

Ohio.—Toledo, Sandusky, Garrettsville, and North Lewisberg, 3d; Tiffin, 2d; Cleveland, 23d.

Oregon.—Lakeview, 13th.

Pennsylvania.—Erie, 3d; Leetsdale, 12th; Wellsboro, 1st; Mahanoy Plane, 3d, 4th.

Vermont.—Burlington, 3d.

Virginia.—Bird's Nest, 1st; Cape Henry, 10th.

Wisconsin.—Wausau, 1st; Milwaukee and La Crosse, 14th, 17th.

HAIL.

Corsicana, Texas: a violent wind and hail-storm swept over this place on the evening of the 2d. Hail-stones of unusual size fell, breaking sky-lights and windows. Stock in the surrounding country suffered severely, many animals being killed.

Leavenworth, Kansas: a thunder-storm prevailed from 3.15 to 4 a. m., on the 2d; from 4 to 4.08 a heavy fall of hail occurred. On the 30th a very heavy fall of hail began at 12.30 a. m. and continued for a few minutes; in some parts of the city the hail stones fell to a depth of five inches. The storm approached suddenly from the northwest and the fall of hail was followed by very heavy rain which continued until 2.15 a. m.

Thorp's Spring, Hood county, Texas: a severe rain and hail-storm occurred at this place during the night of the 15-16th. The fall of rain and hail began at 11.15 p. m. and continued with great violence for twenty minutes. The storm came from the southwest; it was accompanied by continuous flashes of lightning and very loud thunder, which caused substantial buildings to shake.

Talladega, Talladega county, Alabama: a severe hail-storm occurred about four miles south of this place on the 17th. Hail fell for about twenty minutes, covering the ground in some places to unusual depths. The young corn was ruined and trees were stripped of their foliage.

Much damage was done at Mardisville, a village five miles southeast of Talladega.

The April report of the "Alabama Weather Service," under direction of Professor P. H. Mell, jr., contains the following account of a hail-storm which occurred at Roanoke, Randolph county, Alabama, on the 17th.

The storm occurred about 1.30 p. m., and was about three miles wide. The fall of rain was almost like a flood, with a strong wind, blowing down some fences and prostrating many forest trees. The storm came from the northwest, and it is thought that about three inches of hail fell, although the stones were not unusually large. The trees were stripped of their foliage and the fruit crop was nearly destroyed along the track of the storm. The glass in many windows was broken. At Ashland and Fredonia the storm was equally severe. Light hail fell in various parts of the county.

San Antonio, Texas: a violent hail-storm is reported to have occurred on the 18th at Pearsall, Trio county, about twenty-five miles southwest of this place. The hail-stones were about the size of marbles and covered the ground to a depth of several inches. A frame church was completely demolished, together with some smaller buildings. Gardens and crops were badly damaged.

Louisville, Kentucky: from 6.03 to 8.13 p. m. on the 17th, a thunder-storm occurred accompanied by hail of small size. Trees and shrubbery were stripped of young buds and sky-lights and windows were broken.

Clay Centre, Clay county, Kansas: at 5.25 a. m., on the 29th, a thunder-shower, accompanied by a light fall of small hail, occurred at this place.

Reports from Wakefield, in the southeastern part of Clay county, Kansas, state that during the night of the 28-29th a very violent hail-storm occurred there. The storm came from the southwest and caused great damage in the vicinity of Wakefield. Some of the hail stones were five inches in circumference; trees were stripped of their foliage and small animals killed.

Hail is also reported to have fallen in the following states and territories:

Alabama.—Mount Vernon Barracks, 8th.

Arkansas.—Lead Hill, 15th.

Arizona.—Prescott and Wickenburg, 15th.

California.—Fort Bidwell, 13th, 16th; Sacramento, 7th; Oakland, 19th; Blue Lake, 9th, 16th, 18th; Tower House, 16th; Hydesville, 18th; College City, 26th; Cahuenga Valley, 27th.

Colorado.—Pueblo, 4th, 28th; Denver, 2d, 15th; Montrose, 4th, 6th, 14th, 15th, 21st, 22d.

Connecticut.—North Colebrook, 26th; Hartford, 2d, 29th.

Dakota.—Fort Pembina, 3d; Fort Totten, 10th, 11th; Fort Sisseton, 10th.

District of Columbia.—West Washington, 8th.

Georgia.—Quitman, 17th, five miles northeast of station.

Illinois.—Edgington, 16th; Bunker Hill, 30th; South Evans-ton, 11th, Mattoon, Swanwick, Wilton Centre and Charleston, 7th.

Indiana.—Laconia, Vevay, and Jeffersonville, 17th; Logansport, 3d, 11th, 25th; Terre Haute, 12th; Indianapolis, 12th, 17th.

Iowa.—Keokuk, 28th; Oscaloosa, 4th; Ottumwa, 16th.

Kansas.—Manhattan, 7th, 30th; Independence and Wellington, 14th; Wyandotte, 29th; Salina, 21st, 29th; Allison, 15th; Leavenworth, 1st; West Leavenworth, 30th; Maud, 1st, 13th, 14th; Sterling, 20th, 27th; Oswego, 26th.

Kentucky.—Frankfort, 8th, 17th; Richmond, 8th.

Louisiana.—Point Pleasant, 2d, 7th.

Maine.—Gardiner, 4th; Waterville and Portland, 29th.

Massachusetts.—Taunton, 2d, 13th; Worcester, Rowe and Boston, 26th.

Michigan.—Hudson, 3d; Boyne and Escanaba, 2d; Mottville, 11th; Moorestown, 21st.

Minnesota.—Saint Vincent, 24th.

Missouri.—Independence, 1st, 29th; Pierce City and Carthage, 15th; Conception, 20th; Saint Louis, 16th.

Nebraska.—De Soto and North Platte, 20th; Red Willow, 19th, 20th, 28th, 29th; Stockham, 27th; Omaha, 20th, 27th.

Nevada.—Fort McDermitt, 13th, 28th.

New Jersey.—Dover, 29th.

New Mexico.—Fort Union, 28th.

New York.—Plattsburg Barracks, 26th; Madison Barracks, Fort Columbus and Mountainville, 2d; Humphrey, 3d, 28th; Albany, 12th, 26th.

North Carolina.—Raleigh, 10th; Blackwell, 9th; Wash Woods, 14th.

Ohio.—College Hill, 12th, 14th; Jacksonborough, 3d, 12th; Garrettsville, 28th; Yellow Springs, 17th; Cincinnati, 14th, 17th; Columbus, 12th, 17th.

Oregon.—Fort Klamath, 2d, 13th, 18th; Albany, 15th, 16th, 17th; East Portland, 12th, 14th, 15th, 16th; Portland, 12th, 14th, 15th, 16th; Roseburg, 16th, 17th.

Pennsylvania.—Blooming Grove, 28th; Dyberry, 4th, 28th.

Tennessee.—Austin, 9th.

Texas.—Cleburne, 11th, 24th; New Ulm and Austin, 2d; Comfort, 7th, 17th; Fort Concho, 5th, 11th, 17th; Fort Davis, 5th.

Utah.—Nephi, 8th, 22d.

Virginia.—Bird's Nest, 10th; Dale Enterprise, 18th.

Washington Territory.—Tacoma and Pysht, 15th; Fort Canby, 14th, 16th, 17th; Fort Townsend, 15th.

Wisconsin.—Sussex, 1st; Manitowoc, 2d; Embarras, 14th, 27th.

Wyoming.—Fort Fred Steele, 14th; Fort Bridger, 19th, 21st, 22d, 27th.

PRECIPITATION FROM A CLOUDLESS SKY.

Lead Hill, Arkansas: at about 8 p. m. of the 10th a sprinkle of rain fell, lasting two minutes. The sky was clear, except a small cloud in the southwest, and the stars were plainly visible at the time.

Mount Washington, New Hampshire: from 12.25 to 12.35 p. m., on the 12th, very light snow fell when the sky was entirely cloudless.

WINDS.

The most frequent directions of the wind during April, 1885,

are shown on chart ii. by arrows flying with the wind. In the west Gulf states, southern slope, lower Missouri, upper Mississippi, and Ohio valleys, and Tennessee the prevailing directions were mostly from the south; they were variable in all other districts.

HIGH WINDS.

(In miles per hour.)

During the month of April, velocities of fifty or more miles per hour were recorded at stations as follows:

On the summit of Mount Washington, New Hampshire, 84, w. 1st; 90, sw. 2d; 82, sw. 3d; 54, se. 4th; 70, nw. 5th; 60, nw. 6th; 60, sw. 7th; 75, w. 8th; 75, nw. 9th; 50, w. 10th; 62, nw. 15th; 67, nw. 16th; 50, w. 19th; 76, sw. 20th; 86, nw. 21st; 60, nw. 22d; 80, nw. 24th; 70, nw. 25th; 70, se. 26th; 96, nw. 27th; 61, nw. 28th; 79, nw. 30th.

Pike's Peak, Colorado, 80, w. 8th; 62, n. 9th; 57, w. 18th; 78, w. 26th.

Fort Buford, Dakota, 50, w. 6th.

Fort Totten, Dakota, 54, nw. 7th.

Fort Sill, Indian Territory, 80, sw. 21st.

Dodge City, Kansas, 63, se. 20th; 58, se. 21st.

Boston, Massachusetts, 60, n. 29th.

Fort Maginnis, Montana, 52, n. 6th.

Sandy Hook, New Jersey, 64, nw. 29th.

Cape May, New Jersey, 56, nw. 14th; 70, nw. 29th.

Indianola, Texas, 56, e. 23d.

Fort Elliott, Texas, 51, s. 21st.

Cape Henry, Virginia, 56, nw. 29th.

Chincoteague, Virginia, 50, nw. 29th.

Fort Myer, Virginia, 50, nw. 29th.

Tatoosh Island, Washington Territory, 56, w. 14th.

LOCAL STORMS AND TORNADOES.

Waverly, La Fayette county, Missouri: a tornado occurred at this place at 8.30 p. m., on the 1st. Its course was to the northeastward, its path being about one hundred feet wide. One church and four dwellings were destroyed. The damage to property is estimated at \$60,000. No persons were killed.

Martin, Falls county, Texas: a tornado occurred at this place at about 4 p. m. on the 2d. Two churches and several stores were demolished, the court-house partially destroyed, and a number of persons injured.

Point Pleasant, Tensas parish, Louisiana: a thunderstorm prevailed between 2 p. m. and midnight of the 2d, the electrical display being constant and vivid; rain began to fall at 3.15 p. m., and continued until midnight, 6.02 inches falling during that time. Another heavy rain and thunder-storm began at 11.50 p. m. on the 5th, and continued until 6.58 a. m. on the 7th, the precipitation amounting to 12.28 inches.

Natchez, Mississippi: violent thunder-storms with very heavy rain occurred between 2 p. m. on the 6th and 4 a. m. on the 7th, the rainfall amounting to 5.31 inches, which is considered the heaviest that has occurred for many years; much damage was done.

Whitney, Hill county, Texas: a tornado occurred at this place at 7.30 p. m. on the 11th. The direction of movement was east, 10° north. Much damage was done to buildings. Two persons were injured.

Gainesville, Cooke county, Texas, 18th: reports from the southeastern part of this county state that a destructive storm occurred in that locality during the night of the 15-16th. At Burns four dwellings were totally wrecked and other damage caused.

The Charlotte, N. C., "Observer" of the 18th states that a tornado occurred at Laurinburg, Richmond county, at about 5 p. m. on the 16th. It was preceded by a violent hail-storm lasting ten minutes, the hail-stones accumulating to a depth of ten inches in fence corners and near buildings. The tornado was not more than two minutes in passing through the town and was preceded and accompanied by a roaring sound. Two stores and a hotel were unroofed, while a number of smaller buildings and many trees were blown down.

Considerable damage was also done in the county to barns, fencing, etc.

Mr. M. D. L. Jordan, voluntary observer at Milan, Gibson county, Tennessee, reports that a tornado occurred six miles west of that place during the evening of the 17th; the tornado's path was about one hundred yards wide; much damage was done to out-buildings, fencing and timber.

Nashville, Tennessee: a tornado occurred at Brentwood, Williamson county, during the evening of the 17th. Two buildings, one a church, were blown down and a large stable was lifted from its foundation; a large pile of railroad ties was blown over.

Yuma, Arizona, 19th: a high northwesterly wind set in at 6.30 p. m. and increased in force during the night. The air was filled with clouds of sand, which enveloped the town and rendered it impossible to distinguish objects at more than a few paces distant. At 10.50 p. m. a large tree within a few yards of the office building was blown down, breaking the wires of the anemometer. A number of other trees and fences in the vicinity of the station were also blown down and small boats on the river were capsized. The maximum velocity of the wind was 48 miles per hour. The storm continued until after midnight and then abated.

Crawford, McLennan county, Texas: at 12.20 p. m. on the 19th a funnel-shaped tornado-cloud was observed approaching this place from the southwest; it passed through the northwestern part of the town in a curved path; houses were overturned and fences blown down; the tornado was of but a few minutes duration.

Waco, McLennan county, Texas: a tornado occurred six miles north of this place at 1 p. m. on the 19th. The tornado-cloud was funnel-shaped and moved in a northeasterly direction, its path being twenty-five miles long and three hundred feet wide. The cloud whirled in a direction contrary to the movement of the hands of a watch. A thunder-storm preceded the tornado and heavy rain fell both before and after the storm. No persons were killed, but fences, trees, and houses were blown down.

The observer at Fort Supply, Indian Territory, reports that at 9.10 p. m. (75th meridian time) on the 20th, a tornado occurred at that place. The tornado-cloud was first noticed in the southwest; it moved first to the northeast and afterward changed its course to north and northwest, and is reported to have ascended from the earth when it reached the hills, about two miles north of station, where it was last seen. The course of the storm was over a space almost unoccupied, which accounts for the small amount of damage done. The Indian tepees, about one thousand yards east of the signal office, were destroyed. The Indians report that the tepees were first twisted around from right to left and then carried away. An out-house, about fifty yards from the tepees, was carried a distance of thirty yards, and a large telegraph pole was blown down and carried a distance of seventy-five yards.

The conditions preceding the tornado were as follows: an overcast sky during the morning, the clouds moving slowly from the south; fresh to brisk southerly winds until 5.50 p. m., then calm and sultry; rain and hail at intervals from 6.23 to 7.30 p. m., with thunder and lightning at 7.25 p. m.; calm and sultry at 9 p. m.; from 6.25 to 7.25 the temperature fell from 73° to 64°. The tornado was followed by heavy rain-showers, hail, thunder, and lightning. At 11.05 p. m. the wind shifted to southeast and blew at a velocity estimated at sixty miles, and heavy, dark clouds were observed in the west, northwest, east, and southeast, moving slowly northward; at 11.25 the wind moderated and was followed by heavy showers, with thunder, lightning and hail.

Daylight on the morning of the 21st showed a well-defined path of a tornado which occurred during the night, concerning which the following statement was made by a sentinel, Private John Conn, company G., 24th U. S. Infantry, at this post: "I was walking post No. 2, which extends about two hundred yards north and south in rear of officers' quarters, on

east side of garrison. At about 12.55 a. m. the wind, which had been blowing strongly from southeast, abated, and a calm prevailed for about one minute. I then noticed a large black, funnel-shaped cloud, slightly west of south from where I stood. The upper and larger part was inclined to the north, the lower portion apparently dragging along behind. It appeared to be about a mile distant from me. It had great attractive power for other clouds close to it, as it drew them rapidly into itself. The cloud had a violent whirling motion from right to left. The wind struck and carried me five or eight feet and dropped me into a pool of water. From the time I first noticed the cloud until I was knocked down, about five or eight minutes had elapsed. I saw nothing of the cloud after it passed me, as I was frightened too much to look up. This cloud came from the east side of the garrison, or towards me from the south-southwest."

The storm was particularly severe and destructive at the southeast end of the garrison, and, while the buildings on the northeast, east, and west sides of the parade ground were mostly unharmed, many out-houses on the north side of the garrison were blown down. The damage caused by the tornado at this post is estimated at about \$3,000.

Fort Sill, Indian Territory: high southerly winds prevailed on the 20th. At 11 p. m. a violent storm occurred, which continued until the morning of the 21st. The maximum wind velocity, sixty-five miles per hour, occurred at 3.30 a. m., and for a short time the wind blew at the rate of eighty-four miles per hour. The roofs of several of the most important buildings at this post were blown off, while many small houses were blown down. The storm, when at its height, was accompanied by very heavy rain, thunder, and lightning.

Dodge City, Kansas, 20th: high southeasterly winds prevailed during the day with rain from 5.40 to 6.40 p. m. and from 8 p. m. until 1.30 a. m. on the 21st; at 4 p. m. a thunder storm passed over the station from southwest to northeast; at 7.15 p. m. the wind, for five minutes, blew at the rate of seventy-eight miles per hour from the southeast. But little damage resulted in this vicinity; several small houses on the prairie were blown down. From 11 a. m. on the 18th to 7 a. m. on the 21st, the wind blew steadily from the southeast.

Oberlin, Decatur county, Kansas: the wind blew from the south with considerable force nearly all day on the 20th, and at about 6 p. m. a threatening bank of clouds appeared in the southwest over which vivid flashes of lightning played continuously. At 7 p. m. rain and hail began to fall which soon ended; this was shortly followed by three sudden gusts of wind occurring in quick succession. At 7.30 p. m., many persons living west of the town observed a tornado-cloud passing down the valley of the north fork of the Sappa river, the cloud being high in the air, but was particularly noticeable on account of its rotary motion and inky blackness. The roaring and rumbling sound was plainly heard for a distance of two miles preceding its approach. The cloud passed down the valley for a distance of four miles before it descended to the ground; it soon ascended into the air again, but struck the ground a second time near the outskirts of the town, through which it passed, destroying or damaging about a dozen buildings. The tornado pursued a zigzag course from southwest to northeast, and its path was about seventy-five feet in width. No damage has been reported as having been caused by the tornado after leaving Oberlin. Reports from Hooker, about six miles southeast of Oberlin, state that one dwelling was destroyed and another unroofed at that place.

Ellsworth, Ellsworth county, Kansas: the heaviest rain and wind storm experienced for many years occurred during the night of the 20-21st.

Denison, Grayson county, Texas: a tornado occurred at this place at 5.35 p. m. on the 21st, moving in a northeasterly direction. After the storm a heavy rain fell, which continued for twenty-four hours. One person was killed and much damage was done to buildings. The total valuation of property destroyed is estimated at \$20,000.

* Sterling, Rice county, Kansas: a tornado occurred at this place at 2 a. m. of the 21st, moving in a northeasterly direction; width of path three hundred and fifty feet. Some hail and also a very heavy rain accompanied the storm. The sugar works were demolished and several houses and barns destroyed.

Peoria, Hill county, Texas: a tornado occurred at this place at 10 a. m. on the 22d. It moved in a northeasterly direction, its path being four miles in length and four hundred feet in width. One person was killed and three were wounded. Much stock was killed, and two dwellings, a school-house, and many outbuildings were destroyed. The damage done to property is estimated at \$10,000.

Prairie Grove, Limestone county, Texas: a tornado occurred at this place at 1 p. m. on the 22d. It moved in a northeasterly direction and the width of the destructive path was 2,500 feet. The tornado-cloud was funnel-shaped. A very heavy rain fell during and after the storm. One person was killed, eighteen were injured, and five houses, one mill and one store were blown down.

Dallas, Texas: at 3 a. m. on the 22d, a very severe storm occurred at this place, causing considerable damage to buildings, many of which were unroofed; fences were also blown down and the fruit crop was badly damaged.

Reading, Pennsylvania: a violent wind-storm prevailed in this (Berks), and the adjoining counties during the early morning of the 29th; many trees were blown down. The change in temperature during the storm was very unusual, the thermometer falling from 25° to 30° in a short time. At Lenhartsville, Berks county, a number of buildings were unroofed.

Canajoharie, Montgomery county, New York: during the morning of the 29th, a whirlwind destroyed about thirty trees at Argusville, a few miles south of this place.

Harrisonville, Cass county, Missouri: a tornado occurred five miles north of this place at 8.30 p. m. on the 29th. It moved in an east-northeasterly direction and occupied but an instant in passing a given point. During the progress of the tornado one person was struck by lightning at Olathe, Kansas, and one killed at Kiugsville, Missouri. Seven houses, two stores, and many outbuildings were destroyed. Near Pleasant Hill, Missouri, fourteen freight cars were thrown from the track.

NAVIGATION.

ICE IN RIVERS AND HARBORS.

Black river.—Port Huron, Michigan: the ice began to break on the 7th; during the night of the 7-8th the river rose rapidly, and on the following day 100,000 logs floated down the river, forming a jam at the bridge; the river began to fall at about noon, but rose again during the night of the 8-9th; at 3.30 p. m. on the 9th a large raft broke away, carrying with it a steam barge and two schooners; one of the schooners was sunk, and the bridge was damaged to the extent of \$6,000; the river began to fall during the evening of the 9th.

Chaumont bay.—Madison Barracks, New York: the ice broke up on the 24th.

Delaware river.—Easton, Pennsylvania: the ice dam at Delaware Water-Gap broke during the night of the 2-3d; on the 3d the river at Easton was filled with heavy ice.

Detroit river.—Detroit, Michigan: floating ice from 1st to 6th, and from 18th to 22d.

Devil's lake.—Fort Totten, Dakota: crossing on the lake was discontinued on the 16th, there being large openings in the ice; the ice began to break near the station on the 29th.

Des Moines river.—Des Moines, Iowa: river free from ice on 2d.

Duluth bay.—Duluth, Minnesota: the ice began to break on the 4th; by the 15th ice had disappeared from around the docks.

Escanaba river.—Escanaba, Michigan: the ice began to break on the 21st.

Grand river.—Grand Haven, Michigan: the river opened during the night of the 4-5th; heavy floating ice continued