UNIQUE DESTRUCTION OF A TULIP TREE BY LIGHTNING

By FRANK P. NORBURY, Cooperative Observer

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In the afternoon, about 4:30 o'clock, April 13, 1927, there occurred a thunderstorm at Jacksonville, Ill., a feature of which was the destruction by lightning of a tulip tree standing on the lawn of Hon. Fred H. Rowe. This tree, approximately 125 feet in height, with a base girth of 12 feet, stood in a group of trees distributed on the lawn and the adjacent Duncan Park. It was beginning to bud. It was wet from the rain and the ground thoroughly saturated by the heavy rains of the preceding three weeks. The bolt shattered the tree, causing what appeared to be an explosion, centered in the middle third of the trunk. The photographs show the lower third standing, rent in strips from above downward. The middle third was torn in shreds and strips, excepting a branch extending on the east side, which was severed and propelled fully 25 feet from the main trunk. Strips from the middle third, some measuring 5 and 10 feet in length, were thrown 100 to 200 feet away from the base. Smaller pieces were found even farther away. It is to be noted that very little débris was to be seen. (This is due to the nature of the wood of the tulip tree.) That the disruption was explosive in kind, like that of a firecracker, is confirmed by the observance of a neighbor who chanced to be looking out of the window at the turbulent storm. She said, "that following the stroke the tree trunk flew asunder." There were flares of light circumscribing the trunk, followed by a cloud of smoke, mingled with what appeared as steam. There was little evidence of combustion, but the smell of smoke extended north to the near residences. One neighbor thought her home had been fired by the lightning, as she smelled the smoke. To confirm the probability of explosive force the middle third was so completely shattered that the upper third when torn off fell and lodged in the shattered remains of the lower third, as shown in the photograph. The extent of disruption suggests explosion, which probably was due to the generation of steam, made possible by the intense heat liberated by the positive charged bolt in its contact with the grounded and negative charged tree. It is probable that the inherent qualities of the tulip tree may have been a factor in the phenomena of this unique disruption. This tree was a beautiful specimen of the species (*Liodendron tulipifera*) to be found in central North America, the characteristics of which are absolutely straight, symmetrical, and tapering trunk, with diverging branches, sweeping upward. Its wood is classed among the light woods and has a compact grain. It is a wood that absorbs moisture readily and, like the poplar and cottonwood, will shrink and warp. In the live state "it is full of sap," as its foliage indicates, being very glossy and bright green. Because of its texture, its ability to absorb moisture, and its symmetrical and tall trunk may be noted the factors which account for the peculiar explosive disruption, as shown in the photographs.

LIGHTNING

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The editor of the REVIEW has kindly permitted me to study the original prints of Doctor Norbury's very interesting photographs of the blasted tree that forms the subject of the preceding note. Four views are shown, one of which is reproduced above. They reveal several things that seem worthy of careful attention, especially as it is difficult to reconcile them with the commonly accepted ideas regarding the nature of lightning: (1) The seat of the explosion was evidently situated deep in the trunk, otherwise the trunk would not have been so completely shattered, and it was well below the center of the tree. (2) In none of the photographs is there any indication that bark was significantly stripped from the trunk. No pieces of bark can be distinguished among the débris, and in every photograph an examination with a lens shows that those outer splinters that are suitably situated for observation still are covered with apparently undamaged bark. (3) The long upper portion of the trunk, which is seen leaning against the shattered stump, is only slightly damaged, and that damage is superficial and limited to a narrow strip extending (as shown in another photograph) from the butt to beyond the limits of the photograph. The damaged portion is broadest and apparently deepest at the butt and becomes narrower and more superficial as the top of the photograph is approached. It runs parallel with the trunk from the butt to a point hidden by the shattered stump and then begins to spiral gently around the trunk. It would be interesting to know whether the grain of that portion of the trunk is likewise spiral.

It is difficult to reconcile these facts with the commonly accepted idea that we are here concerned with an ordinary current of electricity passing through the air, to the tree, and through that to the ground, the explosion being due to vapors generated in the tree by the heat produced by the passage of the current. Were this the proper explanation, the greatest density of current, and consequently the greatest heating and the greatest damage, would be where the current passes from the air to the tree. For, when once in the tree, that being a very fair conductor, vastly better than the air, the current would spread and would distribute itself in accordance with the conductivity of the various portions of the trunk; the current density in the new sapwood just under the bark would surely be greater than that in the interior of the trunk. Hence the main damage would be relatively superficial and much bark would be ripped from the tree. But this does not accord with the observations. Furthermore, as the tree and the ground were very wet, and hence were good conductors, the tree would have been struck near the top, and the main seat of damage would have been there instead of more than halfway down. If the narrow strip of damage extending along the upper section of the tree is regarded as evidence that the bolt did actually strike the tree near its top, then it is necessary to answer the question: How is it possible for the bolt to have passed down more than half the length of the trunk, damaging only a narrow, superficial region, and then by means of a deep-seated explosion to have completely blasted a lower, but not lowest, portion of the trunk? It seems impossible. If the stroke came down along this strip, then surely the explosion was not produced directly by the stroke, but arose from some secondary effect. If the bolt raised the tree to a very high positive potential,