

SCIENCE:

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Attention is called to the "Wants" column. All are invited to use it in soliciting information or seeking new positions. The name and address of applicants should be given in full, so that answers will go direct to them. The "Exchange" column is likewise open.

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THE TORNADO: APPEARANCES; LIEUT. FINLEY'S VIEWS.

(Continued from p. 314.)

Lieut. Finley's Views.

For the past ten years Lieut. Finley has devoted a great deal of attention to this subject, and has received reports of tornadoes from thousands of observers. His views, then, should have much weight as being a *résumé* of all the facts reported. Quotations will be made from his book entitled "Tornadoes," published in 1887 by the *Insurance Monitor*. No attempt has been made to classify these, but I have given them in the order in which they occur in the book. Speaking of the flow of air on either side of a large storm, we find, "As these conditions continue to prevail, there is a growing contrast of temperature to the north and south of the major axis (of the depression), owing to the long-continued movement of the atmosphere from opposite directions; such movement eventually affecting the disposition of air in the warmer regions of the extreme south, and likewise the colder regions of the extreme north. The contrast of temperature now naturally increases with marked rapidity, and the formation of clouds commences in earnest. Huge

masses of dark and portentous appearance bank up in the north-west and south-west with amazing rapidity, and soon the scene becomes one of awful grandeur. The struggle for mastery in the opposing currents is thus indicated by the gathering cloud-formations. The condensation of vapor from the extremely humid southerly currents by contact with the augmenting cold of their struggling opponents continues. It increases rapidly. Finally, when resistance to the unstable equilibrium can no longer be maintained (controlled by the rate of temperature change and rapidity of condensation), the opposing forces are, as it were, broken asunder, followed by the upward rush of huge volumes of air. The outward indication of this event is first shown in the whirling, dashing clouds over the broken surface of the heavy bank of condensed vapor, forming the background,—a scene not easily depicted or realized by one who has not witnessed it, but never to be effaced from the memory of the actual observer. There is an awful terror in the majesty of the power here represented, and in the unnatural movement of the clouds, which affects animals as well as human beings. The next stage in the further development of this atmospheric disturbance is the gradual descent of the funnel-shaped cloud from a point apparently just beneath the position of the enactment of the first scene. The tornado is now before us, not fully developed, but soon to acquire that condition when the terrible violence of its power will make the earth tremble, animals terror-stricken, and men's hearts quake with fear."

"There seems to be some strange connection between the almost simultaneous appearance of clouds in the south-west and north-west, possessing as they do such unusually threatening forms. As they approach from opposite directions, they are suddenly thrown into the greatest confusion, breaking up, as it were, into small portions, which dash pell-mell over each other and in every direction; now darting toward the earth; now rushing upward to considerable heights like sky-rockets, or at moderate elevations rolling over each other in a well-developed whirl. An observer, in describing the approach of the clouds from the south-west and north-west, stated that they came together with a terrific crash, as if thrown from the mouths of cannons. Generally, following closely upon the existence of this condition, the funnel-shaped tornado-cloud appears against the western sky, moving boldly to the front from without this confused mass of flying clouds." Lieut. Finley describes four motions of the tornado: "No. I. is called the whirling or gyratory motion, which is invariably from right to left. Above all other motions, this is attended with the greatest violence. This gyratory motion forms what is termed the 'vortex' of the tornado-cloud, within which the velocity of the centripetal currents of air is almost beyond conception. No. II. is called the progressive motion of the tornado,—the motion which determines the cloud's track from one point to another. No. III. is termed the rising and falling motion of the tornado. No. IV. is called the zigzag motion, or swaying from side to side of the central line of cloud-movement. This movement is sometimes quite suddenly performed, but generally it is a moderately slow movement, and one that can be watched and easily identified. In completing the extent of a single act of this motion, the tornado-cloud will diverge about an equal distance on either side of