

Mexican data for January, 1898.

Stations.	Altitude.		Temperature.			Relative humidity.	Precipitation.	Prevailing direction.	
	Feet.	Inch.	Max.	Min.	Mean.			Wind.	Cloud.
Agua Calientes.....	6,119	23.94	75.7	31.5	57.6	50	0.00	s.	w.
Arteaga (Coahuila).....			77.4	24.8	57.4		0.00		
Barousse (Coahuila).....	5,414		80.2	24.3	58.5		0.00		
Collma (Sem.).....					73.9				
Durango (Sem.).....	6,241	24.04	80.6	31.5	56.8	58	0.00		w.
Leon.....	5,934	24.31	78.6	27.0	57.7	44	0.00	sw.	
Magdalena (Sonora).....	4,948				50.5		7.56	ne.	
Mazatlan (Chalao).....	25	29.98	78.1	56.3	67.3	75	0.00	nw.	sw.
Merida (Yucatan).....	50	30.05	95.4	51.4	75.2	63	0.26	ese.	se.
Mexico (Obs. Cent.).....	7,472	23.08	73.9	28.4	55.0	49	0.00	e.	s.
Morelia (Seminario).....	6,401	23.99	80.1	34.2	58.3	57	0.00	sw.	w.
Oaxaca.....	5,164	25.10	84.9	36.1	61.2	54	0.00	nw.	ne.
Puebla (Col. Cat.).....	7,112	23.36	74.5	26.1	56.3	54	0.00	ne.	
Parros (Coahuila).....	3,986		76.6	38.5	66.6		T.		
Saltillo (Col. S. Juan).....	5,399	24.84	79.2	26.4	61.0	46	0.00	s.	sw.
San Luis Potosi.....	6,202	24.16	73.8	28.4	56.8	56	0.00	sw.	w.
Silao (Guanaajuato).....	6,063	24.30	74.5	38.5	59.5	55	0.00	w.	w.
Torreón (Coahuila).....	3,720		81.1	37.5	59.2		T.		
Vaqueria.....			78.3	29.3	61.5		0.00		
Zacatecas.....	8,015	22.52	78.8	28.4	55.6	55	0.00	sw.	w.
Zapotlan (Seminario).....	5,078		84.4	39.0	63.0	58	0.00	sse.	sw

THE TORNADO OF JANUARY 12, AT FORT SMITH, ARK.

By J. J. O'DONNELL, Weather Bureau Observer.
(Dated February 21, 1898.)

From the very full notes on this tornado reported by Mr. O'Donnell, the Editor has made the following extracts:

On January 8, over the central Pacific Slope, an area of high pressure extended eastward over the southern Plateau and the Platte Valley to the Missouri River, southern Iowa, and Kansas. By the morning of the 10th a low area extended over the southern Pacific Slope, the Salt Lake, and Rio Grande valleys, and a secondary low prevailed in the neighborhood of Dodge City, Kans. The latter continued deepening, and on the morning of the 11th appeared as a storm center over southern New Mexico, inclosing the isotherms of 40 and 50, the path of movement of the center being about halfway between the inclosed isotherms. In the Northwest a low also appeared; there were thus two areas of low pressure with an intervening high. North and west winds with falling temperature prevailed on the west, but south and east winds with rising temperature on the east side, with cloudy weather and some rain. By 5 p. m. of the 11th the barometer had fallen 0.30 in front of the advancing storm center, but at Fort Smith the fall was only 0.12, and at Little Rock 0.10. The minimum at Oklahoma occurred at 5:30 p. m., and then rose until 8 p. m., but at this same time the barometer was falling rapidly at Fort Smith and at Little Rock. It is probable that the area of falling barometer either remained stationary or moved eastward, as Shreveport reports a maximum wind velocity of 36 miles at 7:55 p. m., whereas the maximum at Fort Smith, up to 8 p. m., was only 13 miles from the east. The change of wind at Oklahoma, from south to north, was probably contemporaneous with the rise in pressure, the beginning of the fall in temperature and the development of the thunderstorm. At this time, 6 p. m., the echelon movement of the clouds, with the bluish-green color, was first observed at Fort Smith; probably similar contemporaneous phenomena occurred elsewhere along the axis of the storm center. At 8 p. m. all stations in front and on the east of the storm's center or axis reported precipitation, and at many of them thunderstorms with maximum wind velocities of over 25 miles per hour, but at Fort Smith (and within 50 miles distance, so far as could be ascertained) no rain whatever had fallen. At South McAlester, Ind. T., on the Choctaw Railroad, 80 miles west-southwest of Fort Smith, rain began about 9 or 9:30 p. m., according to Judge Clayton, with lightning, which continued into the night; the air was then very sultry. About

11 p. m. the tornado cloud was observed in the air between Hartshorne and Alderson, Ind. T. (therefore 20 miles nearer Fort Smith), by persons who fled to their tornado cellars.

At Fort Smith, at 5:15 p. m., the cumulo-stratus clouds were moving rapidly from the south and southwest, mingling in the usual manner of such clouds, while the eastern horizon was obscured by stratus. Shortly after 6 p. m. these cumulo-stratus had changed somewhat in color, from dark gray to bluish-green, being inky black on the edges and but slightly mottled in the center. As the night approached the bluish-green became deeper, the inky spots became larger, the texture was more compact, the movement and direction remained the same, and there was no appearance of a funnel at that time.

At 8 p. m., while observing the clouds, the wind vane veered to the south with a jerk that almost wrenched it from its support, but immediately backed slowly to east and remained steady; the clouds were a sheet of unbroken stratus moving from the west, and seemingly lower than before.

At 9 p. m., when changing the thermograph sheet, the wind was still steady from the east; intense darkness prevailed in the west and north; some stars were to be seen in the east, showing that the sky in that quadrant was lightly obscured; not a trace of lightning anywhere.

At 9:35 p. m. the first lightning was observed, very low in the southwest horizon; it spread toward the south and the west, and by 10 p. m. reached an altitude of 50°.

At 11:10 p. m. the first thunder was heard, coming from the southwest; then, at intervals of six or seven minutes, it was repeated until the tornado struck the city. At no time was the lightning fierce nor the thunder loud; the lightning was always weak and distant, considering its quantity.

About 11:30 p. m. the lightning became more concentrated in the southwest, the flashes, radiating fan-shaped from a center in luminous beams, reaching to the zenith. Until midnight frequent sheet lightning illuminated the whole southern and western sky, exhibiting dense masses of broken cumulo-stratus clouds, meeting and uniting as they passed rapidly eastward.

As the clock was striking midnight and the office was about to be locked up, the barometer reading 28.846, actual, the wind south, not a drop of rain having fallen, the air feeling sultry and very damp, and while the book of mean pressures was being examined for comparative barometer readings, a gurgling noise was heard, like water rushing out of a bottle, followed immediately by a rumbling, such as that made by a number of heavy carriages rolling rapidly over a cobblestone pavement, and finally like a railroad train. These three noises appeared in this order of succession; each was distinctly different and clearly distinguishable from the other. This noise or roar is entirely peculiar to itself, though resembling those just mentioned, and is always recognizable as the "tornado roar." About two seconds elapsed between the first roar and the rattling and quivering of the office window by the wind and the terrific driving rain which at once forced itself in between the frame and the sash, at the top, the bottom, and the sides, and flooded the office. The book of means was laid aside and the observer went to the landing in the large skylight on the roof of the observatory, whence he saw the tornado cloud 450 feet distant to the southward, a twisted black mass of two clouds, accompanied by lightning from the upper parts of the clouds. The lightning was a continuous series of flashes of a pale yellow color; the noise of the thunder sounded like the muffled beating of a number of drums within the cloud. The clouds appeared like inverted siphons, each curved over downward from the right or left hand side of the cloud, respectively, to the center, where they came in contact with each other and twisted about one another downward to the ground, being narrowest about 40 feet from the ground and, probably, about 100 feet high.

The tornado cloud was seen emerging out of the National Cemetery and passing by the United States post office and the county courthouse. In its passage through the cemetery it uprooted forty trees, lifted the iron flagstaff, although embedded in solid granite, snapped to pieces the 1-inch wire cable guy of the staff, lifted bodily from its base 500 feet of 12-inch brick wall $4\frac{1}{2}$ feet high, and demolished the keeper's residence. In its passage through vacant property to the principal business street it passed over the residence of Mrs. Mivelaz, the brick walls of which burst outward with a loud explosion, undoubtedly due to the low air-pressure at the center of the tornado; a similar fate befell a frame building. Farther on, and on the left-hand side of the tornado track, a two-story stone building was demolished and a three-story brick building was carried entire 25 feet away from its foundation. Thirty-three persons were killed outright and nineteen subsequently died from their injuries; forty-four others were seriously injured.

As far as can be learned, the tornado descended to the ground first in the mountainous country near San Bois, in the Choctaw Nation, 100 miles southwest of Fort Smith; crossed the Arkansas River three times, viz, at the mouth of Cache Creek, at a point near Fort Smith, at a third point beyond Fort Smith, four miles east of Van Buren. At Belmont in the eastern part of Crawford County, 20 miles northeast of Fort Smith, it was observed ascending and disappearing in the air.

The passage of the tornado cloud was actually observed during about six seconds by the observer at Fort Smith, during which time it traveled about 700 feet, passing in front or south of his office at 12:08 or 12:09 a. m., at which time the extreme wind velocity was 60 miles from the southwest, while the maximum or average velocity during five minutes was 48 miles. The rainfall lasted four minutes, from 12:07 to 12:11 a. m., January 12, and amounted to 0.38, as found in the gauge. At 12:40 a. m. not a cloud remained visible in the sky except a bank of stratus in the western horizon. The directions in which the débris were thrown are given by Mr. O'Donnell in detail. Nearly everything within 300 yards of the central path was thrown from either side toward the center. The only movement that was not fre-

quently shown was from the northwest. The general trend of the central path was almost exactly from west to east, in its passage through the city of Fort Smith. The area of destruction, and apparently the force of the wind, was greater on the south or right-hand side than on the north or left-hand side. The damage to property was very light at distances exceeding 400 feet on the south side and 250 feet on the north side. The total damage to property is estimated at \$450,000. The Weather Bureau Observer, standing within the skylight, on the roof of the Observatory, 54 feet above the ground and 450 feet north of the central portion of the track, could see on a level with his eye and higher up, objects flying out of the cloud toward the north and west. The testimony of those who live on either side of the tornado path confirms the conclusion that the precipitation was heavier on the south than on the north side.

The readings of the barometer were: 11th, 8 p. m., 28.846, and the same at midnight. At 12:45 the barometer read 29.010. The lowest pressure, as deduced by correcting the barograph record, was apparently 28.67, but as the barograph clock had unfortunately become disordered a few days before there is no record of the time of this minimum. This depression could not have lasted more than a minute; it occurred in the midst of a general depression of about 0.30 which had continued since 4 p. m. of that date. The collapse of the dwelling of Mrs. Mivelaz, which was about 200 feet south of the center of the path, is the principal evidence of a decidedly sudden local diminution in pressure.

The anemometer record shows that the extreme velocity of 60 miles within a minute also occurred at 12:08 or 12:09.

The corrected thermograph record shows a fall from 73° at midnight to 62° at 12:10 a. m. of the 12th, but this fall may easily have been due to the wetting of the dry bulb by reason of the high winds at that moment. On the other hand, this may also represent the lower temperature of the rain and vapor within the cloud, a few hundred feet north of the central tornado. Some of the débris from the tornado seems to have been found the next day at Ozark, Ark., 30 or 35 miles distant, toward the east-northeast. Another tornado occurred an hour previous, i. e., at 11 p. m. of January 11, at Alma, Crawford Co., Ark., 20 miles northeast of Fort Smith.

NOTES BY THE EDITOR.

MOUNTAIN STORMS.

A correspondent, Mr. L. D. Woodfill, Highhouse, Fayette Co., Pa., asks the following questions. Any information will be thankfully received:

In this part of the country, near Uniontown, Pa., we always hear a loud roaring, as of great winds, from six to twelve or sixteen hours preceding a mountain storm. During this roaring, which appears to be in the mountain, 6 miles off, it is almost a perfect calm here. What is the cause? I am told that this phenomena only occurs in the southwest part of Fayette Co., Pa.

DR. WALTERMATH'S MOON.

A circular letter addressed to the Editor of the MONTHLY WEATHER REVIEW by Dr. George Waltemath of Hamburg, requested that observations be made on February 3 for the purpose of discovering whether or no any small, round, black spot could be seen crossing over the sun's disk, corresponding to the hypothetical small moon or large meteoric body which Dr. Waltemath thinks must exist, circulating around the earth in about one hundred and seventy-seven days or a little less than six months. Although there could be no rational expectation of the existence of such a body, yet, as the observations were easy to make and would afford an ab-

solute confirmation or refutation of this new theory, the Editor requested Professor Bigelow to allow the use of his 4-inch telescope, for the purpose of the search. The same glass had been used by Mr. R. H. Dean in observing the transit of Mercury, November 10, 1894, when, as now, it was arranged so as to cast a well-defined image of the sun about 5 inches in diameter, upon a sheet of white paper, at the rear of a photographic camera box. The definition was sufficiently clear to allow an object, whose apparent diameter is 5 seconds of arc, to be distinctly seen. In addition to cursory observations by Professor Bigelow and the Editor, a more careful examination was made at 12 noon, 1, 2, 3, and 4 p. m., by Mr. Dean. The day was clear and the atmosphere very favorable but no sunspots or other objects were seen on the projected image of the sun.

With regard to the corresponding observations of the transit of Mercury, November 10, 1894, Mr. Dean had at that time reported—

The first appearance of the image as a clearly defined black spot on the west limb of the sun's projected image was at 10h. 57m. 50s., seventy-fifth meridian mean time. The entire image was visible at 10h. 59m. 0s. At the close of the transit there was no light between the edge of Mercury and the edge of the sun at 4h. 9m. 15s., but it wavered until 4h. 10m. 0s., when the two edges were clearly in contact