others unroofed; the damage to crops was very severe. Farther eastward the storm was reported as exceedingly violent. Mallory Lake, Hillsdale Co., Mich., 12th, 3.30 p. m., two and a half miles southeast of station, violent southwest storm unroofing and destroying buildings, leveling fields of oats and corn, demolishing fences and uprooting forest and fruit trees; occasional gaps intervened where the force of the wind seemed to raise for a short distance above the earth, and then return to it with renewed destructive energy. At Dover, fences were blown down, wheat shocks scattered over the fields and oats and corn badly damaged. Near Osseo several farm buildings were blown down, fences demolished and trees uprooted; in Wheatland and Palmyra townships much damage to crops. Brooklyn, N. Y., 13th, 4 to 4.25 p. m., trees, chimneys and small outbuildings blown down, and in several cases large buildings unroofed; in northern New Jersey and on Staten Island, the violence of the wind was very marked, trees were uprooted and many buildings blown down or unroofed. Cornish, Me., 16th, 4.30 p. m., violent wind storm or whirlwind passing from SW. to NE., moved over the adjoining country: width of path, about 50 rods and length about five miles; one large building, 70 x 15 feet, directly in the path of the storm-cloud was blown to pieces, carrying the *debris* several hundred yards: many other buildings were more or less damaged and orchards suffered severely; in passing over a cemetery, which chanced to be in the storm's path three large stones, 20 inches in diameter and several feet in height were broken off by the violence of the wind; some hail accompanied the storm, but did no damage; the storm-cloud, after crossing the Ossipee river, appeared to rise from the earth, when further evidence of its existence vanished. Fosteria, Ohio, 7th, during night, most violent windstorm for years; many buildings, among the largest in town, were unroofed and several blown down; in the country very disastrous effects were produced upon standing crops. Off Reedy Island, near Ft. Delaware, Delaware river, 7th, 7 p. m., terrific wind storm, lasting about 40 minutes: storm passed from SW. to NE. and the rain fell in torrents for about ten minutes: British bark "Beatrice" was struck by lightning and burned to the water's edge; the captain of an ocean steamer who passed through the storm stated that it was the most terrible he had witnessed in 20 years: it was short but exceedingly furious. Perry Valley, Iowa, 7th, violent wind storm passed over this region destroying several farm houses and the highway bridge over Perry's Creek. Rensselaer county, N. Y., 26th, violent wind storm swept over the county in the vicinity of Troy, demolishing buildings, uprooting trees and severely damaging crops. Ft. Supply, Ind. Ty., 22nd, 10.30 p. m., wind blew from the northwest at the rate of 30 to 60 miles per hour: but little damage was committed, owing to the sheltered position of the town. In northern Kentucky, southern Ohio and Indiana, violent wind and rain storms, causing great damage to crops and buildings were experienced on the 21st. Americus, Ga., 18th, at some distance from the town a small whirlwind, about 5 feet in diameter and sometimes 100 feet high, formed over a corn-field where it tore up the stalks by the roots and carried them with sand and other loose materials high into the air. The body of the whirling mass was of vaporous formation and perfectly black, the centre apparently illuminated by fire and emitting a strange "sulphurous vapor" that could be distinguished a distance of about 300 yards, burning and sickening all who approached close enough to breath it. Occasionally the cloud would divide into three minor ones, and as they came together again there would be a loud crash, accompanied by cracking sounds, when the whole mass would shoot upwards into the heavens. New Jefferson, Harrison, Co., Ohio, 16th, one church, many barns, stables and other buildings were blown down: about 20 horses were killed by the falling of stables: much damage to crops and fences in surrounding country. Atlanta, Ga., 12th, 5 p. m., terrific wind storm from the northwest, continuing for 30 minutes; the heavens were of inky blackness, which with the fury of the wind, made an appalling sight; considerable damage was done to fences, trees and outbuildings. Winona, Wis., 11th, 5 p. m., the car shops of the Winona and St. Peter railroad, 40x150 feet, were completely demolished; the air was filled with boards and other *debris* during the passage of the storm; several other buildings were badly damaged. Ft. Wayne, Ind., 12th, 5 p. m., unroofing houses, destroying shade trees and fences and severely damaging crops. Danville, Va., 8th, 5 p. m., buildings unroofed and blown down and considerable destruction to fences, trees and crops. Dallas, Tex., 1st, during night, fearful storm of wind and rain, fences, outbuildings, six residences and one church were demolished.

VERIFICATIONS.

Indications.—The detailed comparison of the tri-daily indications for July, 1881, with the telegraphic reports for the succeeding twenty-four hours, shows the general average percentage to be 87.57 per cent. The percentages for the four elements are: Weather, 93.6; Direction of the Wind, 83.1; Temperature, 87.3; Barometer, 86.3. By geographical districts they are: For New England, 86.9; Middle states, 82.6; South Atlantic states, 87.9; Eastern Gulf states, 91.4; Western Gulf states, 92.2; Lower Lake region, 86.0; Upper Lake region, 86.6; Tennessee and the Ohio valley, 90.8; Upper Missouri valley, 86.1; Lower Missouri valley, 84.3; Northern Pacific coast region, 98.3; Central Pacific coast region, 100.0; Southern Pacific coast region, 100.0. There were 82 omissions to predict (46 being due to the absence of reports from the Pacific coast), out of 3,813, or 2.15 per cent. Of the 3,731 predictions that have been made, 84, or 2.26 per cent are considered to have entirely failed; 140, or 3.75 per cent. were one-fourth verified; 376, or 10.07

per cent, were one-half verified; 347, or 9.30 per cent. were three-fourths verified; 2.784, or 74.62 per cent. were fully verified, so far as can be ascertained from the tri-daily reports.

Cautionary Signals.—Thirty-five Cautionary signals were displayed during the month, of which 29, or 82.86 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. No Off-shore signals were displayed. The above does not include signals ordered at display stations where the velocity is only estimated; one hundred and three winds of twenty-five miles or over were reported, for which no signals were ordered. Six 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 river guages during the month of July, 1881. At no time during the month were rivers above the danger line at any of the various stations. The highest water in the Red, Arkansas and Mississippi rivers was reached between the 3d and 4th; in the Mississippi river between the 1st and 18th; in the Ohio, Cumberland and Tennessee rivers between the 1st and 6th; in the Monongahela on the 23d and 24th, and in the Williamette, at Portland, Oregon, on the 1st.

Floods due to unusually heavy rains were particularly destructive to crops and other property in the northern portion of the Upper Mississippi valley, being most severe in those portions of the states of Illinois, Iowa, Wisconsin and Minnesota bordering the Mississippi river. *California.*—San Gorgoino, 4th, heaviest rain storm in 7 years; mountain streams turned into rushing torrents, washing out field crops and fruit trees. *Colorado.*—Denver, 30th, very heavy rains, flooding all streams and causing damage estimated at $50,000 to streets, stores and cellars. *Iowa.*—Carroll, Carroll Co., 13th, heaviest rain storm ever known in this state; 12 inches (estimated) fell in three hours; creeks and rivers overflowed and all bridges for miles were carried away, roads impassable and all communication cut off. Cedar Rapids, 13th, the destruction of railroad, farm and city property immediately west of here by heavy rains is unparalleled in the history of this region. The railroad companies were the greatest sufferers, a very large number of valuable bridges and culverts being washed out and many miles of track ruined. Marengo, 13th, river highest ever known; public square two feet under water and boats were propelled through the streets without difficulty; several large flouring and woolen mills flooded; court-house, post-office and a large number of business houses flooded; entire damage estimated at $500,000. Waukee, 11th, heavy washout on the Des Moines and Northwestern R. R. Leighton, 11th, between this station and Pella, track badly damaged and bridge carried away. Marshalltown, 11th, water four feet deep in the town, great damage to property. Colfax, 11th, water rose above the flat cars standing near the depot; tracks badly washed; communication cut off. Kellogg, 11th, from this town to Wilton railroad track badly washed; farming lands submerged; Raccoon and Des Moines rivers rising rapidly, cutting the levees badly. Bentonsport, 15th, Des Moines river, 12½ feet above low water mark, a rise of 32 inches in about twelve hours. Ottumwa, 15th, Des Moines river highest for years. Brighton, 15th, Skunk river overflowed; railroad bridge badly damaged. Des Moines, 11th, river at flood tide; several hundred yards of railroad track washed away; 15th, water much higher, inundating the first story of the flouring mill; the brick and saw mills completely surrounded; lower portion of city near Walnut street submerged; people deserted their homes; several narrow escapes; Raccoon river overflowed, backing up the Des Moines river, so as to submerge the western portion of city to the depth of four feet; lowlands to the southwest of city submerged, driving out the stock. Keokuk, 13th, Des Moines River, very high, damaging railroad bridge, 3 miles below station; 15th, river rose at the rate of 1½ inches per hour; 16th, full of heavy driftwood, track of the Keokuk and St. Louis R. R. submerged; 18th, river stationary at 22 inches above the danger-line; bottom lands below Alexandria overflowed and trains on the Keokuk and St. Louis R. R. stopped; 19th, river falling slowly. *Wisconsin.*—Salem, 21st, the La Crosse division of the Milwaukee and St. Paul Railroad badly washed in many places, delaying all trains. La Crosse, 21st, immense damage in surrounding country; all rivers and creeks above their banks; in the city, basements were flooded, in many cases entailing great loss; streets were very badly washed, in some cases to the depth of 12 or 15 feet Chaseburg, Vernon Co. 21st, water four feet higher than ever known before; great amount of damage done to buildings, bridges and crops. Coon Valley, 21st, water highest ever known; seven persons drowned; bridges all gone, roads impassable and all communication cut off. Winona Junction, 21st, 700 feet of the Chicago, Milwaukee and St. Paul Railroad washed out; heaviest rain storm for years. Campbell, 21st, bridges washed away; roads almost impassable. Bostick Valley, Vernon Co., 21st, bridges and dams entirely gone; over 500 tons of hay carried away by the rushing torrent of water; loss to farmers exceedingly severe in several instances reaching $1000 to a single proprietor. In the townships of Webster, Liberty and Kickapoo, nearly every bridge was swept away; at Bloomingdale and Avalanche the bridges, although