

have seen during the daytime, a condition of two opposing winds blowing toward each other. What is the result? No observations were obtained at the time which would explain this point. However, Hann<sup>1</sup> says that the daytime wind from the deeper valley, resulting from the warming of a greater body of air, will cross the dividing line and blow down the shallower valley. To support this he cites the case of the Inn and the Maira rivers, where the day wind from the deep valley of the latter extends over the pass separating the two and gives a down-valley wind along the headwaters of the Inn. Under similar conditions, it is probable that the same phenomena can be found in this country.

Although both these mountain and valley winds, as observed in Colorado, were very constant in their daily recurrence, they were entirely interrupted by a cyclonic disturbance, and somewhat modified during spells of general cloudiness.

The passage of thunderstorms across a valley showed still more marked control over the breezes. While in the neighborhood of Durango, in the Animas Valley, which runs north and south at this point, the movement of a thunderstorm across the valley to the south of the observer entirely reversed the wind direction, so that during the passage of the storm the wind blew down the valley from the north, instead of up the valley from the south. In this particular case the reversal of wind direction resulted in a change from a warm south wind to a cool north wind, and back to south again, all in the space of less than twenty minutes. But the passage of a storm across the valley to the north of the observer was seen later to have no effect upon the wind beyond a slight increase in velocity.

No such interruptions were observed in the case of mountain breezes, but it is reasonable to suppose that they do occur, the more so because mountain breezes are as a rule weaker than valley breezes. The cause of the interruption lies plainly enough in the radial circulation of air around the storm center.

In a single instance one other modification of the valley wind was observed. Near the head of Ten Mile Creek, a tributary of the Animas some five miles above Needleton, the valley bottom is occupied by Balsam Lake, about one-half mile long by one-quarter of a mile wide. This lake is at an elevation of about 11,450 feet; is fed by streams running from melting snow fields, and had, during the week of our stay there, a maximum temperature of about 45° F. During the day, therefore, the water was much cooler, often more than 25° cooler, than the air in the surrounding valley. In a small gorge at the outlet of this lake in the afternoon I observed a feeble wind blowing out from the water surface, that is, down valley, in direct opposition to the general valley wind. Though this contrary wind was perceptible for only a short distance from the lake, its occurrence is easily explained, and it seems probable that more observations would indicate a general interruption of both valley and mountain breezes.

#### WATERSPOUTS AT CAPE MAY, N. J., AUGUST 24, 1902.

By Dr. C. Fontaine Maury Leidy, dated Philadelphia, September 5, 1902.

Because of the great interest and comparative rarity of waterspouts, I report as an eyewitness a most interesting storm which occurred off Cape May, August 24, 1902, at 10:30 a. m. Looking out to sea, about 1 mile, slightly west of a line, from the center of the town to Cape Henlopen light, there was a dense black, overhanging cloud; from its south edge there hung a black column, perpendicularly to the ocean, the base was enveloped in a dense cloudy steam-like mist. The extreme end entered directly into the densest part of the cloud. The sides of the column were parallel, and it

seemed to be of the same density from top to bottom and from side to side. The accompanying cut<sup>1</sup> gives a most accurate view as it was in reality. One curious feature of this dense cloud was that it seemed to be absolutely alone. Surrounding clouds were few, and none other so dense. From the rapidity with which it enlarged there was not the slightest doubt but that it was fed from this enormous waterspout. Shortly after the first column faded away, the base seemingly enveloped in steam, about 200 yards distant another column formed, apparently suddenly, the first column remaining only in the form of a pedicle, appearing to hang from the clouds, about one-fourth the original length. About 400 yards to the left another column appeared, at no time was there more than one complete column, the others fading away and then returning. The first column almost entirely disappeared, but returned more dense than ever before, with the total disappearance of the other two waterspouts; they continued for fully forty minutes in almost the same location.

There was a heavy depressing feeling in the atmosphere. The tide was high at about 11 a. m.; it was unusually high at this hour. The wind was increasing but the sea was unusually calm but choppy in the course of the storm.

Living directly on the beach, I saw almost over the back buildings of the house, so low that one could have easily thrown a ball into the mass, an enormous bottle-shaped cloud, white and dense, hanging from the cloud, with the neck pointing toward the earth. It appeared to be 8 to 9 feet long and about 4 feet in diameter. Shortly the neck became greatly elongated and 8 or 10 feet of tubing seemed to protrude. During this change there was considerable wind, with enormous drops of rain, the largest I have ever seen. This mass crossed the edge of the house, there being great disturbance in the wind but not until it reached the beach was there noticed any circular or spiral movements. The first object met was a small dog which endeavored to return home but was lifted off his fore feet and turned around and around in the direction of the hands of a clock. Not once was this poor frightened animal able to regain his feet until he managed to get so far into the outskirts of the whirlwind as to regain all four feet and run away. The next object was a large "A" tent which, though very securely pinned down, was lifted up and torn completely off the staples excepting one fastening; the tent twirled round and round and remained suspended perpendicularly in the air for several minutes, the whirlwind passing over it finally. As the sand was reached we saw the dense mass drawn up into a cylindrical shape which quickly passed to the breakers, and when there almost as though a curtain was raised, the waterspout appeared from the base upward. The column was dense and black, the base enveloped in mist; there was no distinct rotary direction but the choppy sea was twirled and seemed to flow in all directions. During the formation of this last column there was considerable rain but no hail, although the size and force with which the enormous drops struck caused one to stop and look for hail. There was very little thunder and lightning. The disturbance remained in the water possibly fifteen minutes after the disappearance of the waterspouts. At one time there were four individual waterspouts to be seen, but only one entirely perfect at any one time; the other three merely formed the pedicles which hung from the cloud. The first column remained on and off for more than half an hour. The last one remained not more than eight to ten minutes.

<sup>1</sup>The cut here referred to was a half tone reproduction of an admirable photograph taken by an unknown local artist, representing the third of the series of waterspouts. After some delay a copy of this photograph was obtained, but in the mean time the original negative seems to have been altered by the addition of lines that destroy its value for meteorological study, and we have, therefore, with much regret, decided not to reproduce it.—Ed.

<sup>1</sup>Hann, J. "Lehrbuch der Meteorologie," p. 439 and Z. O. G. M., 1885, Vol. XX, p. 139.