

STAGE OF WATER IN RIVERS AND HARBORS.

The following table shows the danger-point at the several stations; the highest and lowest water during September, 1890, with the dates of occurrence and the monthly ranges:

Heights of rivers above low-water mark, September, 1890 (in feet and tenths).

Stations.	Danger-point on gauge.	Highest water.		Lowest water.		Monthly range.
		Date.	Height.	Date.	Height.	
<i>Red River.</i>						
Shreveport, La.	29.9	30	5.2	7	2.2	3.0
<i>Arkansas River.</i>						
Fort Smith, Ark.	22.0	19	10.6	15	2.7	7.9
Little Rock, Ark.	23.0	26	15.6	10, 11	6.1	9.5
<i>Missouri River.</i>						
Fort Buford, N. Dak.		10	3.3	30	0.8	2.5
Sioux City, Iowa		1	5.9	24	4.1	1.8
Omaha, Nebr.	18.0	15	7.6	25, 26, 28, 29	6.4	1.2
Kansas City, Mo.	21.0	1	6.2	30	4.6	1.6
<i>Mississippi River.</i>						
Saint Paul, Minn.	14.5	9, 10	2.3	29	1.6	0.7
La Crosse, Wis.	13.0	11 to 15	5.0	1	3.5	1.5
Dubuque, Iowa.	16.0	15, 16	5.9	2	3.7	2.2
Davenport, Iowa.	15.0	17	3.6	3	2.2	1.4

Heights of rivers—Continued.

Stations.	Danger-point on gauge.	Highest water.		Lowest water.		Monthly range.
		Date.	Height.	Date.	Height.	
<i>Mississippi River—Continued.</i>						
Keokuk, Iowa.	14.0	19, 20	3.4	3, 4	2.0	1.4
Saint Louis, Mo.	32.0	22 to 24	8.3	18, 19	6.9	1.4
Cairo, Ill.	40.0	24-25	20.4	13	10.5	9.9
Memphis, Tenn.	34.6	27 to 29	16.0	1, 2, 15	8.5	7.5
Vicksburg, Miss.	41.0	30	21.6	1, 2	10.2	11.4
New Orleans, La.	13.0	30	5.3	1, 19	3.8	1.5
<i>Ohio River.</i>						
Pittsburgh, Pa.	22.0	14	15.2	4	2.6	12.4
Parkersburg, W. Va.	38.0	15	27.2	5	4.9	22.3
Cincinnati, Ohio.	50.0	18	35.2	7	11.1	24.1
Louisville, Ky.	25.0	18, 19	12.5	7, 8	6.4	6.1
<i>Cumberland River.</i>						
Nashville, Tenn.	40.0	17	15.0	9	2.6	12.4
<i>Tennessee River.</i>						
Chattanooga, Tenn.	33.0	1	7.6	9, 10	2.8	4.8
<i>Monongahela River.</i>						
Pittsburgh, Pa.	29.0	14	15.2	4	2.8	12.4
<i>Savannah River.</i>						
Augusta, Ga.	32.0	30	24.2	21	6.5	17.7
<i>Willamette River.</i>						
Portland, Oregon.	15.0	1	4.1	23, 24	0.9	3.2

ATMOSPHERIC ELECTRICITY.

QUORAS.

Auroras were reported as follows: 3d, Mount Washington, N. H.; Northfield, Vt.; and Salem Corners, Pa. 8th, Medford, Minn. 10th, Cresco, Iowa; Orono, Me.; and Madison, Wis. 11th, Detroit and Manton, Mich.; Madison, Iowa; Orono, Me.; Madison and Potosi, Wis. 12th, Webster, S. Dak. 14th, Bar Harbor, Me. 15th, Webster, S. Dak. 16th, Mount Washington, N. H.; Cresco, Iowa; and Madison, Wis. 18th, Mount Washington, N. H. 19th, Mount Washington, N. H.; Fort Buford, N. Dak.; Huron, Webster, and Wolsey, S. Dak.; Cresco, Iowa; Orono and Bar Harbor, Me.; Newburyport, Mass.; and Embarrass, Wis. 20th, Kent's Hill, Me. 21st, Webster, S. Dak. 28th, Columbus, Ohio. 30th, Mount Saint Mary's, Md.

Fort Buford, N. Dak., 19th: an aurora was first observed 10.53 p. m., at altitude about 8°, and extended over 50° of azimuth between north and east. The arch was about 2° in width and of a light gray color. The arch continued to rise and extend and increase in brightness until 12.50 a. m., 20th, when it attained its maximum intensity, reaching altitude about 55°, and covered about 75° of azimuth. The color was white and continued so until 1.20 a. m., when it became dimmer, with the arch irregular and receding. The dark segment was well defined during part of the display. At 2 a. m. only a few traces remained visible. No streamers or material changes were observed during the entire display.

Columbus, Ohio, 28th: an aurora was visible from 9 p. m. to 10.30 p. m.; it consisted of a narrow band of pure white light with well-defined edges, about 5° wide, forming an arch rising to altitude about 80°, and extending from about 90° to 270°

azimuth. There was a slow flow and ebb of the light, moving from west to east through the band, about doubling the brightness at the crest of the flow. There was an indefinite show of white light low down about the north part, too faint to be more than barely noticeable. The moon was shining with unusual brilliancy and prevented a view of the greater portion of the aurora where the latter was faint.

THUNDER-STORMS.

The more severe thunder-storms of the month are described under "Local storms." East of the Rocky Mountains thunder-storms were reported in the greatest number of states, 35, on the 5th; in 20 to 28 on the 6th, 7th, 8th, 12th, 13th, 15th, and 16th; in 10 to 19 on the 1st to 4th, 9th, 10th, 11th, 14th, and 18th to 24th; and in 4 to 9 on the 25th to 30th.

East of the Rocky Mountains thunder-storms were reported on the greatest number of dates, 30, in Fla.; on 20 to 24 in Ga., La., Miss., and S. C.; on 10 to 19 in Ala., Ill., Iowa, Kans., Md., Mich., Minn., Mo., Nebr., N. Y., N. C., Ohio, Pa., S. Dak., Tenn., Tex., Va., and Wis.; and on 3 to 9 in Ark., Conn., D. C., Ind., Ky., Mass., Mont., N. H., N. J., N. Dak., R. I., Vt., and W. Va. West of the Rocky Mountains thunder-storms were reported as follows: Ariz., 1st, 2d, 3d, 5th to 9th, 14th to 17th, 22d, 23d, 24th, and 30th; Colo., 1st, 2d, 3d, 6th, 8th, 10th, 13th, 16th, 20th, 21st, and 23d to 26th; Cal., 19th, 21st, 24th, and 26th to 29th; Idaho, 30th; Nev., 25th, 26th, 28th, and 29th; N. Mex., 3d, 5th, 13th, 22d, 27th, and 30th; Oregon, 28th and 30th; Utah, 1st, 2d, 5th, 10th, 11th, 16th, 19th, 22d, 25th, 29th, and 30th; Wash., 2d; Wyo., 2d. There were no states or territories in which thunder-storms were not reported.

MISCELLANEOUS PHENOMENA.

DROUGHT.

Drought prevailed in a large part of the northeast section of Missouri during the month, and, in connection with the dry weather of previous months, resulted in short crops, excepting wheat. Water for stock was scarce and poor, and land dry and difficult to prepare for fall seeding. A report from Nodaway Co., northwest Missouri, stated that water for stock was failing, and the ground too dry to plow. In east-central and southeast Iowa streams were reported low, water for stock scarce, and the ground dry. A report from Independence,

southeast Kansas, stated that creeks and pools that were not dried up were lower than ever before, and that water for stock was very scarce. At Howe, southeast Nebraska, the drought was broken on the 7th. At Wolsey and Woonsocket, southeast South Dakota, streams and wells were reported going dry, and the ground drier than in 10 years. At Marshall and Montevideo, southwest Minnesota, drought continued during the month, streams were reported lower than for 13 years, and at Marshall the Redwood River was dry. At North Lewisburgh, west-central Ohio, the drought was broken on the 4th. At Staunton, north-central Virginia, the drought was broken on

the 6th. A report from Eola, Oregon, stated that the drought continued during the month.

PRAIRIE AND FOREST FIRES.

Prairie fires caused considerable damage near East Portland, Oregon. In the region about Etta Mine, southwest South Dakota, and Bismarck, central North Dakota, forest fires caused widespread damage. In California forest fires raged during a great part of the month in the southern part of Humboldt and the upper part of Mendocino counties. Forest fires were reported at Grant's Pass, southwest Oregon, and in central and west-central Washington.

SUN SPOTS.

Mr. D. E. Hadden, Alta, Iowa: 1st, 2 groups, one new. 2d to 5th, one group, 2 spots. 6th, cloudy. 7th, one group, 3 spots; faculae near east limb. 8th, one group, 4 spots; one large spot on east limb, surrounded by faculae; one faint spot, south, surrounded by faculae. 9th, one group, 2 spots. 10th, one group, 3 spots. 11th and 12th, cloudy. 13th, clear disc. 14th, cloudy. 15th, group of faculae near northwest limb. 16th, one spot surrounded by faculae. 17th, 2 groups, 4 spots; new group in south latitude. 18th and 19th, 2 groups, 5 spots. 20th, one group, 2 spots. 21st, one group of faculae, southwest. 22d, group of faculae near east and west limbs. 24th, one group, 2 spots; group near west limbs, with faculae. 25th, one group, 4 spots. 26th and 27th, one group, 5 spots. 28th, one group, 4 spots. 29th, one group, 4 spots; one veiled spot. 30th, one group, 3 spots.

Mr. C. E. Buzzell, Leaf River, Ill.: the group of August 25th in view 1st and 2d. 3d to 5th, cloudy. 1st, new group three days in, in view 6th and 7th. 8th, clouds. 6th, 1 small group two days in, in view 9th, 10th, and 11th. New small group two days in, on 11th. Clouds, 12th. Clear disc 13th and 14th. Clouds, 15th. 16th, 2 groups one and two days in, in view 18th and 19th, both vanished on 20th. 21st, prominent faculae on east limb, which changed to spots on 24th; they were unchanged on 29th. Clouds on 30th.

Mr. John W. James, Riley, Ill.: 1st, the group first seen August 26th, on sun's meridian. 6th, the largest spot close to

western edge of disc, the rest broken up; very prominent faculae in their place; a few groups formed since yesterday two days from the western edge, disappeared by solar rotation 8th. 10th to 16th, none seen. 17th, 3 small groups in very low south latitude; gone 21st. The faculae reappeared by solar rotation, 20th, but the large spots gone. 21st to 23d, none seen. 24th, 2 new groups three days east of sun's meridian. 30th, another new group formed 24 hours west of these new groups.

Mr. H. D. Gowey, North Lewisburgh, Ohio: sun spots were observed 1st to 8th, 16th to 20th, 23d, 24th, 28th, and 29th.

Haverford College Observatory, Pa., (observed by Prof. F. P. Leavenworth):

Date.	Number of new		Disappeared by solar rotation.		Reappeared by solar rotation.		Total number visible.		Faculae.	Remarks.
	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.		
Sept., 1890.										
1, 3 p. m.	0	14	0	0	0	0	2	65	1	Definition poor; 3 large spots.
2, 10 a. m.	0	0	0	0	0	0	2	59	1	Definition fair; 2 large spots.
3, 9 a. m.	0	0	0	0	0	0	2	54	2	Definition fair; 2 large spots.
4, 10 a. m.	1	7	0	0	0	0	3	52	1	Definition good; 1 large spot.
6, 5 p. m.	4	18	0	0	0	0	5	37	5	Definition good; 1 large spot.
7, 4 p. m.	0	12	1	1	0	0	4	44	8	Definition fair; 1 large spot.
8, 10 a. m.	0	0	0	0	0	0	4	20	4	Definition poor; 1 large spot.
9, 3 p. m.	0	22	0	7	0	0	4	34	2	Definition fair.
10, 11 a. m.	1	4	1	2	0	0	2	34	0	Definition fair; spots small.
12, 11 a. m.	1	5	0	0	0	0	2	25	0	Definition poor.
13, 10 a. m.	0	0	0	0	1	2?	1	6	1	Definition fair.
15, 3 p. m.	1	2	0	0	0	0	1	2	5	Definition poor; 1 very large spot.
17, 12 m.	1	15	0	0	0	0	2	17	1	Definition fair; 2 very large spots.
18, 11 a. m.	0	11	0	0	0	0	2	28	1	Definition fair; 2 very large spots.
19, 12 m.	1	10	0	0	0	0	3	35	3	Definition fine; small.
20, 10 a. m.	0	0	0	0	0	0	1	7	2	Definition fair.
21, 3 p. m.	1	1	0	0	0	0	2	4	1	Definition fair.
23, 11 a. m.	1	19	1	0	1	0	3	24	5	Definition fine; very small.
24, 10 a. m.	0	0	0	0	0	0	1	13	3	Definition good.
25, 12 m.	0	11	0	0	0	0	1	30	4	Definition fair; small.
28, 4 p. m.	0	7	0	0	0	0	1	17	2	Definition poor.
29, 10 a. m.	0	0	0	0	0	0	1	17	0	Definition poor.
30, 10 a. m.	0	0	0	0	0	0	1	23	0	Definition poor.

VERIFICATIONS.

CAUTIONARY SIGNALS FOR SEPTEMBER, 1890.

[Verifications made by Assistant Professor C. F. Marvin, assisted by Mr. H. E. Williams, chief clerk of the Forecast Division.]

Statement showing percentages of justifications of wind signals for the month of September, 1890:

Wind signals.—(Ordered by 1st Lieut. R. E. Thompson). Total number of signals ordered, 45; justified as to velocity, wholly, 30, partly, 3; justified as to direction, 44. All of the signals ordered were cautionary; 20 signals were ordered for easterly winds, of which 19 were justified, and 25 were ordered for westerly winds, all of which were justified. Percentage of justifications, 58.5.

No cold-wave signals were ordered during the month.

FORECASTS FOR 24 HOURS IN ADVANCE.

The forecasts for districts east of the Rocky Mountains for September, 1890, were made by 1st Lieut. Richard E. Thompson, 6th Infantry, Signal Officer, and those for the Pacific coast districts were made at San Francisco, Cal., by 2d Lieutenant John P. Finley, Signal Corps.

Percentages of forecasts verified, September, 1890.

States.	States.
Maine..... 80.7	Rhode Island..... 77.7
New Hampshire..... 79.8	Connecticut..... 77.2
Vermont..... 80.8	Eastern New York..... 80.5
Massachusetts..... 77.3	Western New York..... 82.9

Percentages of forecasts verified—Continued.

States.	States.
Eastern Pennsylvania..... 81.5	Illinois..... 74.7
Western Pennsylvania..... 79.9	Lower Michigan..... 82.6
New Jersey..... 75.3	Upper Michigan..... 80.2
Delaware..... 76.1	Wisconsin..... 83.3
Maryland..... 81.5	Minnesota..... 83.5
District of Columbia..... 82.7	Iowa..... 82.9
Virginia..... 81.0	Kansas..... 77.5
North Carolina..... 81.4	Nebraska..... 83.8
South Carolina..... 76.7	Missouri..... 78.1
Georgia..... 70.6	Colorado..... 81.9
Eastern Florida..... 82.9	North Dakota..... 82.1
Western Florida..... 83.2	South Dakota..... 83.1
Alabama..... 77.7	Southern California*..... 87.0
Mississippi..... 75.9	Northern California*..... 85.8
Louisiana..... 75.4	Oregon*..... 88.3
Texas..... 82.1	Washington*..... 87.9
Arkansas..... 72.9	By elements: Weather..... 83.0
Tennessee..... 72.8	Temperature..... 73.9
Kentucky..... 76.7	Monthly percentage of weather and temperature combined..... 79.4
Ohio..... 81.0	
West Virginia..... 80.0	
Indiana..... 74.3	

* In determining the monthly percentage of weather and temperature combined, the Pacific coast states are not included. † The forecasts of temperature in districts east of the Rocky Mountains for September, 1890, were made with reference to the maximum temperature alone; that is, a prediction of warmer or cooler indicated that the maximum temperature of the day designated would be higher or lower than the maximum of the previous day. ‡ The monthly percentage of weather and temperature combined is determined by multiplying the percentage of weather by 6, and the percentage of temperature by 4, and dividing their sum by 10.

FORECASTS FOR 48 HOURS IN ADVANCE.

Appreciating the great importance that long time predic-