

FUNNEL CLOUDS AT A GREAT ALTITUDE**By J. Gladden Hutton**

The funnel clouds here illustrated were observed Sept. 27, 1917, at Brookings, South Dakota. The writers attention was called to them about 3:25 P. M.

Three funnel-shaped clouds at a very high altitude, apparently at the altitude of cirrus clouds, were observed moving from west of northwest. One of these clouds, shown in Figures 1, 2, 3, and 4, passed north of, while the other two passed almost directly over the observer. Only one of the latter clouds was photographed. This one is shown in Figure 5. The sun was shining at the time of observation and the clouds appeared pure white against a clear blue sky.

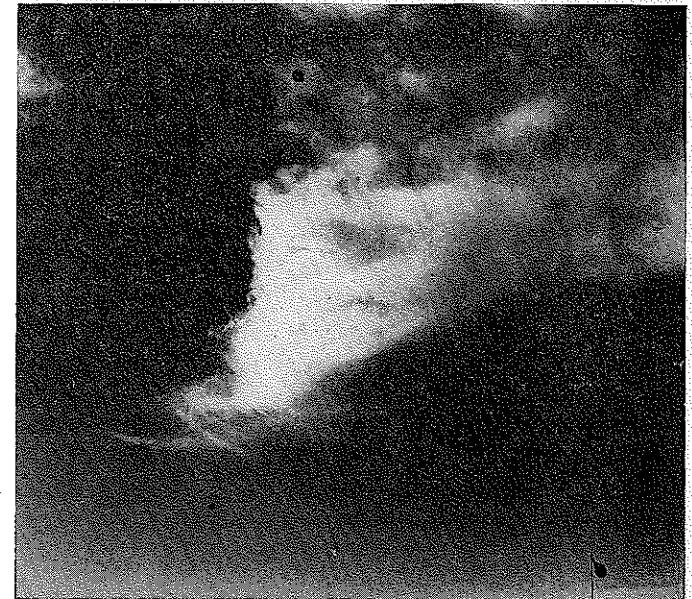


Figure 1. Showing gyratory motion of funnel-shaped cloud.

Figure 1 is from a photograph made at 3:35 P. M. Figures 2 and 3 show the appearance of the cloud at about three minute intervals later, while Figure 4 shows the appearance at 3:50 P. M. The gyratory motion, which would be in a



Figure 2. About three minutes later than Figure 1.



Figure 3. About six minutes later than Figure 1.



Figure 4. Fifteen minutes later than Figure 1.

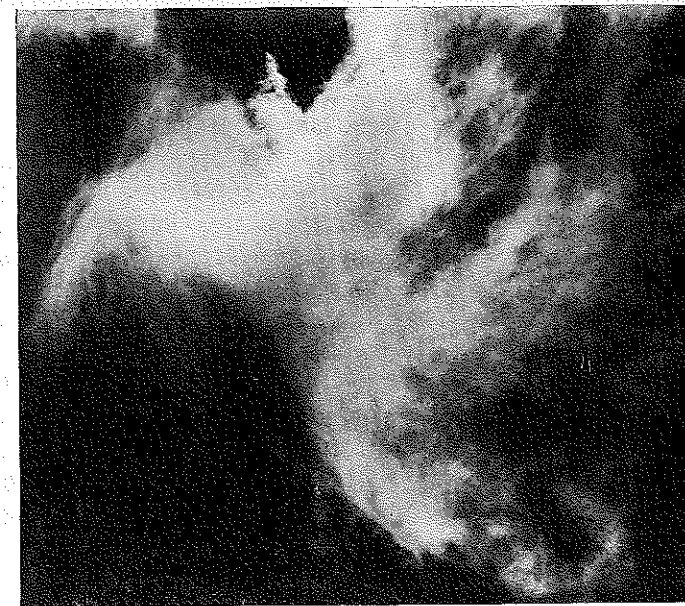


Figure 5. Another funnel-shaped cloud from directly in front.

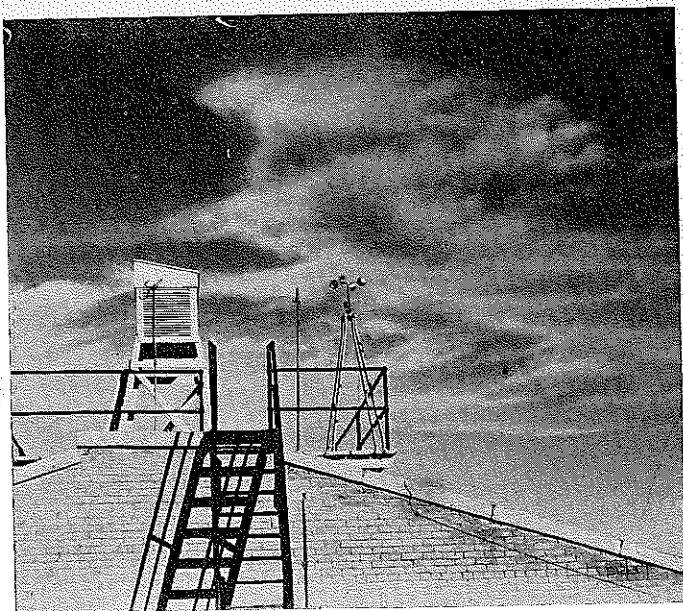


Figure 6. Appearance of the cloud shown in Figure 5 after it had passed over to the east.

clock-wise direction if seen from above is plainly shown. The more rapid movements of the top of the cloud toward the east progressed until in Figure 4 the cloud occupies a horizontal position, though there is still some evidence of gyratory movement in the lower part of the cloud. After the top of the cloud had been swept forward the funnel-shape disappeared.

Figure 5 shows a view of another funnel cloud taken from almost immediately in front. The gyratory motion is plainly shown. The general appearance of this cloud as well as that of the one shown in the preceding figures corresponds closely to that of tornado clouds occurring near the surface of the earth. Figure 6 shows the appearance of the cloud shown in Figure 5 after it had passed over the observer toward the east. A festooned structure of the

Weak whirls are common in the upper atmosphere as even a casual observer may note, but the writer does not cloud was visible to the eye, but is not well shown in the

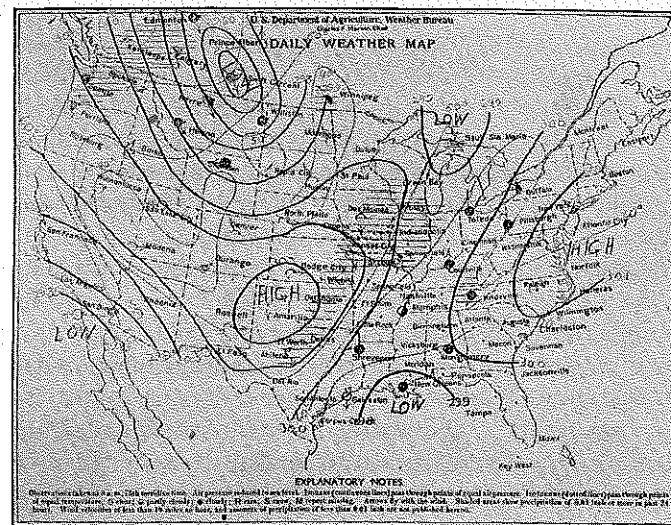


Figure 7. Weather map for September 27, 1917.

photograph.

The wind at the surface of the earth was blowing from a point west of southwest at the rate of about twenty miles per hour and there was no apparent change in the velocity when the funnel shaped clouds passed over.

The weather map for September 27th is shown in Figure 7. It will be noted that these clouds probably occurred in the air flowing eastward from the front of the cyclone. Unstable conditions in the atmosphere underlying the out-flowing current probably gave rise to these tornadoes aloft. The name "aerial tornadoes" is here proposed to distinguish atmospheric movements of this type from those occurring at the surface of the earth.

recall any which were as well marked as these, nor has he seen illustrations of such clouds. The photographs are here presented merely as a meteorological note.

In making the negatives Wratten and Wainwright's Panchromatic plates and a filter, No. K3, were used. The exposure meter was not read on account of lack of time, and as a result the plates were badly over exposed. The camera used was a Graflex, fitted with a seven-inch Bausch & Lomb-Leiss Tessar lens, and a $3\frac{1}{4} \times 4\frac{1}{4}$ plate.