

RELATIVE HUMIDITY.

The average percentages of Relative Humidity for the month ranged as follows: New England, 53 to 84; Middle Atlantic States, 57 to 77; South Atlantic States, 55 to 82; Gulf States, 59 to 75; Ohio valley and Tennessee, 50 to 61; Lower Lakes, 54 to 64; Upper Lakes, 59 to 75; Upper Mississippi valley, 54 to 63; Lower Missouri valley, 58 to 68; Red River of the north, 69 to 71; Eastern Rocky Mountain Slope, 43 to 77; Rocky Mountains, 20 to 44; Western Plateau, 26 to 50; California, 45 to 74; Oregon, 74 to 79. *High stations* report the following averages, not corrected for altitude: Mt. Washington, 81; Pike's Peak, 37.

WINDS.

The prevailing winds, at the Signal Corps stations, are shown by the arrows flying with the wind on chart No. II. The *maximum hourly velocities* have been given in the descriptions of the movements of areas of high and low pressure. The highest hourly velocity of the month at Mt. Washington was 133 miles from the NW. on the 27th, and at Pikes Peak 108 miles from the NE. on the 12th.

Total Movements of the Air.—The following are the *largest* monthly movements in miles recorded at the Signal Corps Stations viz: Pikes Peak, 20,025; North Platte, 13,827; Cape Lookout, 12,753; Dodge City, 12,734; Breckenridge, 11,472; Fort Sill, 10,975; Kittyhawk, 10,631. The *smallest* movements are: Boise City, Idaho, 3,555; Visalia, Cal., 3,489; Indianapolis, 3,403; Deadwood, Dak., 3,397; Uvalde, Tex., 3,168; Silver City, N. M., 2,940; Roseburg, Or., 2,408; Nashville, 2,207; Florence, Arizona, 1,656.

Local Storms.—May 29th, warm, moist southerly winds, with fair weather, prevailed over Iowa and southward to the Gulf States. About 5 p. m. a hail storm of great violence passed from the SW. to the NE., through Holt Co., Mo., and then, developing into a tornado, passed eastward through the southern part of Nodaway Co., Mo., for about 16 miles having a width of 300 to 3000 feet. It began near Smith passed south of Barnard and north of Bockolow [Bolocow?] and was last seen moving towards Conception, but apparently rose and was dissipated before reaching that place. The north side of the track was straight, clean and well-defined; the south side was jagged, looped and curved. On the same afternoon heavy hail and rain-storms occurred in Lawrence Co. and Riley Co., and many other portions of Kansas. May 30th, lower temperatures prevailed in Missouri and Kansas and the advancing edge of the area of cold NW. winds passing eastward over western Nebraska and Kansas, was accompanied by severe local thunder and hail storms, and in some places by tornadoes. At 4:35 p. m., Washington time, (or 3:15 p. m., local time on the 97th meridian) an oval area extended for 300 miles from west of Fort Sill to south of Omaha and having a shorter diameter of about 50 miles; towards this the winds were blowing from all directions, being warm, brisk SW. on the east side and cold, high NW. on the west side. At 11 p. m. this area is represented by a smaller one of low pressure in southeastern Nebraska and two of converging winds respectively in SE. Iowa and central Missouri. Severe tornadoes or equivalent local storms occurred between 3 p. m. and 11 p. m. as follows: 1, Scardia, Republic Co., Kansas. 2, at 4 p. m., tornado passed 4 miles northwest of Minneapolis, Ottawa Co., Kan., path 10 to 15 miles long, 1,000 feet wide; very violent at Delphos, Ottawa Co.; in all 18 persons reported killed. 3, between 6 and 6:30 p. m. tornado passed from Candreys house near county line between Riley and Clay Counties, Kansas, northeastward over or near Stockdale and Randolph, in Riley County; path [30?] miles long; very destructive; 3 persons killed. 4, From 7:45 to 8 p. m. tornado passed eastward over Blue Rapids, Irving and Frankfort, Marshall Co., Kansas, and Centralia, Nemaha Co., Kan.; very severe at Irving; high winds prevailed to long distances from the central path, which was about 30 miles long; in all over 30 persons killed and over 50 severely injured. 5, Richardson Co., Neb., the preceding tornado reported to have reappeared in this county. 6, At 1 p. m. [10? p. m.] near Kirksville, Adair Co., Mo.; 1 person killed. 7, Between 7 and 9 p. m., at Craig, Holt Co., Mo.; this storm was seen by observer at Corning, Holt Co. 8, About 6 p. m. tornado seen to form about 2 miles north of Lee's Summit, Jackson Co., Mo.; passed near Blue Springs and Oak Grove, and was seen to dissipate near Judge Williams' house; path northeastward, 10 miles long and 100 feet wide; 5 or 6 killed. This same storm was seen by observers at Independence and Buckner, Mo. 9, In Wayne Co., and at 9:10 a. m., local time, in Appanoose Co., Iowa, at a point 15 miles NE. of Unionville, Putnam Co., Mo.; one killed; (probably a heavy thunder and hail storm rather than a well developed tornado).

VERIFICATIONS.

Indications.—The detailed comparison of the tri-daily weather indications for May with the telegraphic reports for the succeeding twenty-four hours, shows the general percentage of omissions to be 0.2 per cent, and of verifications to be 82.9 per cent. The percentages for the four elements have been, Weather, 85.8; Direction of the Wind 85.2; Temperature, 82.6; Barometer, 77.9. The percentages of verifications by geographical districts have been: New England, 84.3; Middle States, 85.6; South Atlantic States, 80.4; East Gulf States, 76.6; West Gulf States, 76.7; Lower Lake region, 84.7; Upper Lake region, 87.1; Tennessee and the Ohio valley, 84.2; Upper Mississippi valley, 84.1; Lower Missouri valley, 84.0; North Pacific coast region, 93.1; Central Pacific coast region, 85.4; Southern Pacific coast region, 93.1. Of the 3,790 predictions that have been made, 160, or 4.2 per cent, are considered to have entirely failed; 145, or 3.8 per cent, were one-fourth verified; 580, or 15.3 per cent, were one-half verified; 353, or 9.3 per cent, were three-fourths verified; 2,552, or 67.3 percent, were fully verified, so far as can be judged from the tri-daily weather maps.

Cautionary Signals.—178 Cautionary Signals were displayed during the month, of which 110, or 61.8 per cent, were justified. 42 Cautionary Off-shore Signals were displayed, and of these 30, or 71.4 per cent, were justified as to direction; 17, or 40.5 per cent, were justified as to velocity. Of the Cautionary Off-shore Signals 20 were changed from Cautionary. 220 signals of both kinds were displayed, of which 126, or 57.3 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. 54 cases were reported of winds of 25 miles or over where signals were not ordered; in only 12 of these cases did the winds exceed 30 miles per hour.

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. No case has been reported of the rivers reaching danger line during the month. The Upper Mississippi was lowest during the early part of the month, and the Ohio was lowest during the latter portion of the month. Dubuque, Ia., 30th, the excellent stage of water in the river brought down a great quantity of logs and gave work to all mills. The Black river, Wis., on the 14th, rose 10 feet, producing the highest water for 10 or 12 years. Pittsburgh, 31st, "on account of low water during past few weeks it has been impossible to float loaded barges down the river."

Ice on Lakes, Rivers, &c.—Marquette, Wis., 8th, navigation opened; heavy ice reported beyond the Sault Sainte Marie Canal, but not preventing navigation. Buffalo, N. Y., 1st, several vessels forced their way through ice, outward bound; 2nd, harbor closed by ice; 5th, ice in harbor 3 feet thick; 7th, ice softening and vessels passing out; 9th, large masses of floating ice passing down Niagara river; 15th, ice firm navigation suspended; 16th, ice broke up; 20th, no ice observed on lake.

High Tides.—Cape Lookout, N. C., very high tide on the 3rd.

TEMPERATURE OF WATER.

The temperature of water, as observed in rivers and harbors, with average depth when observations were taken, are given in table on chart No. II. Observations were interrupted at the following places on the dates indicated: on account of rough water, Cleveland, 25th and 26th; on account of loss of thermometers, San Francisco, 1st to 31st, Milwaukee, 13th to 29th, New London, 16th to 31st, Augusta, Ga., 1st to 4th.

ATMOSPHERIC ELECTRICITY.

Thunder Storms.—1st, Me., Dak., Ga., Tex.; 2nd, La.; 3rd, Dak., Tex., Ia., Mo., Ill., Kan., Neb.; 4th, Ind. Ty., Tex., Miss., Mo., Ohio, Ill., Tenn., Ala., Ark., Neb., Ohio, Va.; 5th, Ind. Ty., Tex., Ala., Md., Ark., Ga., Mass., N. J., N. Y., Vt.; 6th, Col., Tex., La., Ala., Ga., Conn., N. Y., Ark., Miss., N. J.; 7th, Neb., Fla., N. C., Ala., Mich.; 8th, Dak., Fla.; 9th, Ia., Minn., Dak., Mo.; 10th, Dak., Ia., Minn., Wis., Ill., Mich., Pa.; 11th, Col., Wyo., Neb., Tex., Fla., Ia., Wis., Mich., Minn., Dak., Ill., Mo.; 12th, Neb., Dak., Tex., Minn., Mich., Ill., Mo.; 13th, Cal., Kan., Dak., Ia., Mo., Wis., Ohio, Mich., Penn., Ky., Ill., Tenn., N. C., Mo., Ala., Ind., Me., Neb., Tex., Vt.; 14th, Col., Ill., Ohio, N. Y., Tenn., Me., Ala., Ind., Ia., Kan., Mich., Mo., Vt.; 15th, Tex., Fla., N. Y., Penn., Ohio, Ky., Ill., Tenn., Ga., N. C., Ind., Va.; 16th, Neb., Kan., Tex., Fla., N. C., Ga., N. Y., Mass., Md., Conn., N. J., Penn., Vt., Va.; 17th, Col., Fla., La., N. C., Ga., Dak., Neb., Kan., Md., N. J., Pa., S. C., Va.; 18th, La., Fla., N. C., Ga., Va., Penn., Mass., Ia., Kan., Md., Mo., Neb., N. J., S. C.; 19th, Neb., Kan., Dak., Ia., Ga., Va., Me., Ala., Ill., Md., Mo., N. J., N. C., Ohio, Pa.; 20th, Ind. Ty., Fla., Mo., Mich., Ky., Tenn., N. C., Ga., Va., Vt., Kan., N. J., Pa.; 21st, Cal., Neb., Dak., Miss., Fla., N. C., N. J., Va., Penn., Mass., Conn., Me., Md., N. Y., S. C., Tenn., Vt.; 22nd, Kan., Dak., Tex., Ga., N. Y., Ia.; 23rd, Dak., Miss., Ala., Fla., Minn., Ga., Kan., Mo., Neb.; 24th, Cal., Tex., Ia., Wis., Mich., Neb., Wyo. Ty., Dak., Ill., Ind., Mo., Ohio; 25th, Dak., Ia., Wis., Ill., Ohio, Penn., Ind., N. Y., Conn., Kan., Md., Mich., N. J., Va., W. Va.; 26th, Ohio, Ky., Ill., Ind., N. C., Ia., Kan., Mich., Mo., N. M.; 27th, Ia., Ill., N. C., Kan., Neb., Pa., S. C.; 28th, Tex., Minn., Wis., Dak., Ill., Ind., Ia., Mich., Neb., N. C., Va.; 29th, Kan., Dak., Minn., Ia., Minn., Mich., Ky., Ind., Ill., Mo., Neb., N. C., Ohio, W. Va.; 30th, Ind. Ty., Tex., Miss., Ia., Mo., Wis., Mich., Ohio, Ill., Kan., Neb., N. Y.; 31st, Tex., Ia., Mo., Wis., Mich., N. Y., Penn., Ill., Tenn., Mass., Ark., Ind., Kan., Miss., Neb., Ohio, W. Va.

Auroras were observed on the following dates: 7th, Starkey, N. Y.; 11th, Vevay, Ind.; 12th, Thornville, Mich.; 13th, Pembina, Dak.; 17th, Pembina, Dak.; 20th, Pembina, Dak., Starkey, N. Y.; 21st, Philadelphia; 23rd, Bismarck, Dak., NE., 10 p. m., Eastport, Me., Monticello, Iowa, Gardiner, Me., Woodstock, Vt.; 24th, Newburyport, Mass.; 25th, Bangor, Me., from 10 p. m. until 2:45 a. m., Starkey, N. Y.; 26th, Cambridge, Mass., regularly looked for at 8 p. m., none seen; cloudy on 2nd, 3rd, 4th, 6th, 7th, 12th, 13th, 16th, 17th, 18th, 19th, 24th, 25th, 27th, 30th; moonlight, 1st, 5th; twilight strong last half of month.

Telegraphic Communication Interfered with by Atmospheric Electricity.—Santa Fe, N. M., 4th, 26th; Colorado Springs, Col., 26th; Pikes Peak, Col., 27th; St. Paul, Minn., 12th.

OPTICAL PHENOMENA.

Solar Halos.—1st, Utah, Ill. 2nd, Dakota, Fla. 3rd, Utah, Ohio, Mich, N. J. 4th, Ohio, Ind. 5th, Utah, Me., Ill., N. C., Va., Conn., Ia., Mass., Neb., N. J. 6th, Utah, Ia., Ohio, Ill., Conn., Mo., N. H., N. J.