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I. Notice of a Tree Stnicl; by Lightning

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Thus ends my paper. My experiments at Cromla are also ended, for the kind old lady has last winter "gone the way of all flesh." I have not removed any of the plants I introduced to her garden. Mr Paterson has kindly ordered them to be protected, and others may yet tell how they have thriven.

I send specimens of the leaves and branches of *Eucalyptus globulus* and *pendula*. The growth of the Weeping Gum is about a third slower than that of the Blue. The growth of the Acacia is not much less than that of the Weeping Gum.

13th July 1876.—Sir ROBERT CHRISTISON, Bart., President,
in the Chair.

The following Communications were read :—

- I. *Notice of a Tree Struck by Lightning.* By Sir ROBERT CHRISTISON, Bart., President of the Botanical Society. (Plates VIII. and IX.)

In July 1874, during a thunderstorm of severity unusual in this district, a large ash-tree, very near the toll-bar on the Dean Road, one mile from the west end of Princes Street, was struck with lightning. The tree is one of eleven hedge-row ashes directly opposite the toll-house, extending from the north wall of the road down a gently-sloping bank northwards. The first is a handsome leafy tree, the earliest of them all to push out buds in the spring. Then come two short stumps with some living shoots,—how thus destroyed I know not, but injured evidently when young, and probably owing to their free exposure to all westerly storms. The stricken tree is the fourth. The next is also an injured wreck. Three of the remainder are healthy, entire, and of considerable age ; a fourth is either much younger or ill-thriven ; and among these are two other stumps, like those already noticed, still putting out shoots. It is obvious that many accidents have happened to this row of trees, prior to that which I have undertaken now to describe.

The particular tree at present in question grows on a slightly raised ridge, between the two lines of a double hedge, much the worse for neglect. It has a trunk about twenty-five feet high, and nine feet in girth at five feet from the ground, and spreading branches which reach to a height of about sixty feet. It is the thickest and tallest in the row; and, although a little down the slope, it rises several feet higher into the atmosphere than its nearest neighbour next the road, which stands on the top of the bank. That tree is thirty yards distant; the nearest thriving tree on the other side is thirty-two yards off; there is no other elevated object in the vicinity; and westward, in the direction whence came the storm, there is a long unbroken surface of agricultural fields. The tree therefore plainly stands much in the way of a westerly storm. The injury sustained by the tree is not unworthy of notice, because it appears to be the least frequent of the damages done to forestry by lightning, and the damage done is very great, and its effects deserve to be watched and recorded.

At least three kinds of injury have been observed from lightning. Sometimes the electric fluid, entering the trunk blows it to shivers, and brings down in a moment the whole leafy superstructure. Sometimes it rips the bark in one or more lines from the point of impact down to the ground, occasionally tearing off a narrow strip of bark, and amputating also any branch it encounters in its descent, or otherwise so damaging the tissues connecting the branch with the trunk, that the branch dies. Sometimes it seems to sweep around between the wood and the bark, throwing off the bark in great sheets round and round the whole girth of the tree. It is also often said to amputate branches without other damage. This is not probable, however; and such simple injuries may be owing rather to the furious temporary hurricane which often attends a thunderstorm, and which must have great aid in its devastations from the fulness of vegetation at the usual season of thunder.

Of the first mode of stroke, involving instantaneous demolition of the whole tree, a very remarkable instance occurred in or about the year 1848, four miles S.E. from Edinburgh, close to Edmonstone House, the seat of Sir

John Don Wauchope, Bart. It so happened that a marriage ceremony was going on at the time in the house. Some of the bridal party, looking out upon the lawn into the deepening gloom of the approaching storm, saw a magnificent wide-spreading oak, eleven feet in girth of trunk, struck by a flash, and instantly sink to the ground, leaving only a portion of the central part of the trunk standing upright through the ruins, like a perpendicular pile of white planks. I saw the wreck two days afterwards. The great limbs lay around the riven trunk in their original arrangement, pinning to the ground with their massive elbows white planks from the trunk, four to ten feet long, six or eight inches wide, and shaped some of them as if they had come from the carpenter's shop; and in one direction several similar planks lay outside the wreck altogether, at a distance of 108 feet from the trunk. It is easy to see how destruction was effected here.

The second process tears open the bark in a direct line from the point struck to the ground, and often removes a narrow strip of bark. But it may do no farther damage unless the electric fluid encounter in its course a branch, which it breaks off, or shatters, or so injures at its attachment that it subsequently dies. Nor in that case is serious harm done eventually to the tree. This seems the commonest consequence of a lightning-stroke. There is an excellent instance in this very garden. A lime-tree (*Tilia europæa*, var. *intermedia*) standing close to what was intended for a magnetical observatory, was struck about thirty-five years ago. The electric blow appears to have hit at the same time two neighbouring branches. On one the current had descended straight down to the north-west side of the trunk, and thence in a straight line to the ground. On the other it had run down in the same way till it encountered the first forking of the tree, counting from the bottom, and there it had divided, and continued its course in straight lines to the ground at four different places, one on the north-east face of the trunk, and the three others on its south side. The whole course of the former blow is now distinctly marked by a long line of smooth bark, rounded and somewhat prominent; so as to present much the appearance of the stem of a great woody

partite deeply sunk in the tree. The hole communicates with another branch is similarly indicated on the branch itself and on three places of the trunk; but on the north-east face of the trunk there is simply a deep narrow crack in the bark, without any attempt at restoration. The blow on the second branch, in its descent, had both destroyed a considerable branch at the forking of the tree, and torn off bark and wood from the trunk above the fork; and here the wood is still extensively bare, widely exposed to the air, yet nevertheless very little advanced in decay. Another peculiarity is that the long ribbon of bark, ten feet at least in length, which had been ripped off, had carried away with it some adhering layers of wood, and had not been detached where the stripping terminated a short way down the trunk; and that a healthy branch, thicker than one's wrist, terminating in twigs and foliage in the usual way, has been formed in a peculiar manner on the inside of the ribbon of detached bark. The tree looks healthy and vigorous in spite of the rough usage it had received. But it incurs eventual risk from the gash made in its wood immediately above its first division into branches.

The third kind of injury is admirably exemplified in the ash-tree at the Dean toll-bar. The lightning appears to have struck its west side, about twenty-five feet from the ground, close to the second and principal branching of the trunk. It had there torn down a small branch, the seat of which is marked by a scar in the bare wood, extending half way to the ground. Below this point of impact the bark has been stripped off, without other visible injury to the wood, in a way which it is difficult to describe, but which I have endeavoured to represent in the accompanying rude drawings. The greatest extent of damage has been done to the west side, on which extremely little bark is left on the whole twenty-five feet of trunk. On the other sides the stripping, though also very great, is less and irregular. Altogether about two-thirds of the whole trunk is barkless; and the destruction goes continuously around it, so that nowhere is the perpendicular space between the upper and lower edges of the remaining bark less than four feet and a half or five feet. The bark, wherever stripped off, has

been carried away through its entire thickness down to the very wood.

I saw the tree two days after the accident, when the amputated branch and great shreds of bark lay around it. The white glistening uncovered wood, contrasting with the dark-grey remaining bark, gave it a very extraordinary appearance, now much less remarkable since the wood itself became grey from two years of exposure to the weather. I could not at first detect any other damage than what has been just described. But now two long fissures may be noticed on the south side next the road, one through the bark above, where it has been left attached, the other hard by in the exposed wood immediately below; and at the lower end of the former, and also at the upper end of the latter, I can see too very narrow chinks of light, so that these fissures must penetrate quite through the trunk, where it is between eighteen and twenty-four inches in diameter. It is probable, therefore, that the electric fluid had in part, at its place of impact, which is very nearly on the same level with these chinks, struck right through the tree, to reach and strip off the bark on the south and east sides,—thus nearly repeating the injury inflicted some years ago close to Moredun House on a large ash; which was struck at a forking, split down the middle of the trunk, and one-half shattered into fragments, while the other half was left standing.

Injury of the kind here described is necessarily fatal. But death is by no means immediate; and the gradual waning of life becomes an object of some interest to watch.

The foliage of the stricken tree did not appear to sustain any harm during what remained of the vegetating season. Fruit even formed on it; for ash-keys hung from its twigs after the leaves fell off in October. But I neglected to ascertain whether the seeds ripened. Next spring—that is, last year—buds were produced over the whole tree, and the foliage eventually was considerable; but it was thinner than before; and at the end of autumn the twigs showed no fruit hanging from them. When vegetation commenced in the present year, the tree for some time seemed to be dead. But fourteen days after all the ash trees near it

had begun to vegetate, its lowest branch, a small one on the east side, put forth buds, which have since thriven so well that the twigs may be said to be fully clothed. A week later buds formed also on all the branches to the south and east, but only on the terminal twigs. These buds have since made fair progress; but the resulting foliage is far inferior to that of the little branch below; and consequently as the tree is approached from town now, in the middle of July, it appears quite leafless till very near it. A week after these high branches began to bud, their example was followed by a very few twigs on the different branches which spread to the west and north; but in the subsequent week of warm dry sunny weather these buds withered and disappeared.

The present state of the tree (July 13th) is this. The torn edge of the bark connected with the ground has curled inward and adheres to the wood. The edge of the upper bark, separated from the lower by a very wide gap, nowhere shows any such change, and in some places hangs down in loose shreds. The branch a (Pl. VIII.) presents full foliage. The lower bark here approaches very close to that of the branch; but there appears to be a narrow gap or fissure between them. The branches a' and b have a scanty foliage on their terminal twigs. The branches A and B are leafless. The leafless branches are all to the west of the fissures in the trunk D, and on that side of the tree which the lightning first struck.

P.S.—Aug. 19.—The entire vegetation, described above as it was on July 13, is now completely withered and dried, even the vigorous shoots on the lowest little branch (a). Everywhere else, indeed, the withered leaves have even dropped off, on that branch they still hang attached, but quite dead and dried. The last ten days of continuous heat, drought, and sunshine may have contributed to this universal death.

A.B. The trunk, July 13 1876.
 a. Hole in bark; b. Hole in bark.
 A.B. The trunk, July 13 1876.
 terminal twigs July 13 1876.
 A. An old hole in the wood.
 D. Site of a hole in the wood.
 C. Site of a hole in the wood.

from the South

from the North