.; Sandy Lake Dam, Minn.; Havre, Mont.; New Brunswick, N. J.; Brookline, N. H.; Honeymead Brook, N. Y.; Fort Buford and Woodbridge, N. Dak.; Barron and Haywards, Wis.

16th, Gaynor, Colo.; Fort Stevenson, N. Dak.; Chelsea, Vt.; Ashland, Wis. 17th, Angola, Ind. 20th, Williamston, Mich.; Albany, Oregon. 23d, Noble, Mich.; Crook, Oregon; Harvey and Medford, Wis. 24th, Palermo, N. Y.; Lakota, N. Dak.; Ashland and Harvey, Wis. 25th, Indian Stream, Me.; Collegeville, Minn.; Lyons, N. Y.; Fort Buford and Jamestown, N. Dak.; Harvey, Wis. 26th, David City, Nebr. 27th, Moscow, Idaho; Waverly, N. Y.; Crook, Oregon. 28th, Indian Stream, Me.; Sault Ste. Marie, Mich. 30th, Ashland, Va.; Harvey, Wis. 31st, Blakeville, Iowa; Parkersburg, W. Va.