together, side by side, in the following table, from which it appears that, in general, the instrumental record of percentages of duration of sunshine is almost always larger than the observers' personal estimate of percentages of area of clear sky; the average excess for December, 1895, is 4.5 per cent for photographic records, and 4.5 per cent for thermometric records. The details are shown in the following table:

Difference between instrumental and personal observations of sunshine.

Photographic stations.	Instrumental.	Personal.	Difference.	Thermometric stations.	Instrumental.	Personal.	Difference.
Phœnix, Ariz.	88	77	11	New Orleans, La	61	60	1
San Diego, Cal.	88	74	14	Portland, Me	60	46	14
Santa Fe, N. Mex	82	70	12	Wilmington, N.C.	60	55	5
Denver, Colo	79	60	19	San Francisco, Cal	58	53	5
Dodge City, Kans.	66	62	4	Vicksburg, Miss	57	54	3
Savannah, Ga	63	57	6	Philadelphia, Pa	56	41	15
Galveston, Tex.	56	55	1	Atlanta, Ga.	53	55	− 2
Eastport, Me	48	37	11	Little Rock, Ark	49	41	8
Kansas City, Mo.	45	41	4	Des Moines, Iowa	48	37	11
Washington, D.C.	44	46	− 2	St. Louis, Mo	48	36	12
Eureka, Cal	38	40	− 2	Boston, Mass	43	37	6
Bismarck, N. Dak	37	48	−11	Rochester, N.Y	43	37	6
Helena, Mont.	34	32	2	New York, N.Y	39	38	1
Cleveland, Ohio	30	30	0	Detroit, Mich.	37	32	5
Salt Lake City, Utah	30	19	11	Baltimore, Md.	36	40	− 4
Portland, Oreg. *	13	20	− 7	Cincinnati, Ohio	33	33	0
				Columbus, Ohio	32	25	7
				Chicago, Ill	28	26	2
				Louisville, Ky	26	24	2
				Buffalo, N.Y.	20	17	3
				Portland, Oreg.*	13	20	− 7

* Records kept by both methods.

ATMOSPHERIC ELECTRICITY.

Numerical statistics relative to auroras and thunderstorms are given in Table X, which shows the number of stations from which meteorological reports were received, and the number of such stations reporting thunderstorms (T) and auroras (A) in each State and on each day of the month, respectively.

The dates on which reports of thunderstorms for the whole area were most numerous, were: 17th, 80; 18th, 34; 19th, 22; 21st, 20.

Thunderstorm reports were most numerous in: Illinois, 23; Iowa, 22; Missouri, 39; Texas, 26.

Thunderstorms were most frequent in: Texas, eleven days; Louisiana, seven days; Illinois and Oregon, six days; Kansas, Missouri, and Nebraska, five days.

Auroras.—The evenings on which bright moonlight must have interfered with observations of faint auroras are assumed to be the four preceding and following the date of full moon, viz, from the 1st to the 5th, inclusive, and also the 27th to 31st. On the remaining twenty-one days of this month 79 reports were received, or an average of about 4 per day. The dates on which the number of reports especially exceeded this average were: 7th, 11; 8th, 17; 9th, 10th, and 24th, 8.

The ratio of auroras to observers was a large percentage in: North Dakota, 50; New Hampshire, 29; Maine, 31.

Auroras were reported most frequently in: North Dakota, eleven days; Minnesota and Montana, five days; Maine, Massachusetts, Nebraska, and Wisconsin, four days.

CANADIAN DATA—THUNDERSTORMS AND AURORAS.

No thunderstorms were reported.

Auroras were reported as follows: St. Andrews, 8th; Father Point, 8th, 13th; Quebec, 8th; Montreal, 9th; Winnipeg, 5th; Minnedosa, 8th; Qu'Appelle, 7th, 8th; Medicine Hat, 23d, 24th; Swift Current, 10th, 29th; Edmonton, 11th, 20th; Battleford, 19th.

INLAND NAVIGATION.

The *extreme and average stages of water* in the rivers during the current month are given in Table VII, from which it appears that the only river that attained the danger line during the month was the Arkansas, which was 5.6 feet above on the 26th at Fort Smith, and 0.5 feet above at Little Rock on the 29th. This rise in the Arkansas followed the heavy rains and snows on the 17th, 18th, 19th, and 20th, above alluded to in the chapter on precipitation. The effect of the rain that fell on these dates upon the height of the lower Missouri River was very appreciable. The tributaries of the lower Missouri were generally overflowed, and the stages of water were the highest ever known in December. The Arkansas rose 20.1 at Little Rock within four days after the rainfall, and the Missouri rose sufficient to cause a rise of 23.4 in the Mississippi at St. Louis. The general drainage into the Mississippi below St. Louis caused a rise of 17.3 at Memphis; 21.3 at Helena, Ark., 28.1, at Arkansas City, Ark., 23.5, at Greenville, Miss., 26.4, at Vicksburg, all on the 31st, and the water had already risen 3 feet on that date at New Orleans, La. On the 1st of the month the Mississippi at Vicksburg had stood at 4.6 below the zero gauge, which is the lowest stage recorded at that city during any previous December.

ICE IN RIVERS AND HARBORS.

The chart of depth of snow and thickness of ice published weekly shows that on Monday, December 2, the distribution of ice was as follows:

Missouri River.—Miles City, 3.0; Williston, 13.0; Bismarck, 2.0; Pierre, 5.0; Yankton, 6.0; Sioux City, 4.0.

Red River of the North.—Moorehead, 8.0.

Mississippi River.—St. Paul, 3.0; Dubuque, 3.0.

Lake Superior.—Duluth, 5.0.

Lake Michigan.—Green Bay, 2.0.

Lake Huron.—Alpena, 0.5.

During the following week the thickness of ice generally increased in the Mississippi, Missouri, Hudson, and other northern rivers.

By December 16 ice had increased on the lower Lakes but diminished in the Missouri River. By December 23 ice had generally diminished or disappeared in the lower Lakes aad upper Mississippi, but increased in the upper Missouri. On Monday, December 30, the condition of the ice was as follows:

Missouri River.—Miles City, 10.0; Williston, 19.0; Bismarck, 7.0; Pierre, 10.0; Yankton, 7.0; Sioux City, 8.0; Omaha, 2.0; Kansas City, 2.0; below this the thickness was 0.0.

Red River of the North.—Moorhead, 15.0.

Upper Mississippi.—St. Paul, 5.0; La Crosse, 8.0; Dubuque, 2.0; below this the thickness was 0.0.

Ohio River.—Louisville, 0.0.

Tennessee River.—Nashville, 0.0.

Lake Superior.—Duluth, 15.0; Marquette, 1.0.

Lake Michigan.—Green Bay, 4.0.

Lakes Huron, Erie, and Ontario.—0.0.

In addition to the preceding the following notes are at hand:

Hermann, Mo., heavy floating ice in Missouri River 3d.

Muscatine, Iowa, Mississippi River frozen over on 5th; ice moved out 17th.

Lake Oneida, N. Y., was frozen over December 16, which is considered quite early in the season for this lake to freeze.

METEOROLOGY AND MAGNETISM.

By Prof. FRANK H. BIGELOW.

For a description of the method of constructing the tables and curves of Chart V, see the WEATHER REVIEW for October, 1895, page 371. The numbers in the columns H, D, V, of Chart V, are added, respectively, to the mean values of the forces for Washington and Toronto, i. e., H = 0.18250; D = 175.0; V = 0.58400.

In the case of V it was necessary to multiply the residuals for Washington by 2 and those for Toronto by $\frac{1}{2}$ in order to reduce them to about the same amplitude, as the sensitiveness of the instruments of these two stations was very different during December, 1895.