

the range of the storm, about one hundred and fifty yards from the point of observation, and the rain was heavier during and after than before its passage; no hail fell. Quantities of timber and movable articles were carried up in the storm, and, although there is good testimony of a whirling motion, I was not close enough to clearly observe this motion. Timber on the north side of the track generally fell toward the south-east; in the track, toward northeast by east; and on the south side of the track, toward north-northeast; and, in rare cases, toward north by west. A far greater number of trees fell on the south side than on the north side of the centre of the storm's path, and their direction was often nearly due north. The storm appeared to divide toward the end of its path; one small part passing over or close by my house, and the other took the same course about one hundred and fifty yards farther on. A chimney on a house was blown down and a tree broken, while there was scarcely any wind where I stood, about one hundred and fifty feet farther on. A large piece of boarding, for bills, fully four hundred feet farther north from the line of the storm than my position, was thrown over and fell south. No persons were killed or seriously injured, and the damage to property approximated \$15,000. This storm, or another one, came down about four miles to the northeast by east and destroyed a barn, but beyond this no further sign was seen in or near this county."

A storm passed through Tipton county, Tennessee, beginning at 2.45 p. m.; great damage was done by wind and hail; the rainfall, exclusive of the hail, was 1.20 inch in thirty minutes; the general direction of the storm was a little south of east, and the direction of the wind whirl was contrary to the movement of the hands of a watch; a severe wind storm prevailed at Memphis, Tenn., in the evening, and considerable damage was done to property and shade trees, and several boats sustained injury; a destructive storm visited Venago county, Pennsylvania, destroying buildings, killing or injuring several persons, and washing out railroad tracks; a hail storm, moving northeast, and accompanied by thunder and lightning, began at Stockton, Cal., at 5.45 p. m., and continued about seven minutes; the hail-stones were about the size of small peas; hail also fell at Nicolaus and Sutter Creek, but no damage was done. On the 12th a heavy wind storm visited Terre Haute, Ind., causing considerable damage to buildings and trees; a severe thunder-storm began at Saint Louis, Mo., at 7.45 p. m., and the wind attained a velocity of sixty miles per hour, without causing material damage; a heavy rain storm, attended by high wind, occurred at Meridian, Miss., causing damage to bridges, etc., and a severe hail storm was reported four miles west of that place. On the 13th a cloud-burst was reported at Mammoth Springs, Ark. On the 15th a heavy rain storm swept over Camp Peña Colorado, Tex., on a path almost parallel with that followed by the storm of the 5th; the storm continued fifty-five minutes; a heavy wind storm, moving northeast, commenced at Wahpeton, N. Dak., at 6 p. m., and continued about ten minutes, causing destruction to property in that

section to the value of about \$2,500. On the 17th a thunder-storm, attended by rain and some hail, began at Leavenworth, Kans., at 9.17 p. m., and hail caused damage to fruit about four miles east of that place.

On the 18th a thunder-storm of unusual severity passed south-eastward over Saint Louis, Mo., and continued from 4 p. m. to 5.05 p. m.; large hail and heavy rain fell, the hail-stones covering the ground to a depth of one-half inch, and the precipitation for the sixty-five minutes was 2.28 inches, 2.23 inches of which fell in fifty minutes, and portions of the city were flooded to a depth of three feet; a destructive hail storm occurred at Fairbury, Nebr., destroying fruit, etc., within an area about one-half mile wide and three miles long; a severe storm passed over Wayne county, Ohio, between 3 p. m. and 4 p. m.; much damage was caused to buildings and trees by the wind, and many sheep were killed by hail; severe gales prevailed on Lakes Erie, Huron, and Michigan; crops were damaged near Dupont, Ga., by heavy hail. On the 20th houses were unroofed in Baltimore, Md., by wind, and in Frederick county, Maryland, hail injured fruit trees and crops; a severe rain storm occurred at Angelica, N. Y., during which a railroad bridge over the Genesee River was carried away, and other damage done by washouts. On the 22d a heavy thunder and rain storm occurred at Davenport, Iowa; a number of bridges over small streams were washed away, and railroads were damaged; heavy thunder-storms occurred at Logansport, Peru, and Marion, Ind., in the early morning; considerable damage was done near Peru by a cloud-burst, and houses were struck by lightning at Marion. On the 23d western Pennsylvania was visited by heavy rain, wind, and electrical storms, which caused considerable damage by flood, etc.; the northern counties of Kentucky and some of the more western counties of West Virginia were swept by heavy storms. On the 24th a tornado moving northeast passed southeast of Alma, Mich., at about 4 p. m., passing through the towns of Emerson and Wheeler, unroofing buildings and uprooting trees in a path about one-half mile wide; the storm was accompanied by thunder and lightning, and hail fell on its outer edges. On the 25th a heavy rain storm, accompanied by severe thunder and lightning, flooded streets and cellars and caused great damage at Johnstown, Pa.; heavy rain and electrical storms prevailed over Washington, Carroll, and Frederick counties, Maryland, at night. On the 29th a thunder-storm, accompanied by hail and heavy rain, began in the evening at La Crosse, Wis.; at about 3 a. m., 30th, hail-stones the size of walnuts fell, causing considerable damage to window glass; the storm was very destructive in Trempealeau county, and in the eastern part of Buffalo county, Wisconsin, where the rainfall was very heavy, carrying away dams and flooding streams. On the 30th a thunder-storm, with rain and hail, occurred at Blue Knob, Pa., commencing at 3.30 p. m.; hail the size of marbles fell to a depth of nearly one inch. On the 31st, at 12.40 p. m., a thunder-storm commenced at Parkersburgh, W. Va., moving from northeast of station towards the south; some of the hail-stones were one inch in diameter.

INLAND NAVIGATION.

FLOODS.

There was a general and marked fall in the lower Mississippi river and tributaries during the month, and much land in the river parishes of Louisiana which was inundated at the beginning of the month was being cultivated at its close. On the 1st the Mississippi River was 41.1 feet on the gauge at Helena, Ark., and 4.1 feet above the danger-line; 48.5 feet, and 7.5 foot above the danger-line at Vicksburg, Miss.; and 14.7 feet, and 1.7 foot above the danger-line at New Orleans, La. The Red River was 31.6 feet, and 2.6 feet above the danger-line at Shreveport, La., and the Arkansas River was 16.6 feet, and 0.6 foot above the danger-line at Fort Smith,

Ark., and 23.7 feet, and 0.7 foot above the danger-line at Little Rock, Ark. The Red River rose at Shreveport, La., until the 8th, when it stood at 34.6 feet on the gauge, and 5.6 feet above the danger-line. The country below Fulton, Ark., was flooded, and immense damage was caused to property and stock. The Pandora levee, about eight miles above Shreveport, La., broke at 9 p. m. of the 6th, and on the 7th the plantations across the river from Shreveport were flooded by backwater. After the 8th the Red River fell steadily at Shreveport, La., until the close of the month. The lower Mississippi river fell steadily throughout the month, save at Memphis, Tenn., where there was a slight rise until the 4th, and there was a marked rise in

the Arkansas River at Fort Smith, Ark., on the 20th and 21st, and a rise of about one and one-half foot at Little Rock, Ark., from the 23d to 25th. On the 2d the Arkansas River fell below the danger-line at Fort Smith and Little Rock, Ark. On the 6th the water was rising between the Mississippi River and Bayou Teche. On the 15th the Red River fell below the danger-line at Shreveport, La., and on the 15th and 16th there was a slight rise in the Mississippi River at New Orleans, La. On the 31st the Mississippi River at Vicksburg, Miss., was 41.4 feet, and 0.4 foot above the danger-line, and at New Orleans, La., the stage of the water was 13.8 feet, and 0.8 foot above the danger-line. Most of the country from Bayou Sara to the mouth of the Red River, Pointe Coupee parish, Louisiana, was under water, and from the mouth of the Red River to within twelve miles of Monroe, Ouachita parish, La., a distance of over two hundred miles, the country had been inundated for nearly three months, and from the Red River up the Black River, for a distance of eighty miles, much of the land was under water at the close of month.

Disastrous floods, resulting from heavy rain, were reported in Ontario, Canada, on the 5th. On the 6th the Brazos River, Texas, was overflowing its banks and rising. On the 15th heavy rain caused the inundation of bottom lands in the vicinity of Camp Peña Colorado, Tex. Reports of the 20th state that rivers and streams in central New York and northeastern Pennsylvania overflowed their banks, flooding streets in towns and villages, submerging the tracks and causing washouts on railroads, and delaying farming operations. The Willamette River, Oregon, rose steadily from the 10th, and on the 16th, 17th, and 18th the water attained a stage of twenty feet on the gauge at Portland, flooding the lower docks. On the 26th high water was reported in the upper Potomac river and its tributaries, and in many places the streams overflowed their banks. A cablegram to the "New York Herald," dated the 29th, stated that railroad communication had been interrupted and villages inundated in Cuba by excessive rains. Reports of the 31st stated that the lowlands along Kings River, Fresno Co., Cal., were flooded, and that bridges were carried away, stock drowned, and crops destroyed. In Tulare county, California, Tulare Lake extended five miles over the surrounding country, causing much damage. In Scott county, Iowa, the heavy rains of the month caused floods which carried away

bridges, devastated farms, and washed out highways. The report of the Nevada state weather service states that streams in that state overflowed as the result of melting of snow in the mountains. The Carson River was out of its banks the last fifteen days of the month, causing considerable damage.

STAGE OF WATER IN RIVERS AND HARBORS.

The following table shows the danger-points at the several stations; the highest and lowest water during May, 1890, with the dates of occurrence and the monthly ranges:

Heights of rivers above low-water mark, May, 1890 (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	8	34.6	31	23.8	10.8
<i>Arkansas River:</i>						
Fort Smith, Ark. ...	22.0	1	16.6	28	5.3	11.3
Little Rock, Ark. ...	23.0	1	23.7	30	9.3	14.4
<i>Missouri River:</i>						
Ft. Buford, N. Dak.		31	8.5	1	1.3	7.2
Sioux City, Iowa.		27	9.7	17	6.4	3.3
Omaha, Neb.	18.0	29	9.0	20, 21	6.5	2.5
Kansas City, Mo.	21.0	28	10.0	15, 16	6.4	3.6
<i>Mississippi River:</i>						
Saint Paul, Minn.	14.5	31	3.6	17, 18, 19	2.7	0.9
La Crosse, Wis.	24.0	1	7.0	17	4.2	2.8
Dubuque, Iowa.	16.0	1	10.0	22	4.9	5.1
Davenport, Iowa.	15.0	1	8.0	22	3.7	4.3
Keokuk, Iowa.	14.0	1	8.3	30, 31	4.0	4.3
Saint Louis, Mo.	32.0	1	18.3	23	11.8	6.5
Cairo, Ill.	40.0	1	36.7	11, 12	28.5	8.2
Memphis, Tenn.	34.0	4	29.3	21	22.8	6.5
Vicksburg, Miss.	41.0	1	48.5	31	41.4	7.1
New Orleans, La.	13.0	1	14.7	27	13.7	1.0
<i>Ohio River:</i>						
Pittsburgh, Pa.	22.0	24	22.0	4	6.3	15.7
Parkersburg, W. Va.	38.0	26	29.5	5	11.0	18.5
Cincinnati, Ohio.	50.0	30	41.3	6	24.2	17.1
Louisville, Ky.	25.0	25	16.4	1, 2, 6	10.2	6.2
<i>Cumberland River:</i>						
Nashville, Tenn.	40.0	25	28.2	6	14.0	14.2
<i>Tennessee River:</i>						
Chattanooga, Tenn.	33.0	22, 23	11.9	15	6.6	5.3
<i>Monongahela River:</i>						
Pittsburgh, Pa.	29.0	24	22.0	4	6.3	15.7
<i>Savannah River:</i>						
Augusta, Ga.	32.0	28	20.3	13, 14, 25, 26	7.0	13.3
<i>Willamette River:</i>						
Portland, Oregon.	15.0	20, 21	20.1	1	10.9	9.2

*On April 1st the zero of the gauge at Memphis, Tenn., was lowered one foot, and all stages of water reported for previous dates should have one foot deducted, for purposes of comparison.

ATMOSPHERIC ELECTRICITY.

AURORAS.

Auroras were reported as follows: 7th, South Canisteo, N. Y. 11th, Carson and Wesley, Iowa. 20th, Ardenia and Number Four, N. Y. 31st, Greenwood, W. Va.

THUNDER-STORMS.

The more severe thunder-storms of the month are described under "Local storms." East of the Rocky Mountains thunder-storms were reported in the greatest number of states and territories, thirty, on the 4th; in twenty-eight on the 14th; in twenty-five on the 1st, 5th, 18th, 24th, and 25th; in from twenty to twenty-four, inclusive, on the 3d, 10th, 11th, 12th, 13th, 14th, 17th, 19th, 20th, 23d, 30th, and 31st; and in from ten to nineteen, inclusive, on the 2d, 6th to 9th, 15th, 16th, 21st, 22d, 26th to 30th. There were no states east of the Rocky Mountains in which thunder-storms were not reported, and there were no dates on which thunder-storms were reported in less than ten states.

East of the Rocky Mountains thunder-storms were reported on the greatest number of dates, thirty, in Texas; on twenty-six in Florida and New York; on from twenty to twenty-five, inclusive, in Illinois, Indiana, Iowa, Kansas, Michigan, Missouri, Nebraska, North Carolina, Ohio, Pennsylvania, and Virginia; on from ten to twenty, inclusive, in Alabama, Arkansas, Georgia, Indian Territory, Kentucky, Louisiana, Maryland,

Massachusetts, Minnesota, Mississippi, New Jersey, South Carolina, South Dakota, Tennessee, West Virginia, and Wisconsin; on from one to nine, inclusive, in Connecticut, District of Columbia, Maine, Montana, New Hampshire, North Dakota, Rhode Island, and Vermont. West of the Rocky Mountains thunder-storms were reported as follows: Arizona, 28th; California, 4th, 6th, 10th, 24th, 26th, 27th, 28th, and 31st; Colorado, 2d, 3d, 8th, 9th, 10th, 12th, 13th, 16th, 20th, 22d, 23d, 27th to 30th; Idaho, 1st, 7th, 8th, 10th, and 31st; Nevada, 1st, 3d to 7th, 9th, 16th, 26th, 27th, 28th, and 30th; New Mexico, 1st to 5th, 9th to 13th, 21st, 23d, 24th, 29th, and 30th; Oregon, 5th, 6th, 7th, 9th, 10th, 25th, and 30th; Utah, 1st, 8th, and 30th; Washington, 7th, 8th, 19th, and 30th; Wyoming, 3d and 8th. There were no states or territories west of the Rocky Mountains in which thunder-storms were not reported.

On the 4th, when thunder-storms were most prevalent east of the Rocky Mountains, a low pressure storm moved from the middle Mississippi valley to western Pennsylvania; a low pressure area extended from New York to Texas, and thunder-storms were reported on the eastern slope of the Rocky Mountains and in all districts lying east of the Mississippi River. On the 14th, when thunder-storms occurred from the Rocky Mountains eastward, south of the Lake region, to the Atlantic coast, three low pressure storms appeared, one over the Saint Lawrence Valley, one over the Lake region, and one in the extreme northwest.