

For the sake of comparison, these percentages have been brought together, side by side, in the following table, from which it appears that, in general, the instrumental records of percentages of durations of sunshine are almost always larger than the observers' personal estimates of percentages of area of clear sky; the average excess for December, 1897, is 5 per cent for photographic and 4 per cent for thermometric records.

The details are shown in the accompanying table, in which the stations are arranged according to the total possible duration of sunshine, and not according to the observed duration. In obtaining the total possible sunshine the value for the parallel of latitude nearest the station is used.

Difference between instrumental and personal observations of sunshine.

Stations.	Latitude.		Apparatus.	For whole month.		Instrumental record of sunshine.			
	o	'		Total possible.	Personal.	Photographic.	Difference.	Thermometric.	Difference.
Key West, Fla.	24	34	T.	329.1	55	...	...	58	+15
Tampa, Fla.	27	57	T.	323.9	57	...	...	58	+1
Galveston, Tex.	29	18	P.	330.2	42	44	+2	...	...
New Orleans, La.	29	58	T.	317.8	55	...	...	55	0
Jacksonville, Fla.	30	20	T.	317.8	50	...	...	60	+10
Savannah, Ga.	32	05	P.	318.0	44	49	+5	...	...
Vicksburg, Miss.	32	43	T.	318.0	37	...	...	39	+2
San Diego, Cal.	32	43	P.	310.7	73	38	+9	...	...
Charleston, S. C.	32	47	T.	310.7	45	...	...	41	-2
Phoenix, Ariz.	33	28	P.	310.7	74	87	+13	...	...
Atlanta, Ga.	33	45	T.	307.7	28	...	...	33	+5
Los Angeles, Cal.	34	08	P.	307.7	79	85	+6	...	...
Wilmington, N. C.	34	14	T.	307.7	45	...	...	48	+3
Little Rock, Ark.	34	45	T.	305.2	29	...	...	41	+12
Chattanooga, Tenn.	35	04	T.	305.2	26	...	...	25	+1
Oklahoma, Okla.	35	26	T.	305.2	54	...	...	58	+4
Santa Fe, N. Mex.	35	41	P.	302.5	72	81	+9	...	...
Raleigh, N. C.	35	45	T.	302.5	40	...	...	41	+1
Knoxville, Tenn.	35	56	T.	302.5	26	...	...	31	+5
Nashville, Tenn.	36	10	T.	302.5	21	...	...	27	+6
Fresno, Cal.	36	43	T.	299.4	67	...	...	72	+5
Dodge City, Kans.	37	45	P.	296.7	64	71	+7	...	...
San Francisco, Cal.	37	48	T.	296.7	55	...	...	71	+16
Louisville, Ky.	38	15	T.	296.7	17	...	...	24	+7

Difference between instrumental and personal observations—Cont'd.

Stations.	Latitude.		Apparatus.	For whole month.		Instrumental record of sunshine.			
	o	'		Total possible.	Personal.	Photographic.	Difference.	Thermometric.	Difference.
St. Louis, Mo.	38	33	T.	293.7	19	...	...	29	+10
Washington, D. C.	38	54	P.	293.7	51	50	-1	...	...
Kansas City, Mo.	39	05	P.	293.7	30	36	+6	...	...
Cincinnati, Ohio	39	06	T.	293.7	29	...	...	35	+6
Parkersburg, W. Va.	39	16	T.	293.7	17	...	...	19	+2
Baltimore, Md.	39	18	T.	293.7	42	...	...	54	+12
Atlantic City, N. J.	39	22	P.	293.7	39	49	+10	...	...
Denver, Colo.	39	45	P.	291.7	55	68	+13	...	...
Indianapolis, Ind.	39	46	T.	291.7	19	...	...	22	+3
Philadelphia, Pa.	39	57	T.	291.7	33	...	...	49	+16
Columbus, Ohio	39	58	T.	291.7	31	...	...	15	-16
Harrisburg, Pa.	40	16	T.	291.7	27	...	...	41	+14
Pittsburg, Pa.	40	32	T.	287.8	16	...	...	16	0
New York, N. Y.	40	43	T.	287.8	38	...	...	46	+8
Salt Lake City, Utah	40	46	P.	287.8	50	48	-2	...	...
Eureka, Cal.	40	48	P.	287.8	49	53	+4	...	...
Cheyenne, Wyo.	41	08	P.	287.8	51	59	+8	...	...
Omaha, Nebr.	41	16	P.	287.8	37	38	+1	...	...
Cleveland, Ohio	41	30	T.	284.7	9	...	...	9	0
Des Moines, Iowa	41	35	T.	284.7	49	...	...	51	+3
Chicago, Ill.	41	53	T.	284.7	31	...	...	30	-1
Erie, Pa.	42	07	T.	284.7	16	...	...	11	-7
Binghamton, N. Y.	42	08	T.	284.7	23	...	...	27	+4
Detroit, Mich.	42	20	T.	284.7	29	...	...	28	-1
Boston, Mass.	42	21	T.	284.7	36	...	...	46	+10
Dubuque, Iowa	42	30	T.	284.7	41	...	...	41	0
Albany, N. Y.	42	39	T.	281.0	23	...	...	30	+7
Buffalo, N. Y.	42	53	T.	281.0	12	...	...	22	+10
Yankton, S. Dak.	42	54	T.	281.0	41	...	...	47	+6
Rochester, N. Y.	43	08	T.	281.0	12	...	...	14	+2
Idaho Falls, Idaho*	43	29	T.	281.0	34	...	...	...	...
Portland, Me.	43	39	T.	277.7	35	...	...	37	+2
Northfield, Vt.	43	10	P.	277.7	28	29	+1	...	...
Huron, S. Dak.	44	21	T.	277.7	37	...	...	42	+5
Eastport, Me.	44	54	P.	274.3	32	39	+7	...	...
St. Paul, Minn.	44	58	P.	274.3	44	42	-2	...	...
Minneapolis, Minn.	44	59	T.	274.3	...	...	...	35	...
Portland, Oreg.	45	32	T.	269.6	28	...	...	28	0
Helena, Mont.	45	32	P.	269.6	28	25	-3	...	...
Bismarck, N. Dak.	45	34	P.	265.6	39	38	-1	...	...
Tacoma, Wash.	46	47	P.	265.6	45	48	+3	...	...
Seattle, Wash.	47	16	T.	265.6	18	...	...	13	0
Spokane, Wash.	47	35	T.	262.1	19	...	...	6	-18
Spokane, Wash.	47	40	T.	262.1	17	...	...	14	-3

* Instrument out of order.

CLIMATE AND CROP SERVICE.

By JAMES BERRY, Chief of Climate and Crop Service Division.

The following extracts relating to the general weather conditions in the several States and Territories are taken from the monthly reports of the respective sections of the Climate and Crop Service. The name of the section director is given after each summary.

Snowfall and rainfall are expressed in inches.

Alabama.—The mean temperature was 47.8°, or 0.8° above normal; the highest was 82°, at Eufaula on the 5th, and the lowest, 19°, at Hamilton on the 31st. The average precipitation was 5.82, or 2.20 above normal; the greatest monthly amount, 12.13, occurred at Jasper, and the least, 1.05, at Clanton.—*F. P. Chaffee.*

Arizona.—The mean temperature was 43.5°, or 9.5° below normal; the highest was 89°, at Maricopa, and the lowest, 12° below zero at Williams. The average precipitation was 0.42, or 0.06 above normal; the greatest monthly amount, 1.50, occurred at Flagstaff, while none fell at Calabasas, Casa Grande, Fort Mohave, and Gila Bend.—*W. T. Blythe.*

Arkansas.—The mean temperature was 40.4°, or 3.1° below normal; the highest was 81°, at Bee Branch on the 9th, and the lowest, 10°, at Dallas, Fayetteville, and Winslow on the 4th. The average precipitation was 6.00, or 1.35 above normal; the greatest monthly amount, 9.11, occurred at Blanchard, and the least, 2.74, at Dardanelle.—*F. H. Clarke.*

California.—The mean temperature was 44.4°, or 8.5° below normal; the highest was 94°, at Downey on the 23th, and the lowest, 20° below zero, at Bodie on the 20th. The average precipitation was 1.75, or 2.67 below normal; the greatest monthly amount, 10.66, occurred at Crescent City, while none fell at several stations.—*H. W. Hammon.*

Colorado.—The mean temperature was 23.1°, or 3.2° below normal; the highest was 74°, at Rockyford on the 8th, and the lowest, 33° below zero, at Steamboat Springs on the 20th. The average precipitation was 0.90, or 0.18 below normal; the greatest monthly amount, 5.75, occurred at Ruby, and the least, 0.05, at Vilas.—*F. H. Brandenburg.*

Florida.—The mean temperature was 60.4°, or slightly above normal; the highest was 91°, at Lemon City on the 9th, and the lowest, 28°, at De Funiak Springs on the 5th, at Perry on the 27th and 28th, and at Wausau on the 6th. The average precipitation was 2.84, or about 0.50 above normal; the greatest monthly amount, 6.50, occurred at Carrabelle, and the least, 1.00, at Lemon City.—*A. J. Mitchell.*

Georgia.—The mean temperature was 48.4°, or 1.1° above normal; the highest was 84°, at Bragg on the 4th and 11th, and the lowest, 18°, at Toccoa on the 24th. The average precipitation was 3.66, or 0.58 below normal; the greatest monthly amount, 7.97, occurred at Diamond, and the least, 1.51, at Talbotton.—*J. B. Marbury.*

Idaho.—The mean temperature was 24.5°; the highest was 57°, at Idaho City on the 29th, and the lowest, 27° below zero, at Gray on the 18th. The average precipitation was 2.08; the greatest monthly amount, 6.49, occurred at St. Maries, and the least, 0.58, at Rexburg.—*D. P. McCallum.*

Illinois.—The mean temperature was 27.3°, or 2.4° below normal; the highest was 72°, at Albion on the 10th, and the lowest, 18° below zero, at Scales Mound on the 18th. The average precipitation was 2.38, or 0.07 below normal; the greatest monthly amount, 5.15, occurred at Cobden, and the least, 0.84, at Sycamore.—*C. E. Linney.*

Indiana.—The mean temperature was 31.6°, or 1.6° below normal; the highest was 70°, at Boonville on the 9th, and at Vevay and Washington on the 10th, and the lowest, 9° below zero, at Topeka on the 24th. The average precipitation was 2.65, or 0.14 below normal; the greatest

monthly amount, 4.37, occurred at Rockville, and the least, 0.61, at Valparaiso.—*C. F. R. Wappenhans.*

Iowa.—The mean temperature was 18.0°, or 5.0° below normal; the highest was 60°, at Denison and Mount Pleasant on the 9th, and the lowest, 25° below zero, at Atlantic on the 18th. The average precipitation was 1.65, or 0.34 above normal; the greatest monthly amount, 3.22, occurred at Ovid, and the least, 0.61, at Burlington.—*G. M. Chappel.*

Kansas.—The mean temperature was 29.0°, or 5.6° below normal; the highest was 79°, at Coolidge on the 8th, and the lowest, 16° below zero, at Phillipsburg on the 16th. The average precipitation was 0.78; the greatest monthly amount, 3.06, occurred at Fort Scott, and the least, trace, at Meade.—*T. B. Jennings.*

Kentucky.—The mean temperature was 38.0°, or 1.2° below normal; the highest was 72°, at Henderson on the 9th, and the lowest, 3° at Mount Sterling on the 24th. The average precipitation was 3.75, or 0.25 above normal; the greatest monthly amount, 5.60, occurred at Williamsburg, and the least, 2.47, at Scott.—*Frank Burke.*

Louisiana.—The mean temperature was 52.3°, or 1.5° below normal; the highest was 89°, at Southern University Farm (near New Orleans) on the 30th, and the lowest, 17°, at Plaindealing on the 4th. The average precipitation was 7.29, or 3.39 above normal; the greatest monthly amount, 14.60, occurred at Robeline, and the least, 3.13, at Rayne.—*R. E. Kerkam.*

Maryland and Delaware.—The mean temperature was 36.9°, or 1.3° above normal; the highest was 74°, at Pocomoke City on the 11th, and the lowest, 4° below zero, at Deerpark on the 25th. The average precipitation was 3.57, or 0.61 above normal; the greatest monthly amount, 6.38, occurred at Sunnyside, and the least, 1.96, at Westernport.—*F. J. Wals.*

Michigan.—The mean temperature was 24.3°, or 4.0° below normal; the highest was 65°, at Coldwater on the 9th and 10th, and the lowest, 22° below zero, at Grayling on the 24th. The average precipitation was 2.41, or about normal; the greatest monthly amount, 5.80, occurred at Berrien, and the least, 0.76, at Humboldt.—*C. F. Schneider.*

Minnesota.—The mean temperature was 12.3°, or 5.0° below normal; the highest was 58° at Lesueur on the 29th, and the lowest, 36° below zero, at Tower on the 26th. The average precipitation was 0.38, or 0.41 below normal; the greatest monthly amount, 1.25, occurred at Albert Lea, and the least, trace, at Detroit City, New London, and Lakeside.—*T. S. Outram.*

Mississippi.—The mean temperature was 47.4°, or about normal; the highest was 85°, at Lake on the 9th, and the lowest, 21°, at French Camp, Louisville, and Pontotoc on the 5th. The average precipitation was 8.54, or 3.41 above normal; the greatest monthly amount, 14.78, occurred at Edwards, and the least, 2.71, at Poplarville.—*R. J. Hyatt.*

Missouri.—The mean temperature was 29.3°, or 4.6° below normal; the highest was 74°, at Mount Vernon on the 9th, and the lowest, 14° below zero, at Sublett on the 18th. The average precipitation was 2.81, or 0.81 above normal; the greatest monthly amount, 6.61, occurred at Birchtree, and the least, 0.61, at Darksville.—*A. E. Hackett.*

Montana.—The mean temperature was 22.7°, or 2.0° below normal; the highest was 61°, at Billings on the 27th, and the lowest, 45° below zero, at Chinook on the 2d. The average precipitation was 0.80; the greatest monthly amount, 3.80, occurred at Castle, and the least, 0.03, at Fort Keogh.—*J. Warren Smith.*

Nebraska.—The mean temperature was 22.9°, or 2.9° below normal; the highest was 68°, at Kearney on the 11th, and the lowest, 26° below zero, at Ashland on the 18th. The average precipitation was 1.31, or 0.61 above normal; the greatest monthly amount, 3.10, occurred at Wakefield, and the least, 0.10, at Willard.—*G. A. Loveland.*

Nevada.—The mean temperature was 29.1°, or 1.4° below normal; the highest was 69°, at Candelaria on the 30th, and the lowest, 14° below zero, at McGill on the 20th. The average precipitation was 1.06, or 0.31 below normal; the greatest monthly amount, 4.21, occurred at Lewers Ranch, while none fell at Hot Springs and Darrough Ranch.—*R. F. Young.*

New England.—The mean temperature was 28.4°, or 1.5° above normal; the highest was 64°, at Boston, Mass., on the 10th, and the lowest, 18° below zero, at Enosburg Falls, Vt., on the 25th. The average precipitation was 4.78, or 1.28 above normal; the greatest monthly amount, 7.36, occurred at Vernon, Vt., and the least, 2.10, at Burlington, Vt.—*J. W. Smith.*

New Jersey.—The mean temperature was 35.1°, or about normal; the highest was 69°, at Toms River on the 11th, and the lowest, 3° below zero, at Rivervale and Somerville on the 29th. The average precipitation was 4.90, or 1.79 above normal; the greatest monthly amount, 6.44, occurred at Englewood, and the least, 3.07, at Hightown.—*E. W. McGann.*

New Mexico.—The mean temperature was 33.4°, or 2.6° below normal; the highest was 78°, at Eddy on the 30th, and the lowest, 17° below zero, at Buckmans on the 17th. The average precipitation was below normal; the greatest monthly amount, 2.55, occurred at Fort Wingate, while none fell at Olio and Socorro.—*H. B. Hersey.*

New York.—The mean temperature was 29.0°, or 0.9° above normal; the highest was 65°, at Lyons on the 9th, and the lowest, 21° below zero, at Canton on the 25th. The average precipitation was 3.78, or 0.91 above normal; the greatest monthly amount, 6.71, occurred at Port Jervis, and the least, 1.56, at Penn Yan.—*R. M. Hardinge.*

North Carolina.—The mean temperature was 43.9°, or 1.1° above normal; the highest was 76°, at Newbern on the 10th, and the lowest, 10°, at Linville on the 24th and at Oakridge on the 25th. The average precipitation was 3.67, or about normal; the greatest monthly amount, 7.31, occurred at Hatteras, and the least, 1.68, at Southern Pines.—*C. F. von Herrmann.*

North Dakota.—The mean temperature was 10.8°, or 2.3° below normal; the highest was 69°, at Berthold Agency on the 11th, and the lowest, 35° below zero, at Berthold Agency on the 3d. The average precipitation was 0.22, or 0.29 below normal; the greatest monthly amount, 0.67, occurred at Hamilton, and the least, trace, at several stations.—*B. H. Bronson.*

Ohio.—The mean temperature was 32.8°, or about normal; the highest was 71°, at Logan on the 9th, and the lowest, 7° below zero, at Sylvania on the 23d, and at Leipsic and Wauseon on the 24th. The average precipitation was 2.39, or 0.14 below normal; the greatest monthly amount, 4.96, occurred at McConnellsville, and the least, 0.90, at Bellefontaine.—*H. W. Richardson.*

Oklahoma.—The mean temperature was 36.6°; the highest was 81°, at Edmond on the 9th, and the lowest, zero, at Fort Reno on the 4th. The average precipitation was 1.01; the greatest monthly amount, 5.22, occurred at South McAlester, and the least, 0.03, at Purcell.—*J. I. Widmeyer.*

Oregon.—The mean temperature was 38.9°, or slightly above normal; the highest was 81°, at Dayville on the 28th, and the lowest, 4° below zero, at Burns on the 31st. The average precipitation was 8.02, or 1.74 above normal; the greatest monthly amount, 42.21, occurred at Glendale, and the least, 0.95, at Burns.—*B. S. Pague.*

Pennsylvania.—The mean temperature was 33.0°, or 1.1° above normal; the highest was 73°, at Cannonsburg on the 9th, and the lowest, 6° below zero, at Franklin on the 23d and at Saegerstown on the 29th. The average precipitation was 3.95, or 0.86 above normal; the greatest monthly amount, 6.25, occurred at Hamburg, and the least, 1.28, at Reedsville.—*T. F. Townsend.*

South Carolina.—The mean temperature was 47.6°, or about normal; the highest was 82°, at Trial on the 11th, and the lowest, 21°, at Holland on the 1st. The average precipitation was 2.40, or 1.15 below normal; the greatest monthly amount, 4.11, occurred at Walhalla, and the least, 1.10, at Georgetown.—*J. W. Bauer.*

South Dakota.—The mean temperature was 18.2°, or 4.8° below normal; the highest was 69°, at Ashcroft on the 9th, and the lowest, 35° below zero, at Cherry Creek. The average precipitation was 0.53, or 0.25 below normal; the greatest monthly amount, 2.40, occurred at Rosebud, and the least, trace, at Fort Meade and Ipswich.—*S. W. Glenn.*

Tennessee.—The mean temperature was 41.5°, or about normal; the highest was 71°, at Dover on the 10th, and the lowest, 10°, at Silverlake on the 24th. The average precipitation was 5.79, or about 2.00 above normal; the greatest monthly amount, 10.97, occurred at St. Joseph, and the least, 3.23, at Elizabethton.—*H. O. Bate.*

Texas.—The mean temperature for the State during the month was 5.8° below the normal. There was a general deficiency in all sections and the deficit ranged from 2.7° to 12.1° over the panhandle and north Texas, from 3° to 9° over east, central, and southwest Texas, and from 1.1° to 12.6° over west Texas and the coast district, with the greatest in the vicinity of Cuero. The highest was 87°, at Jasper on the 8th and 13th, and the lowest, 1° below zero, at Amarillo on the 3d. The average precipitation for the State during the month was 0.10 above the normal. There was a general excess over the eastern part of the State and a deficiency over the western portion. The excess ranged from 0.54 to 3.00 over east Texas, and from 0.12 to 4.29 over the eastern portions of north Texas and the coast districts, except at Galveston, where there was a deficiency of 1.43. The deficiency ranged from 0.17 to 1.76 over the panhandle, central, west, and southwest Texas and the western portions of north Texas and the coast district, with the greatest deficiency at Coleman. The greatest monthly amount, 11.02, occurred at Colmesneil, while none fell at Kent.—*I. M. Cline.*

Utah.—The mean temperature was 22.7°; the highest was 68°, at Pinto on the 12th, and the lowest, 19° below zero, at Loa and Scipio on the 20th. The average precipitation was 1.16; the greatest monthly amount, 2.80, occurred at Huntsville, and the least, 0.06, at Loa.—*J. H. Smith.*

Virginia.—The mean temperature was 39.5°, or slightly above normal; the highest was 74°, at Ashland and Spottsville on the 11th, and the lowest, 2°, at Monterey on the 24th. The average precipitation was 3.39, or 0.31 above normal; the greatest monthly amount, 4.81, occurred at Burkes Garden, and the least, 1.75, at Goshen.—*E. A. Evans.*

Washington.—The mean temperature was 35.8°, or slightly below normal; the highest was 63°, at Kennewick on the 8th, and the lowest, 12° below zero, at Waterville on the 17th and 18th. The average precipitation was 9.21, or 2.46 above normal; the greatest monthly amount, 29.20, occurred at Union City, and the least, 1.21, at Kennewick.—*G. N. Salisbury.*

West Virginia.—The mean temperature was 37.3°, or slightly above normal; the highest was 72°, at Nuttallburg on the 9th, and the lowest, 4° below zero, at Beverly on the 25th. The average precipitation was 4.00, or about 1.00 above normal; the greatest monthly amount, 6.79, occurred at Buckhannon, and the least, 2.05, at Uppertract.—*H. L. Ball.*

Wisconsin.—The mean temperature was 16.4°, or 4.5° below normal; the highest was 54°, at Milwaukee on the 10th, and the lowest, 29° below zero, at Osceola on the 2d. The average precipitation was 1.11, or 0.27 below normal; the greatest monthly amount, 2.69, occurred at Watertown, and the least, 0.10, at Spooner.—*W. M. Wilson.*

Wyoming.—The mean temperature was 19.5°, or 6.5° below normal; the highest was 70°, at Wheatland on the 31st, and the lowest, 33° below zero, at Sheridan on the 16th. The average precipitation was 0.91, or 0.27 above normal; the greatest monthly amount, 2.14, occurred at Fort Washakie, and the least, 0.24, at Lusk.—*W. S. Palmer.*

RIVER AND FLOOD SERVICE.

By PARK MORRILL, Forecast Official, in charge of River and Flood Service.

The rise in the lower Mississippi which began in November continued very slowly during the first three weeks of December. During the last week of the month a sharper rise occurred, bringing the river to about its normal condition on the 31st at Cairo and Memphis. At Vicksburg the stage was still 8 feet below its normal height, but rising steadily.

The upper Mississippi and Missouri were closed by ice at the end of the month, and there has been practically no navigation on them since the last of November. The Ohio remained open and navigation was good, with scarcely any ice. The large coal shipments of November down the Ohio were duplicated. The Arkansas and Red continue very low, although slight rises toward the end of the month enabled a partial resumption of navigation.

During the last week of the month navigation was closed by ice in the Hudson. The navigable streams of the South Atlantic and East Gulf States have risen to fairly good stages and a marked increase in freighting has taken place.

The highest and lowest water, mean stage, and monthly range at 114 river stations are given in the accompanying table. Hydrographs for typical points on seven principal rivers are shown on the accompanying chart, V. The stations selected for charting are: Keokuk, St. Louis, Cairo, Memphis, and Vicksburg, on the Mississippi; Cincinnati, on the Ohio; Nashville, on the Cumberland; Johnsonville, on the Tennessee; Kansas City, on the Missouri; Little Rock, on the Arkansas; and Shreveport, on the Red.

The following résumé of river stages and conditions of navigation in the respective streams is compiled from reports by the officials of the Weather Bureau at various river stations and section centers:

Hudson River. (Reported by A. F. Sims, Albany, N. Y.)—Heavy rains on the watershed during the early days of the month caused the Hudson River to rise 7.1 feet above mean low water by the morning of the 6th. The prevailing wind was from the north, and the river fell 2 feet by the morning of the 7th. No ice was present in the river on that date. A dense fog overhung the valley during the mornings of the 8th and 9th. On the 10th all up-bound boats from New York were delayed in consequence of fog. On the 14th all streams in eastern New York were high, and a special warning to the effect that the Hudson would overflow its banks was made public. The river rose 20 inches in three hours at Albany during the 15th and flooded Quay street; on the 16th a stage of 10.5 feet above mean low water was reached; and by the 16th there was 1 foot of water on the lower streets south of Madison Avenue. The *Dean Richmond* could not make her regular landing at Steamboat square, but tied up at the high dock at the foot of Gansevoort street. The river ran like a mill-race during the 16th, and the swollen current brought down huge masses of debris that had been piled up along shore. Merchants had prepared for such a freshet by removing goods out of reach of water. Trains ran through a foot of water on Quay street during the afternoon of the 15th. At 9:45 a. m. on the 15th there were 73 inches of water passing over the State dam at Troy, the highest record for December in many years. The mills in the northern part of Troy were partly shut down on account of high water.

The Hudson receded and was within its banks by the 17th. On the 20th the *Dean Richmond* left for New York City and navigation was brought to a close; the upper Hudson froze over on the 24th. The condition of the river for several days prior to its close was not favorable for a permanent winter freeze, as the waters swollen by the recent rains, had covered the various wharves that line both sides of the stream and, at the time ice began to form, was too high to allow the dirt to settle. The current was still rapid and the ice formed was lumpy, and barrier after barrier of drift ice found lodgment at various points along the river. Navigation on the lower Hudson closed on the 27th.

Susquehanna River. (Reported by E. R. Demain, Harrisburg, Pa.)—The rainfall within the drainage area of the Susquehanna River was above the average and, being fairly well distributed through the month, the good stages of water in the streams at the end of November were maintained throughout the greater part of December, but a majority of the stations report lower stages on December 31 than existed at the beginning of the month. The conditions as to rainfall and the quantity of water discharged differed materially from those of December, 1896. For that month the average gauge reading of twelve stations was 2.4 feet, and the average rainfall of sixteen stations 0.89 inch, while for December, 1897, the average gauge reading of fifteen stations was 3.2 feet and the average rainfall of sixteen stations 3.20 inches. The dates of the closing of streams are reported as follows: At Sinnehoning, the 22d; at Farrandville, the 24th; at Mifflin, the 25th; at Wilkesbarre, the 25th; and at Williamsport, the 25th. A sudden rise of 2.3 feet at Towanda on the 28th was supposed to be due to an ice gorge below, as no precipitation sufficient to cause such a decided rise was known to have occurred above this point. Slush ice appeared in the river at Keating on the 23d and at Harrisburg on the 24th, and continued running, in decreasing quantities, till the end of the month.

Rivers of the South Atlantic States. (Reported by E. A. Evans, Richmond, Va.; C. F. von Herrman, Raleigh, N. C.; L. N. Jesunofsky, Charleston, S. C.; D. Fisher, Augusta, Ga.; and J. B. Marbury, Atlanta, Ga.)—The volume of water in the James River and its tributaries was about normal throughout the month. The rainfall over the river basin, while generally a little in excess of the average, showed no marked departures, and as the soil was not frozen a considerable portion of the downpour was absorbed. The water remained at about the zero of the gauge until the 15th, when general rains occurred over the basin, producing a rise to 1.5 foot on the following day. This was the maximum stage for the month. The river then declined slowly to its former level, which height it maintained with unimportant fluctuations during the remainder of the month. Navigation was unimpeded throughout the month, and, while some ice formed in shallow water above the falls during the last decade, it was not sufficient to be of consequence. With a normal amount of precipitation for the month, falling chiefly from the 2d to the 4th, 12th to 15th, and 19th to 22d, somewhat higher river stages were maintained in the North Carolina streams during December. Moderate increase in the volume of flow occurred about the 7th, 18th, 24th, and 28th. On the latter date the highest stage, 10 feet above the zero of gauge, occurred at Fayetteville, on the Cape Fear. The Cape Fear maintained a mean stage 2 feet higher than during November, while there was no increase in the mean stage of the Dan. There was very little formation of ice during the month, and has been practically no accumulation of snow in the mountains.

Navigation on the streams of South Carolina during December was much improved over that of the preceding month. Though slightly deficient in amount, there was a uniform distribution of rain over the drainage areas, which caused most of the streams to rise slowly, and sufficiently for purposes of traffic, between the 1st and 24th. The widespread and copious precipitation of the 25th and 26th produced additional rises, so that by the end of the month the streams had reached their normal heights, and navigation was fully resumed. A comparison with the season of 1896 shows that the resumption of navigation this year was twenty-seven days later than in 1896. The Pedee at Cheraw was unnavigable from the 5th to the 22d.

The lumber season was at its height during the latter part of the month. There are thousands of cypress log and timber rafts lying along the banks of the streams awaiting favorable rises. A few light rafts were floated down the Pedee, the Little Pedee, the Waccamaw, and the Wateree, during the latter part of the month, but not with the success expected, for several rafts stuck fast in the shallow water upon the lower Black and lower Waccamaw rivers, and had to be pulled off by towboats. Twenty-three rafts of undressed lumber, the first this season, arrived at Charleston between the 14th and 21st from Edisto and other landings along the Edisto River.

While steamboat men and merchants are hopeful of business during the coming steamboat season, yet the great loss occasioned by low water during November and the first part of December has proven a great setback to them. Considerable cotton was transported by rail, which otherwise would have gone by steamer. The steamboat companies report a great decrease in the fertilizer business this winter and a corresponding increase in the rice trade and in naval stores.