

Hail storms of less violence occurred in the various states and territories as follows:

- Alabama.*—Green Springs, 9th.
- Arizona.*—Fort Grant, 28th.
- California.*—Princeton, 4th; Los Angeles, 13th; Fort Bidwell, 23d.
- Colorado.*—West Las Animas, 5th, 6th, 9th, 16th; Pueblo, 9th, 16th, 20th; Denver, 14th; Pike's Peak, 27th, 28th, 30th.
- Dakota.*—Deadwood, 3d, 27th; Fort Bennett, 5th, 15th, 21st, 25th; Richardton, 6th, 14th; Fort Sully, 11th, 14th; Fort Yates, 17th; Fort Buford, 26th, 27th, 28th; Fort Lincoln, 28th; Bismarck, 28th.
- Georgia.*—Atlanta, 20th.
- Illinois.*—Polo, 1st, 18th; Chicago, 2d.
- Indiana.*—Spiceland, 1st; Indianapolis, 9th; Clinton, 24th.
- Iowa.*—Indianola, 13th.
- Kansas.*—Dodge City, 6th; Wyandotte, 7th, 8th, 13th; Sherlock, 11th; Salina, 25th.
- Maine.*—Portland, 6th.
- Massachusetts.*—Taunton, 7th.
- Michigan.*—Marshall, 24th.
- Missouri.*—Saint Louis, 3d, 8th.
- Montana.*—Fort Custer, 5th, 10th; Fort Assinaboine, 13th, 28th; Fort Ellis, 27th.
- Nebraska.*—Red Willow, 11th, 25th; Yutan, De Soto, and Marquette, 25th; North Platte, 30th.
- New Hampshire.*—Mount Washington, 3d, 6th, 7th.
- New Mexico.*—Fort Union, 30th.
- New York.*—Humphrey, 9th.
- North Carolina.*—Statesville, 11th; Brevard, 21st.
- Ohio.*—Westerville, 2d.
- Pennsylvania.*—Wellsborough 24th.
- Tennessee.*—Ashwood, 7th.
- Texas.*—Fort Concho, 2d; Cleburne, 2d, 3d; Clarksville, 8th; Fort Stockton, 12th.
- Vermont.*—Charlotte and Lunenburg, 6th.
- Virginia.*—Norfolk, 8th; Wytheville, 10th.
- Washington Territory.*—Bainbridge Island, 3d.
- Wisconsin.*—Embarras, 8th.

RAIN FROM A CLOUDLESS SKY.

Mr. A. C. Willsams, of Elk Falls, Elk County, Kansas, reports that rain fell from a cloudless sky at that place on the 16th.

Table of rainy and cloudy days, relative humidity, and dew-point for June, 1884.

Districts.	Rainy days.	Cloudy days.	Rel. humidity. %	Dew-point.
			<i>Percentages.</i>	
			From 66.0 to 83.8	From 48.0 to 57.1
New England.....	From 5 to 7	From 2 to 7	58.6 " 85.4	55.9 " 64.2
Middle Atlantic states.....	" 4 " 14	" 3 " 12	74.7 " 84.9	61.5 " 69.3
South Atlantic states.....	" 9 " 21	" 6 " 16	74.2 " 78.6	69.0 " 72.5
Florida peninsula.....	" 10 " 21	" 3 " 5	72.4 " 79.1	66.6 " 69.2
East Gulf states.....	" 13 " 19	" 4 " 11	72.4 " 79.1	66.6 " 69.2
West Gulf states.....	" 6 " 12	" 0 " 4	73.7 " 80.7	65.8 " 72.8
Rio Grande valley.....	" 1 " 11	" 6 " 11	62.9 " 80.2	69.9 " 72.3
Ohio valley.....	" 9 " 12	" 6 " 12	64.6 " 75.6	59.7 " 65.8
Tennessee.....	" 17 " 19	" 10 " 13	75.7 " 80.7	62.4 " 65.2
Lower lake region.....	" 4 " 13	" 1 " 7	67.4 " 73.7	55.2 " 60.3
Upper lake region.....	" 6 " 15	" 2 " 8	66.9 " 78.4	47.5 " 56.8
Extreme northwest.....	" 7 " 10	" 2 " 8	66.0 " 78.8	52.8 " 60.7
Upper Mississippi valley.....	" 11 " 18	" 4 " 12	68.7 " 82.9	58.6 " 67.7
Missouri valley.....	" 7 " 10	" 1 " 4	67.4 " 75.4	59.3 " 63.6
Northern slope.....	" 7 " 16	" 1 " 9	51.5 " 70.4	40.7 " 59.3
Middle slope.....	" 9 " 13	" 0 " 4	53.4 " 74.2	47.2 " 62.3
Southern slope.....	" 6 " 14	" 1 " 3	57.6 " 67.9	53.6 " 64.3
Southern plateau.....	" 2 " 8	" 1 " 5	24.9 " 59.7	33.0 " 43.4
Northern plateau.....	" 7 " 18	" 7 " 8	66.7 " 67.4	49.2 " 55.6
North Pacific coast region.....	" 14 " 16	" 11 " 18	67.3 " 86.9	50.0 " 51.2
Middle Pacific coast region.....	" 7 " 10	" 6 " 14	59.4 " 85.5	50.2 " 55.1
South Pacific coast region.....	" 0 " 6	" 1 " 13	41.9 " 78.4	52.6 " 57.1
Mt. Washington, N. H.....	Thirteen	Two	78.2	41.7
Pike's Peak, Colo.....	Ten	Three	79.7	25.0
Salt Lake City, Utah.....	Four	Two	39.4	41.0

* Relative humidity corrected for altitude.

COTTON REGION REPORTS.

From the following table it will be seen that the precipitation for June, 1884, in the cotton regions exceeded the average for the same month in the two preceding years, in all of the districts, except that of New Orleans, where a deficiency of 1.35

is shown. For the district of Atlanta the excess is nearly six inches, and it exceeds two inches in the districts of Savannah, Montgomery, and Mobile; in the remaining districts the excesses varied from about normal for Vicksburg to 1.68 inches for Augusta. The means of the maximum and minimum temperatures were generally lower by from 1° to 6° in all districts.

Temperature and rainfall data for the cotton districts, June.

Districts.	Rainfall.			Temperature.			Extremes for June, 1884.		
	Average for June of two preceding years.	Average for June, 1884.	Departures.	Maximum.		Minimum.			
				Mean for June of two preceding years.	Mean for June, 1884.	Mean for June of two preceding years.	Mean for June, 1884.		
New Orleans.....	5.54	4.19	- 1.35	90.4	89.4	72.1	68.1	4.0	102
Savannah.....	5.45	6.05	+ 0.60	90.5	85.7	4.6	55.1	- 5.7	106
Charleston.....	4.88	6.28	+ 1.40	90.2	84.9	5.3	64.8	- 2.4	98
Atlanta.....	3.36	9.13	+ 5.77	88.7	82.5	6.2	66.8	- 4.3	98
Wilmington.....	4.54	9.01	+ 4.47	89.4	84.4	5.0	66.4	- 3.9	100
Memphis.....	3.71	5.20	+ 1.49	86.3	83.3	3.0	67.1	- 3.9	100
Galveston.....	2.79	5.26	+ 2.47	92.9	90.6	2.3	71.3	- 2.7	100
Vicksburg.....	3.44	2.54	- 0.90	91.0	87.7	3.3	69.4	- 1.9	98
Montgomery.....	4.42	2.15	- 2.27	90.4	85.2	5.2	69.4	- 1.4	101
Augusta.....	4.66	6.34	+ 1.68	90.4	85.2	5.2	68.3	- 1.7	103
Little Rock.....	2.55	6.25	+ 3.70	90.6	87.7	2.9	65.8	- 0.5	103
Mobile.....	3.57	6.30	+ 2.73	93.6	87.9	5.7	68.5	- 2.7	106

WINDS.

The most frequent directions of the wind for the month of June, 1884, are shown on chart ii. by arrows flying with the wind. In western New York, New England, and on the middle Atlantic coast the most frequent directions were from south to west; in the southern slope, along the immediate Gulf coast, in the Missouri valley and extreme northwest, they were generally from the south; in the lake region, upper Mississippi and Ohio valleys, and Tennessee, they were from northeast to southeast; on the Pacific coast, from north to west.

TOTAL MOVEMENTS OF THE AIR.

[In miles.]

In the following table are given the stations reporting the largest and smallest total movements of the air in each of the various districts:

Districts.	Stations reporting largest.	Miles.	Stations reporting smallest.	Miles.
New England.....	Block Island, R. I.....	8,816	Eastport, Maine.....	3,341
Middle Atlantic states.....	Del. Breakwater, Del.....	11,441	Lynchburg, Va.....	2,053
South Atlantic states.....	Kitty Hawk, N. C.....	10,298	Augusta, Ga.....	2,929
Florida peninsula.....	Cedar Keys.....	6,885	Sanford.....	4,627
Eastern Gulf states.....	Pensacola, Fla.....	5,401	Vicksburg, Miss.....	3,675
Western Gulf states.....	Indianola, Tex.....	6,217	Fort Smith, Ark.....	2,466
Rio Grande valley.....	Rio Grande City, Tex.....	5,294	Brownsville, Tex.....	4,459
Tennessee.....	Nashville.....	3,524	Chattanooga.....	3,034
Ohio valley.....	Louisville, Ky.....	3,995	Cincinnati, Ohio.....	3,078
Lower lake region.....	Sandusky, Ohio.....	8,150	Toledo, Ohio.....	3,484
Upper lake region.....	Escanaba, Mich.....	5,770	Marquette, Mich.....	3,974
Extreme northwest.....	Moorhead, Minn.....	8,632	Bismarck, Dak.....	5,804
Upper Mississippi valley.....	Saint Louis, Mo.....	6,581	Keokuk, Iowa.....	2,077
Missouri valley.....	Huron, Dak.....	6,728	Leavenworth, Kans.....	2,389
Northern slope.....	Fort Assinaboine, Mont.....	7,250	Deadwood, Dak.....	4,124
Middle slope.....	Dodge City, Kan.....	7,556	West Las Animas.....	5,174
Southern slope.....	Fort Stockton, Tex.....	6,661	Fort Davis, Tex.....	4,358
Southern plateau.....	Fts. Grant & Verde, Ariz.....	5,028	El Paso, Tex.....	3,116
Middle Plateau.....	Salt Lake City, Utah.....	4,875		
Northern plateau.....	Dayton, Wash. T.....	3,777	Lewisville, Idaho.....	1,010
North Pacific coast region.....	Fort Canby, Wash. T.....	6,574	Olympia, Wash. T.....	1,300
Middle Pacific coast region.....	Cape Mendocino, Cal.....	12,665	Red Bluff, Cal.....	4,733
South Pacific coast region.....	San Diego, Cal.....	4,478	Yuma, Ariz.....	3,553

On the summits of Mount Washington, New Hampshire, and Pike's Peak, Colorado, the total movements of the air were 19,090 and 13,244 miles, respectively.

HIGH WINDS.

On the summit of Mount Washington, New Hampshire, maximum velocities of fifty miles or more per hour occurred as follows: 60, nw., 4th; 50, nw., 5th; 64, nw., 7th; 56, nw., 8th; 64, w., 9th; 69, nw., 13th; 72, nw., 16th; 74, nw., 21st; 68, sw., 24th; 68, sw., 25th.

The following high velocities were reported from Pike's Peak, Colorado: 64, sw., 10th; 78, sw., 11th; 92, sw., 12th; 60, sw., 13th; 60, s., 14th; 70, w., 16th; 66, w., 24th; 52, w., 26th.

Other stations reporting velocities of fifty miles or more per hour are as follows:

Cape Mendocino, California, 54, se., 2d; 64, se., 23d.
 Omaha, Nebraska, 56, n., 25th.
 Sandy Hook, New Jersey, 50, e., 26th.
 Barnegat, New Jersey, 59, e., 26th.
 Atlantic City, New Jersey, 52, ne., 26th.
 Delaware Breakwater, Delaware, 56, ne., 14th, 26th, and 27th.

LOCAL STORMS.

California.—Red Bluff: a violent storm, causing great damage to the grass crop, occurred twelve miles south of this place on the 2d. It is estimated that the rain storm of the 13th caused damage to the amount of \$100,000 in this (Tehama) county.

San Francisco, 12th: the heavy rains of the past two weeks have caused great damage to crops in this state. The June rains of the present year have been the heaviest that have occurred in that month since 1870. Reports from fifteen different localities state that the hay crop has been almost entirely destroyed, and that rye and barley have been severely damaged.

Dr. J. B. Trembley, of Oakland, reports that from the 7th to 13th, an almost continuous storm prevailed, which, for duration, violence and the amount of precipitation, has never been equaled in California during the month of June.

Connecticut.—New London: the rainfall accompanying the storm on the 25th and 26th was the heaviest that has been recorded at this place since Signal Service observations were begun, in 1871. The total precipitation during the storm was 5.97 inches, nearly all of which fell within twelve hours.

Dakota.—Huron: much damage was done to the telegraph wires and poles by lightning during the storm of the 7th. Reports from points northwest of this station state that the rainfall accompanying the storm was unusually heavy. On the 15th a severe storm which destroyed several small buildings, occurred at Blunt, a town about eighty miles west of Huron.

Delaware.—Delaware Breakwater: a violent northeasterly gale occurred on the 26th, the wind reaching a velocity of fifty-six miles per hour. The bark "Vasco de Gama" from Cienfuegos to Philadelphia, with a cargo of sugar valued at \$50,000, parted her cables and dragged anchor while lying at this place. To prevent sinking she was run ashore.

Illinois.—Havana, Mason county: at 4 p. m. of the 22d at a point six miles southeast of this place, a small funnel-shaped cloud was observed passing from southwest to northeast. The cloud is described as having resembled the trunk of an elephant and was accompanied by terrific peals of thunder. There was very little wind and no rain. When the end of the cloud struck the earth a dense black smoke arose which enveloped it. The cloud afterwards divided into two parts—one part passing through a cornfield and the other through a field of wheat, leaving well-marked narrow tracks.

Iowa.—Des Moines: reports from Crawford county state that a destructive storm swept through the Bayer valley between 10 and 11 p. m. of the 14th. Considerable damage was done to the buildings and crops along the Bayer valley and on the adjacent hills.

Kentucky.—Louisville: the steamer "J. & W. Gaff," from Cincinnati to Memphis, reports having encountered a very severe storm on the Ohio river, during the afternoon of the 8th, when about sixteen miles below Madison, Indiana. The steamer had both smoke-stacks blown over, and sustained other damage. At Louisville a thunder-storm with heavy rain prevailed but no damage was done.

Maryland.—Annapolis: during the storm of the 13th the sloop "Rachel Bromall" was sunk near Thomas' Point.

Baltimore: the storm on the night of the 26-27th was very severe in Washington and Carroll counties. The Western Maryland railroad was badly washed in several places, one of

the breaks being eight hundred yards long. Over one hundred head of cattle on the farms bordering on Double-Pipe Creek were drowned. The Monocacy river rose to a greater height than has been known for twenty-five years. In Cecil county, bridges, mills and dwellings were carried away. One of the most serious losses was that caused by the breaking of the Chesapeake and Ohio Canal, near Harper's Ferry, where about three hundred feet of the bank were washed away. On the 27th it was estimated that the losses caused by this storm in Carroll, Cecil, Frederick, Harford and Washington counties would aggregate \$500,000.

Massachusetts.—New Bedford: the storm during the night of the 25-26th was very severe. The streets were flooded to a depth of one foot. Much damage was done by lightning.

Michigan.—Marshall, Calhoun county: a severe squall, which blew down trees and caused other damage, occurred between 1.45 and 2 p. m. of the 24th.

Minnesota.—Minneapolis: a severe wind and rain storm occurred on the afternoon of the 12th, during which the Coliseum building was struck by lightning and set on fire.

Montana.—Helena: at 4 p. m. of the 7th a "cloud-burst" occurred at Unionville, four miles south of this station; no rain fell at Helena, although the streets were flooded with water from the overflow at Unionville. On the 22d a "cloud-burst" occurred in the mountains near Corbin's, twenty-two miles south of Helena. A volume of water eight feet in depth rushed down the gulch toward Jefferson, and in its course washed away a house, drowning three of the occupants. An alarm was telephoned to Jefferson and the people of that place took refuge in the neighboring hills, but the water spread before reaching the town, and only a few small frame buildings were washed away. One-fourth of a mile of the Helena and Jefferson railroad track was washed away, and considerable damage was done to crops, and to goods in the stores on the ranches.

Nebraska.—Omaha: at 12.09 p. m. of the 25th, a severe thunder storm passed over this city from north to south. The wind attained a velocity of fifty-six miles per hour, causing considerable damage to outbuildings, signs, etc.

Nevada.—Despatches received at San Francisco, California, on the 10th, from Rye Patch, Humboldt county, Nevada, report the occurrence of a "cloud-burst" in the Humboldt mountains. The surrounding valleys were flooded and the Central Pacific railroad track was badly washed in places for a distance of thirty miles.

New Jersey.—Somers Point: a severe storm prevailed on the 26th; trees were uprooted and buildings damaged; three small vessels in the harbor were blown ashore, one of which was sunk.

Cape May: during the storm of the 26th, the schooner "A. H. Hurlburt" sprung a leak and put into this port for repairs. The wind attained a velocity of forty-eight miles per hour at Cape May.

Barnegat City: a northeasterly gale set in at 5 p. m. of the 26th, and continued with great force during the day. At 7 a. m. the wind attained its greatest force, fifty-nine miles per hour from the east. Cars standing on the narrow-gauge railroad were blown over, and window shutters, etc., were wrenched from the buildings. The schooner "L. & A. Babcock," from Philadelphia to Boston, sprung a leak, and, to prevent foundering at sea, was beached about two miles north of Barnegat at about 5 p. m. The vessel went to pieces in less than two hours after striking the bar and six of her crew were drowned. This storm is considered to have been the severest that has occurred during the month of June, since the establishment of the signal station at this place.

New York.—Albany: a destructive storm is reported to have occurred at Knowersville, (twenty miles west), at about 11.30 a. m. of the 9th; considerable damage was caused by lightning during the storm.

Humphrey, Cattaraugus county: the storm on the afternoon of the 23d was one of the severest that has occurred in this vicinity for several years. More than three inches of rain fell

which flooded streams and washed away bridges, fencing, etc. Several barns were struck by lightning and with their contents were burned.

Rochester: during the storm on the 23d, the rainfall at Clyde, Wayne county, was the heaviest ever known to have fallen at that place. The sewers were not capable of carrying off the large volume of water, and for one hour the streets were flooded; several objects were struck by lightning. At Rochester very heavy rain fell from 12.10 to 12.45 p. m., 0.89 inch having fallen in that time.

Saratoga: a violent wind and rain storm passed over this part of the state on the afternoon of the 24th; many barns and other buildings were struck by lightning. Reports from Litchfield Springs state that the storm was also severe at that place and that numerous buildings were damaged by lightning.

New York City: light showers of rain fell during the afternoon of the 25th; after 9 p. m. a heavy rain began and continued, with a few short intervals, until noon of the 26th, the total rainfall during the storm being 3.63 inches. Since the establishment of this station in November, 1870, there have been only two instances of a heavier rainfall, viz: 3.80 on July 26, 1872, and 4.02 on October 4, 1882.

North Carolina.—Marion, McDonough county, 27th: the recent heavy rains caused destructive freshets in the western part of this state. Two large trestles on the Mountain Division of the Western North Carolina railroad were washed away, and the cotton and tobacco crops were badly injured. The damage caused by the storm in western North Carolina is estimated at \$200,000.

Ontario.—London: the heavy rain storm on the night of the 9–10th, caused a washout near Dorchester station on the Grand Trunk railroad, eight miles west of this city.

Hillsburg: a severe thunder storm passed over this region during the night of the 21–22d. Considerable damage was caused by washouts on the railroad. At Oxford a hotel was struck by lightning and badly damaged.

Oregon.—Lakeview: on the 9th this place was flooded by a "cloud-burst," which occurred on the mountains about one mile distant. Very heavy rain fell from 7.30 to 8 p. m.; this storm is considered to have been the severest that has occurred in this vicinity for many years.

Pennsylvania.—Harrisburg: a destructive storm, accompanied by a very heavy rainfall, occurred in the Cumberland valley during the evening of the 10th. About one-half mile of the track of the Cumberland Valley railroad east of Newville was washed away. The storm's path was about one-half mile in width and was very destructive to buildings, fences, and grain crops. In this city a severe thunder storm prevailed, during which a number of buildings were struck by lightning and two persons killed.

Curwensville, Clearfield county: a storm of great violence passed over this vicinity during the night of the 10–11th. At 1 a. m., Anderson creek, which divides the town, overflowed and flooded the low grounds. At 8 a. m. of the 11th a large dam, eight miles above the town, gave way and a large quantity of lumber was washed away. A number of small bridges west and north of here were also destroyed. At Bridgeport, one mile from Curwensville, a number of houses and barns were swept away.

Pittsburg: on the 11th the Allegheny valley was visited by one of the heaviest rain storms known for many years. A "cloud-burst" occurred in the vicinity of Brookville, and the creek at that place rose ten feet in less than two hours. The rise was so sudden that no preparation could be made for it, and the dams at several mills gave way, and lumber valued at \$75,000 was washed away. At Pittsburg the Allegheny river rose very rapidly, and a number of coal barges were swept from their moorings. Reports from New Martinsville, West Virginia, state that a violent thunder storm prevailed at that place on the night of the 11–12th. A violent thunder storm passed over portions of western Pennsylvania and eastern Ohio

on the 24th, causing much damage to property, principally by lightning. At Washington, Pennsylvania, a large planing mill was struck by lightning and burned, entailing a loss of \$20,000.

Erie: a severe thunder storm, accompanied by very heavy rain, occurred at 7 p. m. of the 23d. Numerous buildings were struck by lightning during the storm.

Reading: the storm of the 25–26th did great damage to crops throughout Berks county, especially to wheat. At Birdsborough a large part of the Schuylkill canal bank broke during the morning, and flooded many of the adjacent fields.

Lancaster, Lancaster county: the storm on the night of the 25–26th was very destructive in this county. The wheat and tobacco crops were badly damaged, and in some places entirely ruined. Traffic on the Philadelphia and Reading railroad was suspended on account of the washing away of several bridges. Many houses in Lancaster were flooded and much damage sustained.

Rhode Island.—Point Judith: a very heavy rain storm began at 5.50 p. m. of the 25th and continued until 2.35 p. m. of the 26th, during which time 5.29 inches of water fell.

Providence: much damage was done at places north of this city by the storm (low area vi.) of the 25th. At Pawtucket, five miles north, six inches of rain fell, 3.26 inches having fallen at Providence. At Central Falls the storm is reported to have been the most destructive that has occurred for many years. The rainfall was very heavy and flooded the streets and sewers. Reports from Woonsocket also state that the storm at that place was unusually severe.

Tennessee.—Chattanooga: the total rainfall for the twelve hours and thirty-five minutes, ending at 8.40 a. m. of the 7th, was 3.45 inches, which is the heaviest for that length of time that has occurred here since the opening of this station. The streets were flooded and in some places rendered impassable. On the 25th a "cloud-burst" occurred on the opposite side of the Tennessee river north of this city. Stringer's branch, a stream in that vicinity, rose to a greater height than was ever before known, and caused damage by washing away the wheat shocks along its banks.

Texas.—El Paso: on the afternoon of the 18th, a severe thunder storm passed over this station from west-southwest to east-northeast. The wind reached a velocity of thirty-seven miles per hour, causing considerable damage to buildings.

Corsicana: a storm occurred at this place on the 13th which blew the roofs from two houses and prostrated many trees.

Vermont.—Springfield, Windsor county: the heavy rains of the 9th and 10th caused a very destructive freshet at this place. All of the streets were badly washed, and the water flooded many buildings. The damage to business interests in Springfield is estimated at \$50,000. All roadways in the surrounding country were rendered impassable from washouts and landslides. The grass crop in many sections was entirely ruined and other crops under cultivation were badly damaged. This is considered the most destructive freshet that has occurred since 1869, and no accurate estimate of the damage caused can be made.

Wisconsin.—La Crosse: on the afternoon of the 21st a severe storm of wind and rain passed over this place; the rainfall amounted to 1.32 inches, nearly all of which fell in about twenty minutes.

Neillsville, Clark county: at 3 p. m. of the 24th a severe storm of wind and rain occurred in this vicinity. A dwelling, six miles east, was struck by lightning and burned; one of the occupants was killed.

NAVIGATION.

STAGE OF WATER IN RIVERS.

The Mississippi river was at its highest stage between the 1st and 12th at all stations from Saint Paul, Minnesota, to New Orleans, Louisiana, except at Cairo, Illinois, where it was highest on the 18th; the lowest stages were observed on