

but slight breaks occurred on 9th and frequently to 30th. 10th, Water from Morganzia crevasse, in West Baton Rouge Parish, La., slowly encroaching on rear lands. Northern Texas railway continues inundated; between Vicksburg and Munroe 40 miles is traversed by skiffs, rest by rail; regular through trains not expected before May 1st. 16th, Crevasse on left bank of Bayou La Fourche, one mile below Thibodeau, La. Night 16th and 17th, levee broke on Tensas river near Stanton's plantation, submerging entire Black and Tensas river country. 17th, Frogmore, Concordia Parish, La.: "water has commenced falling; levees on Cross Bayou, above and below here have given away at several places. Moro and Dunbarton levees on Tensas river have given way, flooding the country for miles." Mineola, Texas, 1st, during previous night very heavy rain and remarkable rise in Sabine river; washouts on railway between Mineola and Tyler. 3rd, Toccoa Falls, Ga., heaviest rain for years; about 12 miles air-line railway track washed out and bridge over Tugalo river carried away. 18th, Freshet in Bogue Chitto, submerging 6 miles track of Jackson railway and interrupting travel between Brookhaven and Coon City, Miss. 25th, Farmers City, Ill., creeks higher than ever before known. Princeton, Cal., 22nd, Sacramento river, 23 ft. 1 in. above zero, highest water ever known. 23rd, much damage in Sacramento, San Joaquin, Santa Clara, Napa, and other valleys in central and western California, from very heavy rains, 20th-23rd. 21st, Yolo levee, near Sacramento, broke. Peoria, Ill., 24th, city flooded, many buildings damaged; numerous washouts and land-slides, interrupting railway travel. Litchfield, Mich., 30th, St. Joseph river highest for 25 years. Fayette, Miss., 16th, streams highest ever seen; crops, bridges and stock swept away, damage very great.

*Hail.*—Hail-storms have been especially frequent and cannot be enumerated in detail. The following storms were unusually severe or interesting from the size of the hail-stones. *March* 31st, very violent in parts of Cowen and Dallas counties, Texas; near Plano the hail zone was 200 yards wide; the stones were as large as hickory nuts, and covered the ground like snow-drifts. *April* 1st, Ft. Ewell, Tex., violent, stones pierced tents and knocked shingles from roofs. 4th, Knoxville, Tenn., very severe, stones as large as partridge's eggs fell in great quantities. 6th, Spartansburg, S. C., "terrific, the severest since memorable storm of June, 1840. Some stones 6 inches in circumference. Much damage to glass, and to fruit trees." Denny's Cross Roads, S. C., "worst ever known in this section; lasting 20 minutes; stones from size of partridge to hen's eggs." 7th, Maxey's, Ga., several stones 12 inches in circumference; hail fell for 15 minutes, much like snow, a calm prevailing. Bairdstown, Ga., one stone weighed 2 pounds. 16th, Merced, Cal., heaviest for years. 17th, Fayetteville, Tenn., stones size of hen's eggs, weighing 4 to 6 ounces. 18th, Mentor, Ohio, stones as large as marbles. 22nd, Tama, Iowa, stones as large as english walnuts. 26th, Oakville, Ont., violent. Montgomery, N. Y., 6th, violent, doing much damage to buildings. 29th, Columbia, S. C., stones as large as hen's eggs. Gainesville, Ga., 4th, stones one inch in diameter; 6th, "size of chestnuts." Nora Springs, Iowa, 24th, of one to two inches in diameter, "soft, snowy texture." Fort Madison, Ia, 24th, size of quail's eggs. Point Pleasant, La., half-inch in diameter. Hudson, Mich., 3rd, "very severe, stones large as walnuts. Twenty-four picked up half-hour after falling weighed 72 oz. Fowls killed and farm houses damaged." Pierce City, Mo., 24th, stones 1.5 by 1.2 in. in diameter. Newark, N. J., 5th,  $\frac{1}{2}$  to  $\frac{3}{4}$  in. in diameter. Franklin, Pa., 4th, large, breaking much glass. Wytheville, Va., 25th, average diameter,  $\frac{1}{2}$  in., of some  $\frac{1}{4}$  inch. Red Bluff, 20th,  $\frac{3}{8}$  in. in diameter, covering ground. Fort Sill, 17th,  $\frac{1}{2}$  in. in diameter. Castroville, Tex., 28th and Mason, Tex., 6th, "size of hen's eggs." Near Mt. Airy, Ga., 3rd, "reported as large as a man's fist." Savannah, Ga., 4th, some  $1\frac{1}{2}$  in. in diameter; much glass broken in city; gardens seriously damaged. Augusta, 6th, size of partridge eggs, covered the ground; "this hail-storm is reported to have killed young stock in Orangeburg, Co., S. C."

## RELATIVE HUMIDITY.

The percentages of mean relative humidity for the month range as follows: New England, from 57.6 to 85.5; Middle Atlantic States, 47.2 to 84.1; South Atlantic States, 60.4 to 79.2; Eastern Gulf States, 67.6 to 77.6; Western Gulf States, 59.3 to 79.5; Ohio valley and Tennessee, 53.6 to 70.0; Lower Lake region, 61.9 to 66.6; Upper Lake region, 62.9 to 72.6; Upper Mississippi valley, 53.7 to 62.0; Missouri valley, 45.9 to 68.4; Red River of the North valley, 72.8 to 75.0; Eastern Rocky Mountain Slope, 23.0 to 72; Western Plateau, 19.0 to 54.8; California, 67.5 to 78.9 Oregon, 52.0 to 70. *High stations* report the following averages not corrected for altitude: Pike's Peak, 68.9; Mt. Washington, 85.0 per cent.

## WINDS.

*Total Movement of the Air.*—The following are among the *largest* total movements in various sections of the country: Pike's Peak, 16,279; Portsmouth, N. C., 13,560; Delaware Breakwater, 13,958 miles; Wood's Holl, 12,491; North Platte, 11,948; Indianola, 11,845; Ft. Elliott, Tex., 11,050; Grand Haven, 10,875; Bismarck, 10,575; St. Louis, 9,499; Erie, 9,491; Red Bluff, 8,621; Cairo, 7,671; Punta Rasa, 7,889. Frost-work prevented a complete record on Mt. Washington. The *smallest in various districts* are: El Paso, 2,546; Roseburg, 2,569; Augusta, 2,787; Uvade, 3,167; Tuscon, 3,448; Lynchburg, 3,794; Toledo, 4,083; Nashville, 4,140; Montgomery, 4,733; Little Rock, 5,118; Springfield, Mass., 5,163; Baltimore, 5,398; Dubuque, 6, 203; Escanaba, 6,804.

*Local Storms.*—Violent local storms, in unusual numbers, occurred during *April*. Tornadoes, causing loss of life or doing serious injury to property, were reported from Kansas and Louisiana on the 2nd; from Georgia on the 3rd, 4th and 24th; from Missouri, Arkansas, Iowa, Illinois and Wisconsin on the 18th and 24th; from Illinois on the 23rd; from Illinois and Missouri on the 24th, and from Mississippi on the 25th, 29th, 30th. The following details have been gathered from reports made by Signal Service and voluntary observers

and other sources more or less reliable. Ottawa, Kan., 2nd, about 6 p. m., severe tornado, destroying much property, injuring 15 persons and killing several. Just before the storm dark and angry-looking clouds formed suddenly in the W. and NW., and as they drew near seven houses were first demolished. The cloud, then bouncing over a space of 400 feet, unroofed a freight depot and overturned two railway cars, injuring seriously several passengers. The path of the storm was narrow; the direction from SW. to NE. Girard, Kan., 2nd, 7 p. m., tornado apparently developed seven miles to the southwest and moved northeastward to within one mile of the town, where its course was changed to east, moving thence directly to the Missouri line; track 3 to 50 rods wide; 3 persons killed, many others badly hurt and 17 houses destroyed. Shreveport, La., 2nd, p. m., violent thunder-storm and tornado, 3 persons injured and 15 buildings destroyed; path one mile long and  $\frac{1}{2}$  mile wide; shape, parabolic curve. Loud roaring preceded storm. Debris on S. side fell to W. or N. side to E. Dalton, Whitefield Co., Ga., 3rd, p. m., tornado passed 6 miles north of town, extending across Conasauga river into Murray Co.; two persons killed, many injured and 18 houses completely demolished; path about one mile wide; two opposing currents of wind were observable during the progress of the storm, one from the west, the other and the most violent from the east. This tornado crossed Grass mountain near the point at which a similar storm passed in 1878. 3rd, near midnight tornado and waterspout between Mount Airy and Toccoa, Ga. It passed through Murray county reaching Cherokee, 100 miles distant, about 2 a. m. Hail reported as large as a mans fist. The county is sparsely settled, yet 50 dwelling of all kinds were levelled, 3 persons killed and many badly injured. A hog was found 40 feet from the ground in the fork of a tree. Length of path unknown; average width about one mile. Remarkable amount of rain reported, but no figures given. Elbert Co., Ga., 3rd, tornado, passed through north part of county, blowing down many houses and the largest trees. Its passage resembled a cloud of smoke and fire rolling on the ground. Washington Co., Ga., 4th, during afternoon, tornado passed through southwestern portion of county, demolishing many buildings, track  $\frac{1}{2}$  mile wide; direction SW to NE. Edgefield, S. C., 6th, 5 p. m., "most terrible storm of wind ever remembered." Trees and houses were swept away; several persons slightly and one seriously injured. Through one large forest, trees were twisted off or uprooted "that had stood for ages." In Mississippi, 15th, p. m., a severe storm swept over Natchez and vicinity, unroofing buildings, uprooting trees and demolishing fences and outhouses. The rain fell in torrents, sweeping away bridges, etc. All telegraphic communication was interrupted for three days. Wheeling, W. Va., 16th, high storm, culminating in a violent due E. wind at 5 p. m. Two freight depots unroofed and several other buildings seriously damaged. High winds were felt through entire central and southern parts of Ohio; At Newark, New Philadelphia, Canal Dover, Milford Center, Springfield, Snyder's Mills, Taylorsville, Columbus, Cincinnati, Martinsville, Bellaire and Lebanon, buildings were unroofed or blown down and much damage was done to other property. Corwin Center, Bradford and Oil City, Pa., 16th, destructive wind-storm, demolishing derricks and unroofing buildings; two men seriously injured. Buffalo, N. Y., 16th, violent wind-storm from SW.; several buildings damaged; heavy weather on Lake Erie; several vessels injured, one sunk. Harrisburg, Pa., 16th, violent wind-storm; covered bridge over the Susquehanna river blown in; several buildings more or less damaged. Beloit, Wis., 18th, about 5 p. m., severe tornado swept over the city from SW. to NE.; houses and other buildings destroyed; many persons injured and several killed. Loss to property estimated at \$75,000. Stiles, Davis Co., Ia., 18th, tornado passed from SW. to NE. through the town and adjoining country, causing great destruction to property; path 20 miles long and from 50 to 300 yards wide; accompanied by heavy hail and floods of water. Bloomfield, Ia., 18th, during afternoon a tornado, causing great destruction to buildings, fences, &c., passed 4 miles north of town in a direction from SW. to NE.; no lives were lost. Greenville, Bond Co., Ill., 18th, furious tornado, almost every portion of the city was more or less injured; numerous houses, &c., were demolished and torn to pieces; several persons seriously injured, but none killed. In and near Decatur, Macon Co., Ill., 18th, violent wind-storm, blowing down trees, and buildings. Wenona, Marshall Co., Warren, Jo Daviess Co., Ill., 18th, violent wind and rain storm; many buildings demolished; no lives lost. Champaign, Ill., 18th, old university building badly wrecked and many other buildings partially demolished. Ottawa, La Salle, Co., Ill., 18th, during the evening a violent storm of wind and rain, causing much destruction. Peoria, Co., Ill., 18th, heaviest storm of wind and rain experienced for many years; many buildings damaged. Summerfield, St. Clair Co., Ill., 18th, very violent storm of wind, rain and hail; much damage to trees and buildings. Jacksonville, Morgan Co., Ill., 18th, terrible storm of wind and rain; the roof of county poor house blown off, large ice house torn to pieces and the bridge across Big Sandy river swept away. Tuscola, Douglass Co., Ill., 19th, about 2 a. m. "a most terrific wind and rain storm," with vivid lightning. Many buildings demolished. Lyndon, Ill., 18th, violent tornado moved NE. from extreme west part of Whiteside Co., demolishing 6 buildings; surface wind of SE. 30 miles prevailed. A funnel shaped cloud hung in rear of path, sometimes absorbed by clouds and again descending destroyed everything in its path. On April 18th, 1869, a tornado passed over almost the same ground. Clinton, De Witt Co., Ill., 18th, about midnight a very violent wind-storm caused considerable damage to buildings. Collinsville, Madison, Co., Ill., 18th, violent wind-storm accompanied by heavy thunder and vivid lightning, rail-road depot completely destroyed. Chester, Randolph Co., Ill., 18th, several houses unroofed and much other property badly damaged. One person seriously injured. Daveuport, Ia., 18th, "wind blew terrific gale," making it unsafe to swing the draw of the government bridge; ferry boats could not cross the river. Much damage to buildings and other property. The following data relative to the remarkably violent storms in connection with low area No. X, that prevailed throughout the Lower Missouri and Central Mississippi valleys on

the afternoon and night of the 18th, has been compiled. In *Missouri* the following places were more or less devastated by a series of separate tornadoes the paths of which ran from SW. to NE., and were distributed over a narrow strip of country, having an average width of about 80 miles. The most destructive or what is known as the Marshfield tornado, was first reported as appearing in Barry county, Missouri, near the Arkansas line, where ten persons were killed in the Crow creek settlement and six on Flat creek. It moved thence northeastward passed six miles south of Springfield, Green Co., reaching Marshfield, Webster Co., about 6 p. m. All of the buildings, brick and frame in this city of nearly 2,000 inhabitants, were demolished except half-a-dozen, the ruins taking fire during the prevalence of the storm; 65 persons were killed and about 200 wounded. In the vicinity of the town the violence of the storm was such that trees three feet in diameter were for a space of several hundred yards wide lifted entirely out of the ground, limbs twisted off and split into kindling wood, and the bark of trees peeled off as if struck by lightning. Loss of property in these two counties estimated at over one million dollars. After leaving Marshfield the tornado struck the St. Louis and S. F. R. R. ten miles east, with greatly diminished force, and at about 8 p. m. reached Franks station 110 miles ENE. of Springfield, where after crossing the Gasconade river, it continued only as a heavy storm of wind and rain. At Conway, Laclede Co., one house blown down and two children killed. In Panther valley, Webster Co., seven persons reported killed and large amount of property destroyed by a tornado which passed northeastward about 20 minutes later than the Marshfield storm. At Licking, Texas Co., the entire town was destroyed, except three houses; 300 persons were left homeless; one person killed and 17 wounded, 5 of them seriously. The loss to property is estimated \$50,000. At Cuba, Crawford Co., the town and surrounding country were nearly laid waste. In the vicinity of Jefferson City about 60 miles NW. of the line of the Marshfield tornado, another series of violent storms devastated portions of Morgan, Cole, Monticau and Callaway countys, on the night of the 18th. At New Bloomfield, Callaway county, 10 houses and one church were destroyed, several persons injured and one killed. The town of Barnettville, Morgan Co., was nearly torn to pieces; several persons killed and many wounded. The surrounding country was strewn with fragments of demolished buildings. At Russellville, Cole Co., great destruction to property occurred; several persons killed and many injured. One of the tornadoes crossed the Missouri Pacific R. R., near Scotts station causing considerable destruction to property, 10 persons were seriously injured. Ten miles SW. of Fulton, Callaway Co., the tornado made great havoc among the farm houses in the line of the storm; 2 persons were killed and 8 wounded. At Carrington, Callaway Co., several houses were unroofed and other property destroyed. The tornado moved nearly due north in this vicinity for three or four miles demolishing everything in its course. Those who were near describe the appearance of the clouds as "terrible," and the noise as the sound of "10,000 express trains." Regarding the storms in that state the Missouri Weather Service, says: "The average width of its (Finley Creek Valley storm) destructive path for a distance of 100 miles would be at least 3,000 feet." "The destructive path of this (Marshfield) storm was about 45 miles long and on the average 1,500 feet wide." The area covered by these three storms will not fall short of 80 square miles. Not less than 100 persons lost their lives." In *Kansas* the violent local storms of the 18th were confined to the eastern tier of counties, and occurred between 3 and 4 p. m. At Leavenworth several buildings were unroofed, one person was seriously injured. At Lawrence the worst wind-storm ever known, the measured wind velocity at the State University from 3:30 to 3:45 p. m. reaching a maximum of 80 miles per hour. The roof of the University building was damaged, large number of buildings unroofed or blown over. At Shawnee Mission, Johnson Co., a violent wind storm prevailed between 4 and 5 p. m., demolishing several buildings and injuring 5 persons. In *Arkansas* the storms of the 18th only visited the northern half of the State. At Fayetteville, Washington, Co., the tornado struck about 8:30 p. m. passing through the town from SW. to NE., the track was about 100 yards wide and not a single building in its course escaped destruction or injury. Buildings, fences and trees were levelled to the ground and the fragments scattered in every direction. Over 100 buildings destroyed, two persons killed and 20 to 30 injured, many of them seriously. The loss to property is reported to be over \$100,000. Goshop, 12 miles northeast of Fayetteville, was struck later by the tornado and almost entirely swept away. At Eureka Springs, 20 miles northeast of Fayetteville, 18 houses were demolished, one person killed and several injured. In Franklin county, near Ozark, a violent storm of wind, rain and hail prevailed from 6:40 to 7 p. m., the roar of the storm was dreadful, and its destruction complete. The damage among the farming community was very great. El Paso, White county, was struck by a violent tornado at 8 p. m., ten persons were killed and twenty injured. The path of the storm was about  $\frac{1}{4}$  mile in width and passed from SW. to NE.; the devastation, throughout its entire course, was complete. The town of Dardenelles, in the northeastern portion of Yell county, was partly destroyed, about 8 p. m., by a violent storm. 18th, severe wind and rain-storm in Chester, Eaton county, S. C., demolishing several buildings and killing live stock. Track of storm  $\frac{1}{4}$  mile wide. In *Indiana*, violent local wind-storms were experienced, but the time of their occurrence was early on the morning of the 19th. At Richmond, Wayne Co., the wind was exceedingly violent, several houses were blown down and unroofed; great damage was caused to buildings and telegraph lines throughout the Whitewater valley. A violent wind-storm reached Wabash about 4 a. m., causing considerable damage to buildings, fences, &c., along the southern boundary of *Wisconsin* the violent tornadoes of the 18th were experienced about 5 p. m. At Shopiere, Rock Co., 23 buildings were unroofed or destroyed; stock killed, and several persons injured. The path of the storm was quite narrow.

and its direction from SW. to NE. In the vicinity of Turtleville, Rock Co., the tornado was equally severe. Those who witnessed its approach from the SW., said that it appeared much like a "turbulent mass or wall of clouds, in color varying from gray to black, and moving somewhat in the form of eddies or small whirlwinds, some rising, some falling, the whole moving at a rapid space, gathering up all loose rubbish, hurling it in every direction. There was a steady ominous roar unlike anything ever heard before, resembling both the screech of a bomb shell and the rumble of many heavy-laden rail-road trains." At Rockton, just across the Illinois line, the tornado was severely felt. The premonitions of an unusual storm were clearly evident in the huge masses of dark clouds piling up in the W. and NW., together with the rapid shifting of the conflicting air currents. Clouds were seen to "whirl, twist and fly in all directions, some chasing swift toward the NW. in solid masses, lighter ones curling gracefully up toward the zenith, working back and forth across the face of the heavier masses, while others swept toward the NE. and E. causing an intermingling of the wildest confusion." Portions of the path of this storm appeared to disclose a zigzag course of the storm cloud, as if in its progressive movement it swung from side to side. The general direction was from SW. to NE. and varied in width from  $\frac{1}{2}$  to  $\frac{3}{4}$  mile. On the 24th at about 7:30 p. m., a violent tornado entered Lima township, Adams Co., Ill., from Lewis Co., Mo., passing northeastward through the northern portions of Keene and Houston townships. The storm-cloud was very black, funnel shaped, and moved with great velocity like a screw propeller; path  $\frac{1}{2}$  mile wide, everything swept before it; 5 persons seriously injured. Taylorville, Christian Co., Ill., 7 p. m., storm passed from SW. to NE. First observed as a funnel shaped cloud gradually approaching the earth, which struck near Sharpsburg, where it demolished everything in its path for a distance of 8 miles; width of track  $\frac{1}{2}$  to  $\frac{3}{4}$  mile; 6 persons killed and 20 injured. Hundreds of horses and cattle killed or seriously injured, and 25 farm houses destroyed. Carlinville, Macoupin Co., Ill., 24th, about 6:30 p. m., "terrific" wind-storm passed 2 miles north, crossing the Chicago and Alton R. R., demolishing houses, barns, fences and orchards. Joplin City, Jasper Co., Mo., 24th, about 5 p. m., terrible tornado, barns, hoisters, engine rooms and buildings through the mines all demolished; 12 houses blown down and several persons injured. Webb City 5 miles north was completely wrecked. Macon, Miss., 25th, 8:30 p. m., terrible tornado demolishing 22 houses and other buildings, including all railroad shops and depots, 16 box cars were blown from the track, many of them turned bottom side up; 22 persons were killed and 72 injured. The damage to property was estimated at \$100,000. One house near the centre of the storm was whirled around and its front changed in exactly the opposite direction. A pair of car trucks weighing 8,000 pounds were lifted 200 yards from the track. The first approach of the storm was indicated by "peculiar black clouds in the SW. and NE. rushing toward each other, and when nearly together two balls of fire appeared to leave them and unite with a terrible roar, when the storm burst." It did not seem to come from across the country, but suddenly shot downward from the air, devastating the city in about three minutes. Paint Rock, Jackson Co., Ala., 25th, many houses and barns destroyed, and three children killed; width of track 75 yards. Giles Co., Tenn., 25th, great damage done buildings and stock. Dalton, Whitefield Co., Ga., 25th, about sundown several houses unroofed and much damage to other property; width of track  $\frac{1}{2}$  to  $\frac{3}{4}$  mile. Mayersville, Issaquena Co., Miss., 22nd, about 1:30 a. m., very violent wind and rain storm continued for 10 to 15 minutes, blowing down houses, fences, stables and trees. Near Griffin, Spaulding Co., Ga., 20th, between 7 and 8 a. m., violent tornado accompanied with a dull roaring noise and funnel-shaped cloud, passed from SW. to NE. destroying fences and unroofing trees over a path about 50 yards wide and 2 miles in length. In some places the cloud rose from the ground, and skimmed along over the tops of trees, twisting off only the upper limbs. Grassy Cove, Cumberland county, Tenn., 25th, 7:30 p. m., destroying several buildings, uprooting trees and demolishing fences. In a large forest to the rear of the town hundreds of the stoutest trees were torn up by the roots or twisted off near the ground with the greatest violence. Dawson, Sangamon county, Ill., 24th, 10 p. m., several buildings destroyed and much fencing blown down. In many instances fences running north and south were, at points, first thrown to the east and then at a short distance almost the same length of fencing thrown to the west, showing a cyclonic action of the storm. Fences running east and west were alternately thrown north and south. Direction of storm N. 70° E. At Medova, Rockbridge, Chesterfield and Anderson Switch, Macoupin county, Rochester, Sangamon county, Tuscola, Douglass county, Ashland, Cass county, Farmer City, DeWitt county and Kankakee, Kankakee county very violent wind and rain storms occurred during the evening of the 24th, causing immense damage to property and stock. Oskaloosa, Miss., 28th, high wind, blowing down several houses (some old) in Jackson, Winn and Ouachita parishes. Columbia, S. C., 29th, 4 p. m., terrific tornado, several persons injured and many buildings blown down. Track a few hundred yards in width, direction from SW. to NE. At Plano, Kinney, Melissa, Brenhan, Granville and Davilla, Tex., 29th, violent wind storms, blowing down houses, destroying much property and injuring several persons. Yazoo City, Miss., violent wind storm demolishing buildings, trees and fences; track very narrow, SW. to NE.

## VERIFICATIONS.

*Indications.*—The detailed comparison of the tri-daily indications for March, with the telegraphic reports for the succeeding twenty-four hours, shows the general percentage of verifications to be 82.3 per cent. The percentages for the four elements are: Weather, 87.8; Direction of the Wind, 78.0; Temperature, 79.9; Barometer, 82.9 per cent. By geographical districts they are: for New England, 81.6; Middle States, 84.7; South Atlantic States, 83.5; Eastern Gulf States, 83.9; Western Gulf States, 81.8; Lower Lake region, 84.5; Upper Lake region, 79.9; Tennessee and the Ohio valley, 84.9; Upper Mississippi