

ington, and West Virginia. 27th, California, Kentucky, New Jersey, Ohio, Tennessee, Washington, and West Virginia. 28th, Arizona, California, Oregon, Texas, and Washington. 29th, California, Iowa, Kansas, Louisiana, Missouri, Utah, and Washington. 30th, Arizona, California, Oregon, and Washington. 31st, Arizona, California, Indian Territory, Kansas, Maryland, Michigan, Nebraska, Oklahoma Territory, Texas, and Utah.

SLEET.

Description of the more severe sleet storms of the month is given under "Local storms." Sleet was reported as follows: 1st, Connecticut, Nevada, New Jersey, New York, Pennsylvania, and West Virginia. 2d, Nevada, Utah, and Virginia. 3d, Illinois and New Jersey. 4th, Illinois, Iowa, Ohio, and Wisconsin. 5th, Iowa and Michigan. 6th, Illinois and Iowa. 7th, Illinois, Missouri, and New York. 8th, Massachusetts, New Hampshire, New York, Ohio, and Pennsylvania. 9th, Iowa, Minnesota, North Dakota, Ohio, and Wisconsin. 10th, Indiana, Iowa, New Jersey, Pennsylvania, and Virginia.

13th, New Jersey. 14th, Arkansas, Kansas, Missouri, Nevada, and Oklahoma Territory. 15th, Arkansas, Indian Territory, Louisiana, Nevada, New Mexico, North Carolina, Okla-

homa Territory, Tennessee, and Texas. 16th, Arkansas, Louisiana, Mississippi, New Jersey, North Carolina, Texas, and Virginia. 17th, District of Columbia, Georgia, Louisiana, Mississippi, New Jersey, North Carolina, Pennsylvania, South Carolina, Tennessee, Texas, Virginia, and West Virginia. 18th, Connecticut, Delaware, Louisiana, Massachusetts, New Jersey, New York, North Carolina, Pennsylvania, South Carolina, Texas, and Virginia.

19th, Louisiana, Nevada, New Hampshire, and Utah. 20th, Iowa, Kansas, Nebraska, Nevada, and Utah. 21st, Arizona, Illinois, Indiana, Iowa, Kansas, Kentucky, Nebraska, Nevada, Oklahoma Territory, Utah, and Wisconsin. 22d, Indiana, Iowa, Michigan, New York, Ohio, and Pennsylvania. 23d, Nevada, New Mexico, and Pennsylvania. 24th, Iowa, Nevada, Texas, Utah, and Washington. 26th, Illinois, Kansas, Kentucky, Nebraska, New Jersey, North Carolina, North Dakota, Ohio, Tennessee, Utah, and West Virginia. 27th, Nevada, North Carolina, Ohio, Oregon, and West Virginia. 28th, Nevada and Washington. 29th, California, Kansas, North Carolina, and Washington. 30th, California, Nevada, and Utah. 31st, Arizona, Kansas, Montana, Nebraska, Nevada, New Mexico, New York, Pennsylvania, Washington, and West Virginia.

WINDS.

The prevailing winds in March, 1892, are shown on Chart II by arrows flying with the wind. In New England and on the northeast slope of the Rocky Mountains southwest to northwest winds were most frequently noted; in the middle Atlantic states and the Ohio Valley and Tennessee they were generally from northwest to north; in the south Atlantic states, the Lake region, the upper Mississippi valley, and on the middle-eastern slope of the Rocky Mountains, from northwest to northeast; in the west Gulf states, from east to south; in the extreme northwest, from northeast to southeast; over the northern plateau region, from southeast to south; on the north Pacific coast, from south to southwest; on the middle Pacific coast, from west to north; on the south Pacific coast, from west to northwest; and over the Florida Peninsula, in the east Gulf states, the Missouri Valley, on the southeast slope of the Rocky Mountains, and over the middle and southern plateau regions, variable.

HIGH WINDS.

[In miles per hour.]

Wind velocities of 50 miles, or more, per hour were reported at regular stations of the Weather Bureau as follows: 1st, 77, ne., at Block Island, R. I.; 52, ne., at Nantucket, Mass. 2d, 54, nw., at Kitty Hawk, N. C. 3d, 62, n., at Woods Holl, Mass.; 60, ne., at Block Island, R. I.; 52, ne., at Nantucket, Mass. 8th, 72, nw., at Bismarck, N. Dak.; 68, nw., at Huron, S. Dak.; 60, nw., at Fort Assinaboine, Mont.; 58, sw., at Helena, Mont. 9th, 66, nw., at Huron, S. Dak.; 60, ne., at Duluth, Minn.; 60, nw., at Moorhead, Minn.; 57, sw., at Chicago, Ill.; 57, w., at Red Wing, Minn.; 54, w., at Davenport, Iowa; 54, nw., at Sioux City, Iowa; 52, nw., at Valentine, Nebr. 10th, 54, sw., at Chicago, Ill.; 54, e., at Tatoosh Island, Wash.; 54, nw., at Louisville, Ky.; 53, sw., at Kitty Hawk, N. C.; 52, nw., at Leavenworth, Kans. 11th, 67, sw., at Woods Holl, Mass.; 53, nw., at Block Island, R. I.; 50, nw., at Oswego, N. Y. 12th, 52, sw., at Woods Holl, Mass. 19th, 64, sw., at Woods Holl, Mass.; 50, nw., at Block Island, R. I. 20th, 54, nw., at Woods Holl, Mass. 23d, 51, n., at Keeler, Cal. 24th, 56, sw., at Tatoosh Island, Wash. 25th, 50, nw., at Amarillo, Tex. 26th, 54, w., at Cairo, Ill. 27th, 52, ne., at Chicago, Ill. 28th, 60, s., at Amarillo, Tex.; 60, se., at Huron, S. Dak.; 60, s., at Fort Canby, Wash.; 52, sw., at Fort Stanton, N. Mex.; 51, s., at Dodge City, Kans. 29th, 56, w., at Amarillo, Tex.; 53, se., at Chicago, Ill.; 53, sw., at Winnemucca, Nev.; 50, se., at Huron, S. Dak. 31st, 80, w.,

at Amarillo, Tex.; 68, nw., at El Paso, Tex.; 60, sw., at Fort Stanton, N. Mex.

LOCAL STORMS.

1st.—Destructive gales prevailed along the middle Atlantic and New England coasts from the 1st to 4th, with snow in the interior. At points on the southeast New England coast the gale was one of the severest noted in several years.

8th.—Hard westerly gales began in Montana in the morning. The storm reached North Dakota in the evening, causing serious damage throughout the state. The high wind, with very low temperature and snow, caused loss of human life and destruction of stock. Small and insecure buildings were wrecked or damaged in South Dakota.

9th.—High northwest winds prevailed in Nebraska, and brisk to high winds caused damage of a minor character in Kansas and Missouri. In Iowa the gale was unusually severe and was attended in north parts of the state by snow which drifted heavily. Great damage was caused in parts of western and northern Minnesota by high wind, cold, and snow. This storm was felt over the western part of the Lake region on the 9th and 10th.

10th.—A gale from the southeast began at Charlotte, N. C., at 9.50 a. m. and ended 6 p. m., causing minor damage. At Washington, D. C., rain began 11.40 a. m., with thunder. The wind veered to northwest at noon, and reached a velocity of 42 miles per hour in the evening. Rain changed to snow and the temperature fell 24° in a few minutes. At Baltimore, Md., rain began 12.15 p. m., changed to snow 12.45 p. m., and ended 3.40 p. m. The wind shifted to northwest 12.45 p. m., and a gale continued throughout the day. At Leonardtown, Md., a severe storm advanced from the southwest at 1.20 p. m., with light rain, snow, hail, and distant thunder, uprooting trees and damaging old buildings. The storm was severe over Virginia and West Virginia.

11th.—The storm swept over New York, New England, and the Canadian Maritime Provinces, causing snow blockades in central, northern, and western New York. Thunderstorms were reported at points along the New England and Nova Scotia coasts.

15-17th.—Heavy storms of snow, sleet, and rain swept over the Southwestern and Southern States. In Oklahoma and Indian territories and Texas the loss of cattle was very great, and early corn and oats were killed and damaged. Snow fell in northern Louisiana. At New Orleans, La., the

wind shifted from south to northwest at 8.30 a. m., 17th, and reached a velocity of 36 miles per hour, with heavy rain. Thunder and lightning preceded the rain. At night the temperature fell nearly to freezing. A heavy storm of wind, snow, and sleet prevailed over Arkansas on the 16th. The storm reached Mississippi on the 17th and caused damage to fruit and vegetables. It prevailed over Tennessee and central and southern Kentucky during the 16th and 17th as a heavy snowstorm, the depth of snowfall in central and southwest Tennessee, 7 to 25 inches, being the greatest on record for those sections.

18-19th.—The storm extended over the east Gulf and Atlantic coast states. At Key West, Fla., the wind reached a velocity of 43 miles per hour from the northwest. High wind and temperature below freezing was reported in South Carolina. The British bark "Windemere" was wrecked on the New Jersey coast. High winds and drifting snow delayed trains in New York. High winds, with rain, sleet, and snow, prevailed over New England, the snowfall being heavy.

23d.—At Keeler, Cal., heavy masses of clouds began forming in the northeast about noon. About 7 p. m. a thunderstorm developed suddenly in the Inyo range of mountains east of Keeler. The clouds were of inky blackness and extended well down the mountains. Light rain began 7.31 p. m., with gusts of wind. Three peals of thunder were heard 7.41 p. m. Fresh to high wind from the northwest subsided after 8 p. m. At 9.30 p. m. the wind veered to north, and in 20 minutes increased from 24 to 61 miles per hour, the highest velocity recorded at that station. The pressure which had been decreasing during the day began to increase just before the storm struck, and during the squall the barograph showed a very unsteady increase of pressure. The storm demolished houses and caused other damage.

24th.—High south to southwest winds, with heavy rain and squalls of rain and hail in the afternoon, prevailed at Tatoosh Island, Wash.

26th.—Severe storms prevailed from Nebraska, Kansas, and Arkansas over the Ohio Valley, Tennessee, Virginia, and North Carolina. At Omaha, Nebr., rain alternated with heavy snow, interrupting traffic. At Leavenworth, Kans., rain and snow attended a northwest gale. At Springfield, Kans., a storm, with hail, uprooted trees and demolished buildings. At Cove, Ark., a storm, followed by rain, thunder and lightning, and snow, moved eastward, uprooting trees; 2 men were killed and several persons were injured by falling trees. A heavy thunderstorm, with rain and hail, moved east over Chattanooga, Tenn., in the evening. At Knoxville, Tenn., a thunderstorm, with rain, high wind, and hail, began 9.25 p. m. and ended 10 p. m., causing considerable damage of a minor character. Heavy thunder and wind storms prevailed throughout Tennessee. At Louisville, Ky., a severe thunderstorm, with heavy rain, high wind, and hail, advanced from the southwest at 4.30 p. m.; the temperature fell 16° in 45 minutes. Destructive thunder and hail storms were reported at Shelbyville and Edmonton, Ky. A tornado from the south, with rain and hail, passed through Cerro Gordo, Ill., in a path 150 feet in width at 1 p. m., injuring one person, and destroying and damaging buildings to the value of \$5,000 to \$6,000. Thunder, rain, and hail storms caused damage in parts of Ohio. A sudden storm of wind, rain, hail, and snow visited Asheville, N. C., about 11 p. m., causing minor damage. During a heavy thunder and hail storm at Wheeling, W. Va., at 11 p. m., several trees were struck by lightning.

28th.—A heavy windstorm prevailed from Colorado to South Dakota. At San Luis, Colo., a velocity of 60 to 75 miles per hour from the southwest was reported. High southeast winds prevailed at North Platte, Nebr. At Mitchell, S. Dak., the wind caused considerable damage to outhouses.

29th.—High southerly winds and heavy rain prevailed over a great part of California, causing some damage to fruit trees, etc. At Nevada City, Cal., rain and snow attended a heavy southeast wind. At Oleta, Cal., a heavy thunderstorm

was accompanied by rain and hail. At Salina, Kans., high wind, with rain and some hail, was reported. In the evening a storm passed near that place, destroying a number of houses, injuring several persons, and killing stock. A heavy wind and rain storm was reported in west-central Missouri.

31st.—Heavy gales and destructive tornadoes and thunderstorms occurred at night in Nebraska, Kansas, Oklahoma and Indian territories, Texas, Missouri, and Iowa. In Kansas 34 lives were lost, and property to the estimated value of about \$150,000 was destroyed. In Texas two lives were lost. At Nelson, Nebr., a tornado moved northeast at 6.15 p. m. in a path about one-fourth mile in width, preceded by heavy rain and attended by thunder, lightning, and hail. The storm seemed to strike the south and west sides of buildings first. Some of the debris was carried southeast, but a greater part was thrown northeast with the storm. Five persons were injured, and considerable damage was caused to buildings. In the evening a tornado moved northeast near Adgar, Nebr., with heavy rain, thunder and lightning, and hail, injuring several persons.

At Smolan, Kans., a tornado moved north-northeast in a path about 80 rods in width at 6.30 p. m., with rain and hail. The storm had a whirling motion, and property was destroyed to the value of \$4,000. About 8 p. m. a tornado visited Oak Hill, Kans., with thunder, hail, and rain following its passage; 2 children were killed, and 12 buildings valued at \$6,000 were destroyed. At De Graff, Kans., a thunderstorm moved northeast at 10.15 p. m., destroying property to the extent of \$2,500. At Topeka, Kans., the barometer fell .22 inch in the early morning and .24 inch during the day. The wind increased to brisk at 6.45 a. m., and to high at 8.30 p. m., and blew at the rate of about 30 miles per hour until sunset, after which it increased in force. At Towanda, Kans., a tornado moved north at 9.15 p. m. in a path about one-fourth mile in width, killing 8 persons, and destroying buildings valued at \$15,000. The storm was attended by heavy thunder, rain, and hail, and revolved in a direction contrary to the movement of the hands of a watch.

At Strong City, Kans., a tornado moved northeast at 11 p. m.; 4 persons were killed, and the damage to property was estimated at \$10,000. At Kiowa, Kans., a heavy thunderstorm began 8.30 p. m. and continued until after midnight, damaging property to the extent of about \$15,000. A tornado moved northeast near Wellington, Kans., at 9 p. m., in a path about one-fourth mile in width, with heavy rain, large hail, thunder, and lightning. The storm had a whirling motion; 6 persons were killed. One person was killed at Liberty, Kans. At Seneca, Kans., a thunderstorm, with hail, occurred 8 p. m. Near Salina, Kans., a tornado moved north-northeast at 6.30 p. m., with heavy rain and some hail. A clearly-defined funnel-shaped cloud was observed to rise and fall, and to the east of this cloud numerous small whirling storms developed; damage to property about \$100,000.

Near El Dorado, Kans., a funnel-shaped cloud moved northeast, followed by very heavy rain. A destructive storm, causing the death of one person, was reported east of Vine Creek, Kans., at 8 p. m. About midnight a tornado moved northeast near Wamego, Kans., destroying everything in a path about 40 rods in width, and killing 5 persons. The storm was attended by heavy thunder and rain. A tornado moved northeast near Florence, Kans., at 10 p. m., in a path 150 feet in width, killing 2 persons; the storm was attended by heavy thunder, rain, and hail. At Hesston, Kans., a south wind began about sunset. A heavy cloud formed in the southwest and moved northward, and a great commotion was observed in the clouds in the southwest; they seemed to lower towards the earth, widen out, and whirl from right to left. The wind continued a gale all night.

At Wichita, Kans., brisk and high southeast winds prevailed. Heavy rain began 9.20 p. m. and ended 11.30 p. m., with hail at 9.30 p. m. About 11 p. m. a tornado moved north-northeast near Eureka, Kans., in a path about 40 rods in

width, with thunder and hail. One person was reported killed at Rose Hill, Kans., one at South Haven, Kans., and 3 persons were killed at Augusta, Kans. A severe thunderstorm moved east over Oklahoma City, Okla., from 9 to 11 p. m., with high wind and hail at 10.03 p. m. High wind caused damage to buildings in Indian Territory. A tornado moved northeast near Bangs, Tex., at 9 p. m., in a path about one-half mile in width, with rain, large hail, thunder, and lightning. The storm had a whirling motion from west to south; one person was killed, and the damage to property in the county was about \$10,000.

A heavy south gale prevailed at Amarillo, Tex., on the 30th, changing to west the evening of the 31st. About 9 p. m. a tornado moved northeast at Santa Anna, Tex. The storm first appeared like a column of smoke, then assumed a funnel shape, and struck the outskirts of the town, destroying a number of buildings. One person was killed and 13 were injured. A second tornado passed along a parallel track about the same time, destroying a number of buildings, and injuring several persons. The storms had a whirling motion, and were attended by rain, hail, and vivid lightning. Near Trickham, Tex., a heavy thunderstorm moved northeast in a path about 300 yards in

width at 8.30 p. m., destroying property to the value of about \$2,000. At Abilene, Tex., the pressure decreased rapidly, with high temperature, brisk to high westerly winds, and a thunderstorm at 8.40 p. m. The storm moved from the southwest, with dashes of rain and hail, and with the first gust of wind from the west the temperature fell from 81° to 50°. Lightning continued until nearly midnight.

At El Paso, Tex., a violent gale prevailed from noon to 7 p. m., with a maximum velocity of 68 miles per hour and an extreme velocity of 82 miles at 5.25 p. m., and wind changing from southwest to northwest. At Warrensburgh, Mo., a thunderstorm moved northeast about midnight, causing damage to property to the extent of about \$10,000. At Adrian, Mo., houses were moved from their foundations by the force of the wind.

At Sioux City, Iowa, light rain began 9 p. m. Thunder was first heard 9.15 p. m., when heavy rain set in with a violent thunderstorm. At 11.15 p. m. the spire of a church was struck by lightning and torn from top to bottom, the pieces being scattered a distance of 100 yards. The positions in which tornadoes were reported on this date are shown on Chart VII.

INLAND NAVIGATION.

STAGE OF WATER IN RIVERS.

In the following table are shown 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, 1892 (in feet and tenths).

Stations.	Danger-point on gauge.	Highest water.		Lowest water.		Monthly range.
		Date.	Height.	Date.	Height.	
<i>Red River.</i>						
Shreveport, La.	29.9	31	16.1	16	7.6	8.5
<i>Arkansas River.</i>						
Fort Smith, Ark.	22.0	26	16.0	7	6.0	10.0
Little Rock, Ark.	23.0	27	18.9	1	8.5	10.4
<i>Missouri River.</i>						
Fort Buford, N. Dak. *						
Kansas City, Mo.	21.0	29	15.3	2.4	5.9	9.4
<i>Mississippi River.</i>						
Saint Paul, Minn. †	14.0	11, 12, 13	5.0	26	2.0	3.0
La Crosse, Wis. †	11.8					
Dubuque, Iowa †	16.0	13	5.5	22, 23, 24	3.2	2.3
Davenport, Iowa	15.0	1, 10	4.0	12, 13	2.0	2.0
Keokuk, Iowa	14.0	31	5.2	15, 25, 26	2.8	2.4
Saint Louis, Mo.	30.0	10	18.6	23	12.0	6.6
Cairo, Ill.	40.0	31	33.3	9	23.6	9.7
Memphis, Tenn.	33.0	31	23.8	11, 12	16.9	6.9
Vicksburg, Miss.	41.0	3.4	33.6	15	28.0	5.6
New Orleans, La.	13.0	9	12.4	20, 21	10.3	2.1
<i>Ohio River.</i>						
Parkersburgh, W. Va.	38.0	30	21.7	21, 22	7.6	14.1
Cincinnati, Ohio	45.0	31	34.5	22	17.0	17.5
Louisville, Ky.	24.0	31	13.1	22	8.7	4.4
<i>Cumberland River.</i>						
Nashville, Tenn.	40.0	28	34.3	7	6.4	27.9
<i>Tennessee River.</i>						
Chattanooga, Tenn.	33.0	28	10.6	7	4.9	5.7
Knoxville, Tenn.	29.0	27	4.8	6	1.9	2.9
<i>Monongahela River.</i>						
Pittsburg, Pa.	29.0	28	16.2	22	3.8	12.4
<i>Savannah River.</i>						
Augusta, Ga.	32.0	27	27.0	24	8.3	18.7
<i>Willamette River.</i>						
Portland, Oregon	15.0	31	6.4	8, 9, 10	2.2	4.2
<i>Susquehanna River.</i>						
Harrisburg, Pa.	17.0	29	13.0	23, 24	2.6	10.4
<i>Alabama River.</i>						
Montgomery, Ala.	48.0	28	45.3	6	5.8	39.5

* River frozen.

† For 23 days.

‡ For 25 days.

ICE IN RIVERS AND LAKES AND OPENING OF NAVIGATION.

Lake Ontario.—The first vessel of the season arrived at Charlotte, N. Y., on the 31st. She cleared and returned to Toronto in the afternoon. The captain reported considerable ice in the Lake.

Lake Erie.—A steamer from Detroit, Mich., arrived at Cleveland, Ohio, on the 28th, and returned to Detroit on the 29th.

This was the first boat of the season. The first boat of the season left Toledo, Ohio, for Monroe, Mich., on the 24th.

Lake Michigan.—Two barges and a schooner, the first of the season, cleared from Manistee, Mich., for Chicago, Ill., on the 31st. The Straits of Mackinac were reported open for navigation on the 15th.

Hudson River.—On the 28th a steamer of the Albany and Newburgh Line passed down the river, opening navigation.

The Raritan River at New Brunswick, N. J., was covered with ice the early part of the 14th.

Susquehanna River.—At Wilkes Barre, Pa., the river was full of floating ice on the 12th. On the 19th the river was clear of ice. At Lock Haven, Pa., the West Branch of the Susquehanna River was partly frozen on the 1st and 2d; frozen on the 3d; 5th, river clear of ice; 14–15th, floating ice; 16th, river clear of ice; 18th, slush ice; 19th, river clear; 21st–24th, frozen; 25th, river clear of ice.

Floating ice was reported in the Alleghany River at Pittsburg, Pa., from the 15th to 21st.

At Detroit, Mich., the river was full of floating ice on the 24th and 25th. The steamer that left for Cleveland, Ohio, encountered heavy ice about 15 miles from Cleveland.

Floating ice was reported in the Saint Clair River from the 24th to 27th. The ice began to break up at Marine City, Mich., the morning of the 25th.

The Grand River was opened at Lansing, Mich., on the 2d. The Wisconsin River opened at Plover, Wis., on the 27th.

The Fox River opened at Green Bay, Wis., on the 26th.

The Saint Croix River opened at Osceola Mills, Wis., on the 30th.

At Saint Vincent, Minn., the Red River of the North rose rapidly and the ice began to break up on the 30th.

Mississippi River.—At Saint Paul, Minn., the harbor and as far down as Dayton's Bluff was nearly clear of ice on the 6th; elsewhere the ice gorge remained. On the 8th ice moved out in the early morning. The river was frozen on the 11th. At Prairie du Chien, Wis., the river opened on the 24th. At Red Wing, Minn., a channel was cut in the ice by ferry boats on the 2d; 5th, ice broke up and river opened as far as could be seen; 9th, large fields of floating ice caused ferry boats to discontinue trips; 10th, river frozen; 11th river frozen and persons crossing on the ice; river reported opened from Winona down; 14th, ferry resumed trips by cutting a channel through the ice; 25th, river opened as far as can be seen; ice on Lake Pepin melting rapidly and unsafe for teams. At Davenport, Iowa,