

## WINDS.

The prevailing winds at the Signal Corps stations are shown by the arrows, flying with the wind, on chart No. II. The *maximum* velocities (in miles per hour) have been given in the description of the movements of areas of low pressure. On Mt. Washington the highest velocity, W. 114 miles, was recorded on the 14th; from seven observations taken daily the following results: calm at 2 observations, N. at 3, NW. at 123, W. at 33, SW. at 16, S. at 3, SE. at 20, E. at 4, and NE. at 13 observations.

*Total Movements of the Air.*—The following are the *largest* monthly movements recorded at the Signal Corps stations, viz.: Pike's Peak, 18,389 miles; Cape Lookout, 13,102; North Platte, 11,081; Ft. Dodge, 10,823; Cape May, 10,731; Sandy Hook, 10,652; Cape Henry, 10,518; Wood's Holl, 10,504; Cape Hatteras, 10,365; Breckenridge, 10,306; Sandusky, 10,194; Milwaukee, 9,960; Red Bluff, Cal., 9,791; Indianola, 9,683; Cheyenne, 9,121; Winnemucca, 9,096. The *smallest* are Florence, Ariz. Ty., 1,652 miles; La Messilla, N. Mex. 1,787; Nashville, 2,110; Visalia, Cal., 2,611; Los Angeles, Cal., 2,214; Deadwood, Dak., 3,284; Augusta, 3,296; Lynchburg, 3,294; Uvalde, Tex., 3,417; San Antonio, Tex., 3,441; Montgomery, 3,798; Ft. Davis, Tex., 3,761.

*Local Storms.*—Tornado in Macoupin Co., Ill., March 10th, in the afternoon, a black cloud having the appearance of a large spinning top was seen to move in southwesterly direction. It would rise and then touch the earth sweeping everything in its path; houses, barns, trees, &c., were totally destroyed. Near Prrietown, Madison Co., the storm found its first and as far as can be ascertained its only victims. A man working on his farm was raised in the air about 30 feet and carried a distance of five hundred yards, resulting in death; a child was blown out of its mothers arms and killed, the father of the child and five remaining children were very seriously injured; another man had his shoulders broken; several others were injured; "houses were scattered to the winds, and farm property generally destroyed by its fury." Many persons described the storm cloud as resembling a large balloon; track about a quarter of mile wide. Storms that uprooted trees, blew down fences, barns, &c., were experienced on the same day in the neighboring counties of Madison, Montgomery, Bond and Clinton. Its formation was due to two conditions: 1st, a narrow barometric trough reaching from storm-centre No. VII southward: 2nd, the rapid advance of a high pressure area from the westward, causing a sudden shift of the wind, from southerly to northerly.

*Waterspouts.*—Ship "India" was abandoned April 1st, 200 miles from the capes of the Delaware. She was caught between two waterspouts one of which passed forward, burst and fell on deck crushing it, and filled vessel with water.

## VERIFICATIONS.

*Indications.*—The detailed comparison of the tri-daily weather indications, with the telegraphic reports for the succeeding twenty-four hours, shows the general percentage of omissions to be 1.2 per cent, and of verifications to be 89.7 per cent. The percentages for the four elements have been: Weather, 92.1; Wind direction, 90.0; Temperature, 90.3; Barometer, 86.3. The percentages of verifications by geographical districts have been: New England, 89.3; Middle States, 90.5; South Atlantic States, 91.6; East Gulf States, 90.7; West Gulf States, 87.8; Lower Lake region, 91.2; Upper Lake region, 89.6; Tennessee and the Ohio valley, 89.4; Upper Mississippi valley, 88.1; Lower Missouri valley, 89.1; Northern Pacific coast region, 91.1; Central Pacific coast region, 88.7; Southern Pacific coast region, 87.5. Of the 3,766 predictions that have been made, 91, or 2.4 per cent, are considered to have entirely failed; 86, or 2.3 per cent, were one-fourth verified; 346, or 9.2 per cent, were one-half verified; 228, or 6.0 per cent, were three-fourths verified; 3,015, or 80.1 per cent, were fully verified, so far as can be judged from the tri-daily weather maps.

*Cautionary Signals.*—199 Cautionary Signals were displayed during the month, of which 157, or 78.9 per cent, were justified. 81 Cautionary Off-shore Signals were displayed, and of these 69, or 85.2 per cent, were justified as to direction; 72, or 88.9 per cent, were justified as to velocity. Of the Cautionary Off-shore Signals 42 were changed from Cautionary. 280 signals of both kinds were displayed, of which 223, or 79.6 per cent, were fully justified. The above does not include signals ordered at 47 display stations, where the velocity is only estimated and not measured. 64 cases were reported of winds of 25 miles or over where signals were not ordered.

## NAVIGATION.

*Stage of Water in Rivers.*—In the table, on the right-hand side of chart No. III, are given the highest and lowest readings of the Signal Corps river-gauges for the month, with the dates. The Red river steadily fell throughout the month at Shreveport. In the Savannah river at Augusta the changes were slight, except rises of about two feet on the 14th and 23rd. The Cumberland, at Nashville, fell from 18 ft. 4 in., 4th, to 6 ft. 1 in., 16th; rose to 22 ft. 6 in. by the 27th; then fell to 15 ft., 31st. Tennessee, at Chattanooga, fell from 11 ft., 1st, to 4 ft. 6 in. by 21st; rose to 6 ft. 11 in., 26th; fell to 5 ft. 10 in. by 31st. Ohio, at Pittsburgh, rose from 7 ft. 7 in., 3rd, to 19 ft. 11 in., 12th; fell to 7 ft. 8 in., 21st; rose to 10 ft. 7 in., 24th; fell to 8 ft. 11 in., 26th; rose to 14 ft. 10 in. by 31st. At Cincinnati, fell from 29 ft. 6 in., 3rd, to 27 ft., 6th; rose to 38 ft., 15th; fell to 28 ft., 21st; rose to 38 ft. 10 in. by 30th. At Louisville, it generally rose from 9 ft. 10 in., 1st, to 13 ft. 6 in., 14th and 17th; fell to 11 ft. 6 in., 21st; rose to 15 ft., 31st. Arkansas, at Little Rock, changes unimportant and river low. Missouri was low, and the changes slight, until towards the latter part of the month it began rising from Yankton to St. Louis. Mississippi, above Cairo the river was low, and the changes were slight. At Cairo, fell from 25 ft. 6 in., 1st, to 23 ft., 11th; rose to 33 ft., 27th; fell to 31 ft. 10 in., 31st. At Memphis, fell from 19 ft. 10 in., 1st, to 16 ft. 10 in., 14th; rose to 25 ft. 5 in. by 31st. At

Vicksburg, fell from 33 ft., 1st, to 27 ft. 7 in., 18th; rose to 34 ft., 31st. At New Orleans there was a fall of 1 ft. 5 in. from the 1st to the 19th, and a rise of 1 ft. the last week.

*Ice on Rivers and Lakes.*—*Yellowstone River*—Ft. Buford, Dak., 9th, ice breaking up; 14th, river frozen over; 25th, floating ice. *Missouri River*—Ft. Buford, Dak., 28th, ice breaking up and moving. Bismarck, 29th, ice breaking up. Ft. Hale, Dak., 11th, river opened. Ft. Standall, Dak., 7th, river open, floating ice; 18th, large quantities of floating ice. Yankton, 8th, ice broke up; 20th, river gorged below city; 21st, river frozen over; 23rd, river open. Plattsmouth, Neb., 6th, ice breaking up. Leavenworth, 2nd, 19th, 20th, floating ice in river. *Red River of the North*—Pembina, 26th, water several feet deep on the ice; 28th, teams crossing. *Mississippi River*—St. Paul, 9th, river closed, except near gauge; 25th, ice breaking up; 26th, river opened from St. Anthony's Falls to about three miles below St. Paul; 27th, 28th, floating ice. La Crosse, 7th, ice thawing rapidly; 11th, ice moved out; 26th, ferry-boat made first trip, navigation fairly opened, but dangerous, on account of large quantities of floating ice; 29th, first steamer left for down river. Dubuque, 5th, ice weakening; 8th, river open; 9th, floating ice; 10th, river clear, ferry-boats resumed trips; 16th, 18th, river full of floating ice; 21st, river frozen over at Eagle Point; 22nd, first boat of season, (from St. Louis); 28th, first raft from up river passed down. Davenport, 8th, ice commenced moving at 6 a. m. opposite East Davenport, and at sunset the river was clear as far as visible; 10th, almost clear; floating ice, 9th, 11th, 17th, 18th, 19th; 16th, first steamer of the season, (from St. Louis); 17th, ferry-boats resumed trips; 24th, first steamer passed, going south. Burlington, 6th, ice broke up; 7th, clear; 16th, navigation opened, first steamer, (from St. Louis.) Ft. Madison, Iowa, 12th, first boat up river to Madison. Keokuk, 4th, ice breaking up; 5th, ice broke up south of bridge, river navigable to all points south, floating ice; 8th, first steamer, (from St. Louis,) river clear. St. Louis, 1st, river clear; 3rd, slush-ice. *Monongahela River*—Morgantown, W. Va., 4th, first log-rafts of season passed down river. *Hudson River*—Albany, 27th, floating ice; 31st, several ice gorges between Albany and New York. Poughkeepsie, 16th, first boat of season from New York. Newburg, 13th, river open. West Point, 10th, ferry-boat forced passage across river; 13th, first steamer passed up river. Garrisons, N. Y., 10th, ice broken up; 28th, disappeared from ponds. *Lake Superior*—Duluth, 12th, ice in harbor broken up by heavy winds; 13th, lake frozen over as far as visible; 15th, first departure, tug forced way through the ice with difficulty; 17th, tug returned, having succeeded in getting within 26 miles of Prince Authur's landing, where she landed her passengers on the ice; 31st, harbor almost free of ice. *Lake Michigan*—Grand Haven, 9th, ice along shore disappeared; 18th, harbor blockaded by ice; 20th, blockade broken up by easterly winds; navigation open. Chicago, 10th, lake shores entirely free from ice. *Lake Huron*—Port Huron, 20th, navigation opened. *St. Clair River*—Port Huron, 6th, ice breaking up. *Detroit River*—Detroit, 31st, navigation opened, steamer arrived from New Baltimore, Michigan. *Lake Erie*—Cleveland, 6th, 10th, floating ice; 13th, lake clear; 24th, navigation opened. Sandusky, 11th, lake clear eastward as far as visible, but to the W. and NW. an unbroken field of ice from 15 to 30 inches thick; 20th, large fields of moving ice; 24th, steamers made first trips, tug sunk by heavy masses of ice, through which she tried to force a way. Buffalo, 1st, lake frozen, except in channel; clear beyond breakwater, navigation closed during the entire month. *Lake Champlain*—frozen over the entire month.

## TEMPERATURE OF WATER.

The *temperatures of Water*, as observed in rivers and harbors, with average depth when observations were taken, are given in table on chart No. II. At Alpena, Burlington, Duluth, Escanaba and Marquette, observations were not taken on account of ice. At the following stations observations were only taken on the dates indicated: Buffalo, 20th to 31st; Cleveland, 10th to 13th, 15th to 19th, 22nd to 31st; Chicago, 4th to 31st; Detroit, 5th to 31st; Grand Haven, 9th to 31st; Sandusky, 14th to 31st; Toledo, 15th to 31st.

## ATMOSPHERIC ELECTRICITY.

*Thunder-storms.*—1st, Ohio; 3rd, N. M.; 4th, Mo.; 5th, Iowa, Ill., Mo.; 6th, Iowa, Ill., Ind., Mo., Neb.; 7th, Kan., Mich., Cal.; 8th, Mich., N. Y., Kan., Minn., Ohio, Iowa, Mo., Neb., N. J., Pa., Vt., Wis., 9th, Mich., N. Y., Iowa, Ill., Ohio, Ind., Md., Mass., Wis.; 10th, Mich., N. Y., Iowa, Mo., Pa., Ohio, Ky., W. Va., Ind., Ill.; 11th, N. Y., Ala., Ark., Tex., Fla., Pa., Ill., Tenn., N. C., Ohio, Vt., Va., Ga.; 12th; Ind. Ty., Tex., Fla., Ga., Mich.; 13th, Fla., Ark., Tenn., Ga.; 14th, Tex., Fla., Mass., N. J., N. Y., N. C., Pa., Va., Ga.; 15th, Ark., Tex., N. J., Va.; 16th, Ark., Fla., Tenn., Ga., Miss., N. Y.; 17th, Fla., R. I., Va., Conn., Mass., Miss., N. J.; 19th, Fla.; 20th, Fla., Tenn., Neb.; 21st, Ala., Fla., Mo., Ill., Ga., Ky., Miss., Ohio, S. C., Ga., N. C.; 22nd, N. Y., Fla., Ky., Ohio, Ill., Tenn., Ga., Ind., Miss., N. J., N. C., Pa., S. C., Tex., Va.; 23rd, N. Y., Va.; 24th, Va., Tenn., Md., N. J., N. C.; 25th, Dak., Tex., Mo., Tenn., Ind., Ohio, Va.; 26th, Ala., Utah, Tex., Mo., Ky., Ind., Ill., Tenn., Ohio, Va.; 27th, Col., Dak., Fla., Mo., Minn., Ga., Va., N. C., S. C.; 28th, Ind. Ty., Mich., Neb., Tex., Fla., Iowa, Wis., Ill., Ohio, Ind., Ky., Mo.; 29th, Iowa, Ohio, Ind., Pa., Tenn., Ky., Md., Miss., N. C., Tex., Va., W. Va.; 30th, Cal., Pa., N. C., S. C., Va.; 31st, Ark., N. M., Ind. Ty., Tex., Tenn., Ill., Me., Nev.

*Auroras.*—Cambridge, Mass., regularly looked for at 8 p. m., none seen; cloudy, 1st, 2nd, 4th, 6th, 12th, 14th, 17th, 20th to 31st; moonlight, 3rd, 5th, 7th, 8th; no observation, 9th. Oregon, Mo., 10th. Vevey, Ind., 14th. Starkey, N. Y., 11th, 26th. Iowa City, Iowa, 19th, 23rd.

*Telegraphic Communication interfered with by Atmospheric Electricity.*—Albuquerque, N. M., 31st; San Diego, Cal., 28th; Santa Fe, 3rd, 31st; Colorado Springs, Col., 27th, line heavily charged; Laredo, Tex., 11th, 28th; Graham, Tex., 11th, 31st; Mason, Tex., 26th; McKavitt, Tex., 12th; Castroville, Tex., 28th;