

Mr. B. F. Ferris, Sunman, Ind., reports as follows: "The severity of the drought was not altogether due to the deficiency of the rainfall, but was in a great measure intensified by the action of two other causes operating in conjunction with that. These were the high temperature of the three summer months and the unusual light character of the rains throughout the year. Upon comparing this with other years during which we have been taking daily observations for the Signal Service, we find that although the rainfall was con-

siderably less than that of 1885 and 1886 (3.15 and 5.70 inches, respectively), it was 5.55 more than that of 1884. The mean temperature of the summer of 1887 was 77°.1, 4° higher than 1885 and 1886, and 1°.8 higher than 1884. The rains of the current year have all been very light, so that but very little of it penetrated to any considerable depth but was confined to the surface, and was evaporated by the intense heat. At no time during the summer was the soil saturated so as to prevent ploughing immediately after rain had ceased."

WINDS.

The most frequent directions of the wind during November, 1887, are shown on chart ii, by arrows flying with the wind. Over the northern districts east of the Rocky Mountains the prevailing winds were generally from west and northwest; in the lower Ohio and central Mississippi valleys, southerly; in other districts, variable.

HIGH WINDS (in miles per hour).

The maximum velocities of wind for November, 1887, at Signal Service stations where the movements are registered, are given in the table of miscellaneous meteorological data. Other than the maximum velocities given in this table, but two stations report velocities of 50 or more miles per hour, viz.: Fort Canby, Wash., 60, se., 8th; 60, s., 9th; 60, s., 10th; 60, s., 12th; 68, s., 13th; 54, s., 27th; Valentine, Nebr., 50, nw., 19th.

LOCAL STORMS.

Cairo, Ill.: a thunder-storm, with high westerly winds, began 4.05 and ended 6.35 p. m. on the 9th; at 4.30 an unusual electrical phenomenon occurred in the form of a ball of lightning, which exploded with a terrific report when in altitude 40° in the northeast quadrant.

Butlerville, Jennings Co., Ind.: a severe wind storm set in at 9.15 a. m. on the 19th; at 10.40 a. m. it became so dark

that ordinary work could not be carried on without artificial light; the darkness cleared away at 12.30 p. m.

Fort Custer, Mont.: a severe wind storm prevailed from 2.45 until 6.40 p. m. on the 12th; maximum velocity, sixty miles per hour from the northwest, was recorded at 4.15 p. m.

Vevay, Switzerland Co., Ind.: a fierce gale from west began 10 a. m. of the 19th, scattering every movable object before it; the rough and turbulent condition of the Ohio River rendered its crossing and navigation in general impossible; the dark and gloomy atmosphere enveloped everything in darkness, and common print could not be distinguished; the gale continued throughout the day and the following night.

Key West, Fla.: the severe wind storm which began on the afternoon of the 20th attained its maximum velocity, thirty-six miles per hour, at 6.05 a. m. on the following date and ended 7.48 a. m.

Duquoin, Perry Co., Ill.: an unusually severe storm, for this season of the year, occurred during the night of the 26-27th; it was accompanied by loud thunder and vivid lightning.

Galveston, Tex., 28th: a report from Mineola, Wood Co., Tex., states that during the night of the 26-27th a severe storm occurred at that place. One building was blown down and several persons were killed.

INLAND NAVIGATION.

STAGE OF WATER IN RIVERS AND HARBORS.

In the following table are shown the danger-points at the various stations and the highest and lowest depths for November, with the dates of occurrence, and the monthly ranges:

Heights of rivers above low-water mark, November, 1887 (in feet and tenths).

Stations.	Danger-point on gauge.	Highest water.		Lowest water.		Monthly range.
		Date.	Height.	Date.	Height.	
Red River:						
Shreveport, La. ....	29.9	1	11.5	24	3.4	8.1
Arkansas River:						
Fort Smith, Ark. ...	22.0	29	1.8	22, 23, 24	0.8	1.0
Little Rock, Ark. ...	23.0	1	2.0	21, 22, 23	1.1	0.9
Missouri River:						
Omaha, Nebr. ....	18.0	1, 2, 4, 5, 10, 11	5.7	22	5.3	0.4
Leavenworth, Kans	20.0	13, 14	7.1	30	3.9	3.2
Mississippi River:						
Saint Paul, Minn. ...	14.5	14	1.9	22, 23	0.8	1.1
La Crosse, Wis. ...	24.0	1-9	3.0	27	2.1	0.9
Dubuque, Iowa ....	16.0	1	3.1	30	1.9	1.2
Davenport, Iowa ...	15.0					
Keokuk, Iowa ....	14.0	1	1.9	29	0.5	2.4
Saint Louis, Mo. ...	32.0	1	5.6	30	4.4	1.2
Cairo, Ill. ....	40.0	4, 5	3.5	19, 20	2.1	1.4
Memphis, Tenn. ...	34.0	6, 7, 8, 9	3.2	18-23	2.2	1.0
Vicksburg, Miss. ...	41.0	1	2.0	24, 25	3.9	1.9
New Orleans, La. ...	13.0	9	3.0	17	1.3	1.7
Ohio River:						
Pittsburg, Pa. ....	22.0	29	6.7	25	5.1	1.6
Cincinnati, Ohio ...	50.0	28	5.1	21-24	2.8	2.3
Louisville, Ky. ....	25.0	30	3.3	6, 7	2.3	1.0
Cumberland River:						
Nashville, Tenn. ...	40.0	30	0.6	23, 24	0.2	0.8
Tennessee River:						
Chattanooga, Tenn.	33.0	1	3.0	25, 26, 27	1.4	1.6
Monongahela River:						
Pittsburg, Pa. ....	29.0	29	6.7	25	5.1	1.6
Savannah River:						
Augusta, Ga. ....	32.0	1	8.0	20, 29, 30	6.1	1.9
Sacramento River:						
Red Bluff, Cal. ....		13	0.9	4, 17-21, 24, 28	0.5	0.4
Sacramento, Cal. ...		15-25	7.6	1-12	7.2	0.4
Willamette River:						
Portland, Oregon ...		16	4.4	27	0.6	3.8

\* 27 days; river frozen after 27th.

ICE IN RIVERS AND HARBORS.

Mississippi River.—Saint Paul, Minn.: an ice-dam formed in the river at this point on the 28th.

La Crosse, Wis.: the river was full of floating ice on the 20th and 23d. The last boat of the season arrived on the 25th; the river froze over on the 28th.

Dubuque, Iowa: the last boat of the season arrived on the 9th; navigation closed after that date. The river froze over on the 28th.

Keokuk, Iowa: the navigation closed on the 21st, steamers "Natrona" and "Dexter" being the last boats of the season.

Missouri River.—Fort Buford, Dak.: navigation closed on the 10th and the river froze over on the 24th.

Fort Yates, Dak.: the river froze over on the 27th.

Omaha, Nebr.: the river froze over on the 20th.

Leavenworth, Kans.: the river was full of floating ice during the 26th.

Grand River.—Lansing, Mich.: the river froze over on the 20th; ice broke on the 24th; river froze over again on the 28th.

Thunder Bay River.—Alpena, Mich.: the river froze over on the 30th.

Devil's Lake.—Fort Totten, Dak.: navigation closed on the 18th; the steamer "Minnie H." made her last trip of the season on this date; the lake froze over on the 22d.

Laramie and Platte Rivers.—Fort Laramie, Wyo.: these rivers froze over on the 26th.

Fox River and Green Bay.—Green Bay, Wis.: the river froze over on the 24th; Green Bay froze over on the 25th; steamer "De Pere" from Chicago was unable to reach port on this date on account of ice and was compelled to put back.

Hudson River.—Albany, N. Y.: there was floating ice in the river on the 22d.

Rock River.—Beloit, Rock Co., Wis.: the river froze over on the 28th.

Rockford, Winnebago Co., Ill.: the river froze over on the 21st; the ice broke up and moved out on the 26th and the river froze over again on the 28th.

*Duluth Bay.*—Duluth, Minn.: the bay froze over on the 25th; navigation closed on the 27th.

## HIGH TIDES.

Chicamicomico, N. C.: high tide occurred on the 2d, causing some damage to telegraph lines.

High tide also occurred at this station on the 30th; and at Duke, Fla., 30th.

## ATMOSPHERIC ELECTRICITY.

## AURORAS.

Auroras were observed during the month as follows: 8th, Cornish, Eastport, Gardiner, Kent's Hill, and Orono, Me.; Nashua, N. H.; Plattsburg Barracks, N. Y.; Burlington and Northfield, Vt. 9th, Cornish, Eastport, and Kent's Hill, Me.; North Truro, Mass. 12th and 13th, Kent's Hill, Me. 14th, Wytheville, Va. 15th, Nashua, N. H.; Variety Mills, Va. 17th, Fort Sully, Dak.; Orono, Me. 18th, Kent's Hill, Me. 19th, Bismarck and Webster, Dak.; Duluth, Moorhead, and Saint Vincent, Minn. 20th, Fort Sully and Webster, Dak. 21st, Fort Sully and Huron, Dak. 22d, Fort Sully, Dak.

## THUNDER-STORMS.

Thunder-storms were reported as follows:

4th, Sacramento and Willows, Cal. 5th, Vashon, Wash. 8th, Key West, Fla.; Emporia, Fort Hays, Globe, Leavenworth, Lebo, Wakefield, Ninnescah, and Yates Centre, Kans.; Lamar and Springfield, Mo.; De Soto, Nebr. 9th, Butlerville, Sunman, and Vevay, Ind.; Fort Gibson, Ind. T.; Fort Madison and Keokuk, Iowa; Leavenworth, Kans.; Louisville, Ky.;

Fayette, Saint Louis, and Forest Park, Mo.; Cincinnati, College Hill, Columbus, and Yellow Springs, Ohio; Milan, Tenn. 10th, Albia, Iowa; Cleveland, Ohio. 11th, Albany and Yaquina Light House, Oregon; Corpus Christi, Tex.; Blakely, Fort Canby, Olympia, Port Angeles, and Pysht, Wash. 13th, Archer, Fla.; Moorhead, Minn. 14th, Titusville, Fla.; Dover, N. J.; Syracuse, N. Y.; Southport, N. C.; Stateburg, S. C.; Macon, and Lynchburg, Va. 15th, Lynchburg, Va. 18th, Archer and Cedar Keys, Fla.; Quitman, Ga. 19th, Archer, Fla.; Oskaloosa, Iowa; Wilmington, N. C.; Variety Mills, Va. 23d, Yuma, Ariz.; Lead Hill and Little Rock, Ark.; Cairo, Ill.; Corsicana, Palestine, and San Antonio, Tex. 24th, Utica, N. Y.; Fort Concho, Cleburne, and Abilene, Tex. 25th, Fort Niobrara, Nebr.; Cedar Hill, Tex. 26th, Lead Hill, Ark.; Jacksonville and Springfield, Ill.; Indianapolis, Ind.; Dubuque, Iowa; Frankford, Forest Park, and Springfield, Mo.; Fort Niobrara, Nebr.; Cedar Hill, Cleburne, Corsicana, Decatur, Mesquite, Palestine, and San Antonio, Tex. 27th, Cairo, Ill.; State College, Pa. 28th, Nashua, N. H., State College, Pa. 30th, Las Vegas, N. Mex.

## MISCELLANEOUS PHENOMENA.

## FOREST AND PRAIRIE FIRES.

Owing to the dry weather of November and previous months in the Mississippi, Missouri, and Ohio valleys, forest fires have been very prevalent, especially during November. The loss of much property has resulted, and at times navigation on rivers has been rendered dangerous on account of the prevalence of dense smoke. The following are some of the many reports which have reached this office concerning these fires:

Butlerville, Jennings Co., Ind.: extensive forest fires prevailed in this county from the 3d to the 8th, doing much damage to fences and timber.

Little Rock, Ark.: very extensive forest fires were raging throughout the state from the 5th to 7th, 12th to 15th, and from the 18th to 22d, causing much damage to crops and fences; the smoke was so dense that at times it was impossible to see objects one hundred yards distant.

Cairo, Ill.: dense smoke overspread this region during the 5th, caused by extensive fires in what is known as the "cypress swamps" in Missouri; the fires reached from Commerce, Mo., thirty-five miles north of Cairo, to New Madrid, seventy-five miles to the southward of this city. In the surrounding country the fires have spread rapidly through "Cashe" bottom until the greater part of its area has been swept by the flames. The smoke was so dense after 6 p. m. that the navigation on the rivers was partially suspended for a distance of forty miles along the Ohio River and for one hundred miles along the Mississippi River. Similar conditions prevailed on the 6th, 7th, and 8th; on the last date the fires reached what is known as the "Island," to the northeast of the city, and extended along the trestle of the Mobile and Ohio Railroad. On the 11th the forest fires were still burning in many places, though not so widespread as previously, rains having checked them somewhat, and the smoke did not interfere with navigation. On the 15th the fires again increased and light smoke prevailed during the entire day and night; on this date the transfer steamers were retarded in making their trips on account of smoke, and like conditions prevailed on the 16th, 17th, 18th, 21st, and 22d. The forest fires were extinguished by the snow on the 28th.

Bismarck, Dak.: extensive prairie fires were observed in the north on the 4th and 5th, and in the northeast and south on the 6th.

Fort Yates, Dak.: extensive prairie fires occurred to the west and northwest of station on the 5th, 6th, and 16th.

Fort Supply, Ind. T.: large prairie fires were raging south of this place on the 6th.

Valentine, Cherry Co., Nebr.: large prairie fires occurred about ten miles southwest of this place on the evening of the 6th.

Middlebrook, Randolph Co., W. Va.: the atmosphere was very smoky on the 7th, due to extensive forest fires which were burning about six miles west of this place.

Erie, Pa.: the forest fires in this section were extinguished by the rain of the 10th, on which date the air was filled with smoke from the smothered fires.

Memphis, Tenn.: during the 15th, 16th, and 17th the atmosphere was filled with dense smoke from forest fires in Arkansas; the rain of the 25th is reported to have subdued the fires.

Milan, Gibson Co., Tenn., 16th: the surrounding country has been enveloped in smoke since the 4th, caused by fires; farmers have sustained heavy losses.

Grand Haven, Mich.: several forest fires started east of this place on the 16th and made considerable progress; by the 18th the fires were burning fiercely over an area of about three miles, but the rain and snow on the 19th quenched the flames.

Shreveport, La.: extensive forest fires prevailed in Bossier parish, northeast of this city, on the 18th; reports from the burning district received on the 19th stated that several houses and barns had been destroyed.

Nashville, Tenn., 18th: destructive forest fires have prevailed in southwest Tennessee and Arkansas during the past five days, and on this date are still raging fiercely; many houses and much valuable stock and timber have been destroyed by the flames.

Louisville, Ky.: the atmosphere was filled with smoke during the 18th, caused by forest fires which were burning to the south of this city. On the morning of the 19th it was so dark as to render artificial light necessary.

Laconia, Harrison Co., Ind.: owing to forest fires in various localities and the high westerly winds on the 19th the smoke became so dense as to cause darkness to such a degree that it was difficult to see even a short distance, and steamers on the Ohio River were compelled to stop running at midday. Forest fires were of almost daily occurrence prior to the 23d, several houses, barns, fences, and much timber were burned; the rain which fell on the 23d soon checked the progress of the fires.

Lamar, Mo.: forest fires occurred on the 18th and 19th to the west of this place; the telegraph poles were burned, interrupting communication.

Oxford, Miss., 20th: the smoky condition of the atmosphere during the past few days was due to forest fires in western Tennessee and eastern Arkansas.

Fort Smith, Ark.: the atmosphere on the 21st was filled with smoke from extensive forest fires in the adjoining states.

Springfield, Mo., 22d: dense smoke has enveloped this section during the past few days, due to the extensive forest fires which have prevailed south of this city.

Lead Hill, Boone Co., Ark., 30th: dense smoke from forest fires filled the air on the 5th, 18th, 19th, 21st, 22d, and 23d; it is reported that several farm houses were burned and much other damage done by forest fires in various sections of the state.

Wauseon, Fulton Co., Ohio, 30th: the prairies about five miles southwest of here were on fire during the greater part of the month; forest fires prevailed about the 15th in the timber lands fifteen miles northeast of this place.