

was five degrees lower than the air, and at Milwaukee and Eastport where it has been two degrees colder. The mean temperature of the water has been slightly above the mean temperature of the air on the Gulf and South Atlantic coasts and in the Ohio, Cumberland and Tennessee rivers. In Lake Michigan the water has averaged colder than the air by seven degrees; in Lake Superior by fourteen degrees, and on the coast of Maine by twelve degrees.

WINDS.

Southerly winds have prevailed throughout the United States east of the Rocky Mountains. Chart No. II shows the mean direction as obtained from each of the stations of the Signal Service, and it will be observed that these directions are generally toward the area of mean low barometer. The total atmospheric movement, independent of the direction, has been as follows in the several districts: New England, 5,280 miles; Middle Atlantic coast, 6,480 miles; interior of the Middle Atlantic States, 4,690 miles; South Atlantic coast, 4,730 miles; Gulf coast, 5,650 miles; Ohio, Tennessee and the interior of the Gulf States, 3,360 miles; Lower Lake region, 5,710 miles; Upper Lake region, 6,370 miles; Upper Mississippi valley, 6,395 miles; Missouri valley, 3,517 miles. Violent winds occurred at Washington, D. C., July 4th, 60 miles; Mt. Washington, New Hampshire, July 9th, 96 miles; Milwaukee, Wisconsin, July 9th, 63 miles; Long Branch, July 26th, 50 miles. Tornadoes were reported at Three Mile Bay, New York, July 7th; Bass Harbor, Maine, July 16th; Lexington, Michigan, July 24th; South Bend, Indiana, July 26th.

Dove's law of gyration received four complete verifications at Signal Service observatory in this city, with a single backing of the wind through an arc of 180 degrees.

NAVIGATION.

From the Table on Chart No. III, which gives the condition of the western rivers, it will be seen that the Mississippi and Missouri rivers have declined slowly during the month, the lowest readings being those made on the 31st. The Ohio river experienced a sudden rise during the 26th, 27th and 28th, which caused some damage near Cincinnati.

Comparative observations of the fluctuations of the barometer and the water in Lake Superior at Marquette, Michigan, show that the mercury and the water acted together thirty-four times, and in an opposite direction fifty-nine times.

An unusual wave occurred at the east end of Lake Erie on the 25th, causing the water to rise three or four feet, the water returning to its normal condition as rapidly as it rose. A similar wave occurred at Northport, Michigan, on the 31st.

ELECTRICAL PHENOMENA.

The local storms previously referred to, were, in many instances, accompanied by vivid displays of lightning. The most remarkable series of thunder storms occurred at the summit of Pike's Peak from the 14th to the 25th, during which the electrical effect was so intense as to interrupt telegraphic communication with that station. The observer reports that sharp peculiar sounds were emitted from all pointed objects, and that painful sensations were experienced in the hands and face.

A brilliant display of ball-lightning was observed at Denver, July 21st, the ball exploding in full view and the fragments re-exploding as they reached the earth; this phenomena was also observed at Keokuk, Iowa, on the 16th.