in some places 16 inches deep, many stones being as large as partridge eggs. Fall River, Mass., 15th, greatest fall of hail that has been experienced here for years.

RELATIVE HUMIDITY.

The percentage of mean relative humidity for the month ranges as follows: New England, from 71 to 86; Middle Atlantic states, 66 to 78; South Atlantic states, 71 to 81; Florida peninsula, 74 to 79; East Gulf states, 72 to 78; West Gulf states, 69 to 81; Rio Grande valley, 67 to 83; Ohio valley and Tennessee, 67 to 77; Lower Lake region, 65 to 76; Upper Lake region, 75 to 83; extreme Northwest 69 to 87; Northern slope, 58 to 73; Middle slope, 49 to 76; Southern slope, 52 to 70; Southern plateau, 42 to 61; Middle plateau, 40 to 65; Northern plateau, 69 to 85; North Pacific coast region, 82 to 86; Middle Pacific coast region, 56 to 64; South Pacific coast region, 39 to 61. *High stations* report the following percentages not corrected for altitude: Pike's Peak, 76.2; Denver, 60.2; Cheyenne, 58.2; Mt. Washington, 86.0.

WINDS.

The prevailing winds during the month of November, 1881, at Signal Service stations, are shown on chart No. II, by arrows, which fly with the wind. In the South Atlantic and East Gulf states, *northeasterly*; in the Middle Atlantic states and New England, *northwesterly*; in the Lake region, Tennessee and Ohio valley, *southerly*; in the Upper Mississippi and Missouri valleys, *northwesterly*; in the Western Gulf states, including Texas, *southerly* and *northerly*; in the Rocky Mountain and Plateau regions, *variable*: in the North Pacific coast region, *southerly*; in the Middle and South Pacific coast regions, *north* to *west*.

Total Movements of the Air.—The following are the largest total movements at Signal Service stations: Mt. Washington, 31,375 miles; Pike's Peak, 17,519; Del. Breakwater, 12,861; Cape May, 12,675; New Shoreham, R. I., 12,501: Wood's Holl, Mass., 12,370; Thatcher's Island, Mass., 11,337; Sandusky, 11,250; Sandy Hook, 11,143; Grand Haven, 11,044; Indianola, 10,886; Erie, 10,538; Kitty Hawk, 10,529; Rochester, 10,338; Port Eads, La., 10,320; Milwaukee, 10,128; Buffalo, 10,114; Madison, Wis., 9,884; Champaign, Ill., 9,808; Cape Henry, Va., 9,712; Hatteras, N. C., 9,611; Portsmouth, N. C., 9,398; Barnegat, N. J., 9,379; Cleveland, 9,283; Alpena, Mich., 9,179; Galveston, 9,178; Port Huron, 9,011; North Platte, 8,927; Key West, 8,828; Moorehead, Minn., 8,810; St. Vincent, Minn., 8,722; St. Louis, 8,618; Omaha, 8,581; Huron, Dak., 8,499; Dodge City, 8,402; Ft. Stevenson, Dak., 8,378; Cheyenne, 8,350; Burlington, Vt., 8,346; Marquette, 8,329; Ft. Sill, Ind. T., 8,323: Detroit, 8,315; Oswego, 8,121; Newport, R. I., 8,099; Toledo, 8,090. The *smallest* are Missoula, Mont., 935; La Mesilla, N. M., 1,082; Lynchburg, 1,378; Phoenix, Ariz., 1,511; Silver City, N. M., 1,526; Visalia, Cal., 1,887; Salt Lake City, 2,205; Uvalde, Tex., 2,325; Augusta, Ga., 2,382; Lewiston, Idaho, 2,390; Spokane, Wash. T., 2,624; Laredo, Tex., 2,645; Red Bluff, 2,858; Boise City, 2,864; Florence, Ariz., 2,934.

High Winds.—On summit of Mt. Washington the following high velocities were reported: 108 miles, NW., 10th; 100 miles, NW., 20th; 98 miles, NW., 9th, 18th; velocities exceeding 50 miles per hour were reported from 2nd to 22d and from 24th to 30th. On summit of Pike's Peak, a maximum velocity of 68 miles was reported as follows: from NE., 11th; SW., 12th, 16th; velocities exceeding 50 miles per hour were reported from 4th to 6th, 11th, 12th, 14th to 16th, 18th, 19th, 24th. Other stations reporting velocities of 50 miles per hour or over are as follows: Ft. Custer, Mont., 53 miles, NW., 12th; North Platte, 50, NW., 4th; Ft. Buford, 50, W., 13th; Bismarck, 50, W., 13th, Indianola, 55, N., 2d; Sandusky, 56, W., 14th; Thatcher's Island, Mass., 56, NW., 11th; Wood's Holl, Mass., 50, NW., 20th; Cape May, maximum velocity, 66, NW., 20th, 52, NW., 4th, 15th, and 55, NW., 24th; Delaware Breakwater, 54, NW., 24th; Cape Henry, Va., 52., NW., 3d, 4th; Kittyhawk, 52, N., 4th.

Local Storms.—Near Fort Ridgely, Minn., 25th, very violent tornado moved from southwest to northeast causing great destruction of property. A large black, funnel-shaped cloud approached rapidly from the west and when near by, the centre of the cloud appeared to change its color to a dirty green and purple; lightning flashed and heavy thunder rolled. While the dark cloud was passing the wind whirled with indescribable rapidity; one man was thrown against a tree and his side smashed; another was carried high in the air and thrown lifeless on the ground, his clothing being entirely stripped from his body. Wild ducks, prairie chickens and domestic fowls were killed in considerable numbers and entirely stripped of feathers; in some instances harness was completely torn from the backs of horses and the animals killed or badly wounded. All houses was in the track of the storm were entirely demolished. Fayette, Miss., 11th, at a point four miles east of station a violent tornado suddenly made its appearance in a gentleman's yard. Every tree was blown down and many were scattered in all directions. In the house, crockery, etc., was broken, but the building, a strong frame, was not injured, the doors and windows being open. An eye witness states that the air was filled with flying timber. The tornado passed off very quickly, and lifted from the ground, doing no other damage for a considerable distance until it again descended

to the earth, when it entirely demolished a dwelling and a cotton house, scattering and carrying their contents great distances. Various articles of clothing were seen whirling through the air. Its track was narrow and about eight miles in length.

VERIFICATIONS.

Indications.—The detailed comparison of the tri-daily indications for November, with the telegraphic reports for the succeeding twenty-four hours, shows the general percentage of verifications to be 86.02 per cent. The percentages for the four elements are: Weather, 88.25; Direction of the Wind, 81.96; Temperature, 87.71; Barometer, 86.03 per cent. By geographical districts they are: For New England, 87.3; Middle Atlantic states, 88.4; South Atlantic states, 89.8; Eastern Gulf states, 85.4; Western Gulf states, 86.2; Lower Lake region, 85.3; Upper Lake region, 84.6; Tennessee and the Ohio valley, 86.8; Upper Mississippi valley, 86.4; Lower Missouri valley, 80.6; Northern Pacific coast region, 65.9; Central Pacific coast region, 86.6; Southern Pacific coast region, 93.5. There were 78 omissions to predict out of 3,690, or 2.00 per cent. Of the 3,612 predictions that have been made, 130, or 3.60 per cent. are considered to have entirely failed; 117, or 3.24 per cent. were one-fourth verified; 367, or 10.16 per cent. were one-half verified; 414, or 11.46 per cent. were three-fourths verified; 2,584, or 71.54 per cent. were fully verified, so far as can be ascertained from the tri-daily reports.

Cautionary Signals.—221 Cautionary signals were displayed during the month of November, 1881, of which 199, or 90.09 per cent., were fully justified by winds of twenty-five miles per hour, or over, at, or within, a radius of 100 miles of the station. Sixty-seven Off-shore signals were displayed, of which 51, or 76.12 per cent., were fully justified; 53 or 79.10 per cent., were justified as to direction; 61, or 91.05 per cent., were justified as to velocity, and 4, or 5.97 per cent., completely failed. Twenty-one Off-shore signals were changed from Cautionary. Two Northwest signals were displayed, both of which were fully justified. 290 signals, of all kinds, were displayed, of which 252, or 86.89 per cent., were fully justified. The above does not include signals ordered at 67 display stations, where the velocity is only estimated. 149 winds, of 25 miles, or over, were reported, for which no signals were ordered. 49 signals were ordered late.

NAVIGATION.

Stage of Water in Rivers.—In the table on the right-hand side of chart No. III are given the highest and lowest stages of water as observed at Signal Service stations during the month of November, 1881. The water in the Missouri river has remained at a very low stage throughout the month being at all stations, even on the date of highest water, from 10 to 18 feet below the danger-line. In the Mississippi, there has been a moderately high stage from St. Paul to Dubuque; at Davenport and Keokuk the water has been from 1 to 5 feet above the danger-line; at St. Louis within 6 inches of the danger-line, and from Cairo to New Orleans all stations remained from 4 to 8 feet below the danger-line. In the Ohio, Cumberland, Tennessee and Monongahela rivers the water remained quite low throughout the month, the highest being at Pittsburg where it reached within 8 feet of the danger-line. In the Red, Arkansas, Savannah and Sacramento rivers, no changes of importance took place; water quite low throughout the month.

Ice in Rivers and Harbors.—*Saginaw River:* East Saginaw, 25th, ice forming rapidly and people reported crossing on the ice at Zilwaukee. Bay City, 24th, ice formed during the night and on the following day river full of broken cakes of ice. *Dakota River:* Morriston, Dak., 14th, river frozen over. *Embarrass River:* Embarrass, Wis., 28th, river frozen over. *Manitowoc River:* Manitowoc, Wis., 20th, river frozen over. *Lake Huron:* Port Huron, 25th, schooner "A. J. Rogers," just in port from Thunder Bay, is badly iced up. Schooner "Emerald," from Presque Isle, 25th, vessel covered with a perfect coat of ice, everything on decks frozen solid. *Mississippi River:* Red Wing, Minn., 18th, large quantities of floating ice between St. Paul and Lake Pepin; steamer "Imperial" was from 4 p. m. of the 18th, until noon of the 22d, in making a distance of 60 miles. La Crosse, 15th, floating ice in river, first of season; 28th, ice broke up in river. Davenport, 10th, although no ice has yet appeared in the river, the weather has been so cold that navigation is now considered closed for the season. St. Paul, 15th, 17th, 24th, floating ice in river, 18th, river frozen along the banks. Steamer "Arkansas" left port; the last boat of season. 20th, river frozen along the banks; channel full of ice; navigation practically closed for the season. River has been open from April 7th to November 20th, a period of 227 days. The greatest depth of water (19 feet 8 inches) occurred April 29th; lowest (3 feet 4 inches) occurred September 14th and 15th, giving a range for the season of 11 feet 5 inches; average depth, 11 feet 5 inches. 22d, ice gorged in river below city. 23d, gorge broke during morning. *Milwaukee River:* Milwaukee, 20th, river frozen over. *Red River of the North:* Moorehead, Minn., 15th, river frozen over. St. Vincent, Minn., 13th, river frozen. Winnipeg, 18th, river frozen over, but not strong enough to permit crossing. *Tongue River:* Ft. Keogh, Mont., 18th, river frozen over. *Missouri River:* Bismarck, 18th, river frozen over and teams crossing. Yankton, 18th, river frozen over. Ft. Buford, 17th, river frozen over. Ft. Sully, Dak., 15th, ice floating in river.