"With respect to the direction in which trees were blown down, roofs carried away, and débris scattered no complete uniformity exists. Material, especially in the centre of destruction, can be found carried in every direction, but, taking the path of destruction as a whole, the generalization adopted by Prof. H. A. Hazen, that from both borders of the track trees and débris are blown forward and inward toward the centre, seems to be quite well sustained. That such is the case is also confirmed by Judge Rhone after examining the track of the tornado both in Wilkes Barre and for many miles through the forest southwest of that city. A similar observation has been related to me by an observer of the tornado tracks in the forests of Arkansas. It appears, therefore, that, in general, a surface current of destructive force blows from either side inward to feed the vortex of the storm. Many persons described the motion of the tornado cloud as like that of a huge balloon, careening from side to side in its progress, at one time swooping down to the ground, and then floating for a time entirely above it. This conception of the actual behavior of the tornado cloud enables us to understand in some degree the extraordinary freaks in the destruction. The pendant apex of the cloud, like the car of a balloon, swishes into the side of a house here, lashes the corner of a roof there, curls around a church steeple or factory chimney yonder, and further on swirls up a whole mass of timber into its centre, whirling them in its grasp, and dropping them hundreds of feet away. In addition to these general characteristics, some individual phenomena deserve to be specially mentioned. An interesting feature, observed in a considerable number of cases, was that the roof of a house was blown off and the entire leeward side was torn outward with it, leaving the interior of the house wholly exposed.

"In at least one case, however, I found a house, a portion of whose leeward side was blown out on the first floor, while the roof remained intact. This seemed like an actual case of bursting, and could not be explained like the others, as having been dragged outward by the attached roof. I heard also of other houses in which the side blew out, while the roof remained unhurt. A case of equally great interest was a row of light frame tenement houses situated in a depression on the east side of the Lehigh Valley Railroad track near the Pennsylvania Railroad round-house. The houses, each 16 feet in width, were placed five feet apart, and faced about east by south. The path of destruction at this point is of unusual width, and changes from a northeasterly to a more easterly direction. Consequently it is difficult to locate the centre of the path of greatest destruction, or to construct any simple idea of the tornado's behavior. The railroad embankment, 20 feet high, divides the path into two parts, and it is not irrational to suppose that the tornado cloud may likewise have divided itself into two tongues. But, in any case, the phenomenon is this: the house on the south side of the row was lifted from its foundation and dropped three feet forward and five feet to the left, close up against the middle house. The house on the north side was taken up and set down about three feet backward, and close up against the middle house. The middle house was lifted up and dropped back again in its place without much displacement but with considerable injury—its lower portion being battered in, as if it had been dropped from a greater height than the others. A photograph in my possession illustrates these details.

"Of many other phenomena I will mention only one more. A large smoke stack with an attached piece of casting, the whole mass weighing not less than 400 and perhaps 500 pounds, lies in a yard on the northwestern edge of the tornado track, having been carried fully 500 feet north from a mill in the centre of the track. The mass seems therefore to have been whirled up to an unknown height by a vertical uplift, and then carried by a current of enormous force to the northward until its inertia carried it out of the tornado cloud, after which it reached the ground under the action of gravity and its acquired velocity."

WATER-SPOUTS.

On the 20th, between 3.45 and 4 p. m., 4 water-spouts were observed about 4½ miles nnw. from Key West, Fla. 3 of the spouts were well-defined though of small diameter. The water at their base was churned into a mist which extended to a height of about 20 feet. The fourth spout, which developed at 3.50 p. m., extended downward but a short distance from the clouds, although its influence extended to the water, as shown by the mist raised. Each of the formations lasted 5 minutes. The cloud under which the spouts formed was cumulo-stratus in formation, and the spouts developed between 2 rain squalls. On the 30th, at 6.15 p. m., 3 well-defined water-spouts were observed in the Gulf about 2 miles off Galveston Island. The cloud with which the largest spout was connected had the characteristics of a tornado cloud; no rain fell from it, and the sky was clear to the north and south. This cloud connected with 2 others, one to the west and the other to the east, from both of which rain was apparently falling. The other 2 spouts were located between the observer and the rain cloud on the east of the large spout; they were well defined and connected with the water below.

INLAND NAVIGATION.

STAGE OF WATER IN RIVERS AND HARBORS.

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

Heights of rivers above low-water mark, August, 1890 (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	31	2.5	23-24	—0.2	2.7
Arkansas River.						
Fort Smith, Ark	22.0	30	11.5	12 to 15	0.0	11.5
Little Rock, Ark	23.0	24	10.1	18	3.2	6.9
Missouri River.						
Fort Buford, N. Dak	.....	1	6.0	31	2.6	3.4
Sioux City, Iowa	.....	1	8.9	31	6.0	2.9
Omaha, Nebr	18.0	1	9.1	31	7.3	1.8
Kansas City, Mo	21.0	1	9.5	31	6.3	3.2
Mississippi River.						
Saint Paul, Minn	14.5	1	2.4	11, 18	1.3	1.1
La Crosse, Wis	13.0	1, 2	4.3	12	3.2	1.1
Dubuque, Iowa	16.0	4	4.8	16	3.0	1.8
Davenport, Iowa	15.0	1	2.9	17	1.7	1.2
Keokuk, Iowa	14.0	1	3.2	18, 19	1.6	1.6
Saint Louis, Mo	32.0	1	10.7	22	7.8	2.9
Cairo, Ill	40.0	1	12.8	10, 25, 26	9.0	3.8
Memphis, Tenn	34.6	1	11.1	26, 27	8.1	3.0
Vicksburg, Miss	41.0	1	12.8	17 to 24	9.0	3.8
New Orleans, La	13.0	27	5.0	31	3.6	1.4
Ohio River.						
Pittsburgh, Pa	22.0	27	8.8	31	3.9	4.9
Parkersburgh, W. Va	38.0	28	13.2	5	2.7	10.5
Cincinnati, Ohio	50.0	30	20.8	4, 5	5.8	15.0
Louisville, Ky	25.0	31	9.1	6	3.7	5.4
Cumberland River.						
Nashville, Tenn	40.0	12	12.2	5, 22	2.7	9.5

Heights of rivers—Continued.

Stations.	Danger-point on gauge.	Highest water.		Lowest water.		Monthly range.
		Date.	Height.	Date.	Height.	
Tennessee River.						
Chattanooga, Tenn	33.0	10	7.5	22	2.5	5.0
Monongahela River.						
Pittsburgh, Pa	29.0	27	8.8	31	3.9	4.9
Savannah River.						
Augusta, Ga	32.0	30	12.8	27, 28	5.7	7.1
Willamette River.						
Portland, Oregon	15.0	1, 2, 3	7.1	25	3.2	3.9

LOW WATER.

Arkansas River.—At Fort Smith, Ark., the river fell to zero on the gauge on the 12th. This is the lowest stage of water on record at this point since 1856. At Wichita, Kans., the river, which had been dry for weeks, began rising the night of the 25th. The river began to fall again on the 30th.

FLOODS.

At Eagle Pass, Ariz., the Gila River was high and impassable ⅓ of the month. Ditches were much damaged, and freighting impeded or stopped.

HIGH TIDES.

Unusually high tide occurred at Key West, Fla., 1st, 2d, and 28th to 31st, and the tide was very high in Pensacola Bay, 26th, 27th, and 28th.