LIGHTNING'S AMONG THE TREES.

All who have been in a forest during a thunder-storm have witnessed the pranks of lightning among the trees. An English engineer who spent several years in this country thus writes on the subject: During surveys in the forests of the United States, when I necessarily lived under canvas, I often had the opportunity of witnessing the effects of lightning on the trees, and my experience lead me to believe that trees are only destroyed by lightning when they have been previously wetted by the rain.

A sojourner in the woods, whether he is taken in pursuit of game or with the object of prospecting for timber, minerals, and land, is always careful to erect his tent under a short thick tree in order to escape the danger of lightning or of trees falling and bringing down others in their *way on him*; and it was often while thus situated I noticed after stormy nights when thunder and lightning were accompanied by rain that many trees had fallen. The report of the snapping of the trunks would remind one of that of the firing of a cannon, and when lightning and thunder were not accompanied by rain (in the immediate locality of our camp at any rate) no trees had been struck. I infer from the same observations that the lightning always strikes the tallest trees, whatever their species may be, for the taller white pines and poplars were most often seen destroyed and the shorter maples, linden, birch trees, etc., rarely so; also that the sap between the wood and the bark of the tree does not increase the chance of its destruction.

A gentleman connected with the new botanical gardens suggests that the mete-rological offices in different countries collect reliable data embodying the observations of different persons as to the particular circumstances attending thunder storms during which more or less injury has been done trees. He states as the result of his own observation that certain kinds of trees are much more likely to be injured by lightning than others, which goes to show that they are very poor conductors of electricity. The condition of the tree in regard to age and vigor has also, in his opinion, much to do in making it a good or bad conductor. In a communication to a London paper he says: The comparative conductibility of different trees is not wholly, in my opinion, a question of species. The same species at different stages of growth, and growing under different circumstances, will exhibit widely different degrees of conductibility.

Doubtless the hardness of the wood and the character of the grain, and also the character of the ramification, have much to do with that resistance to the electric fluid which results in damage to limbs or trunk. Hence, probably, why the oak, which is remarkable for the general closeness and hardness of its grain, and the ruggedness and contortion of its ramification, so frequently suffers, while soft-wooded trees, like poplars, escape. But younger oaks under the same circumstances might escape, while the older and harder and drier trees would be broken by the electric fluid. A mistake commonly made is to speak of certain trees being "struck" by lightning, the word "struck" being only applied to those trees that are injured by lightning. Thousands of trees are struck during every thunder-storm that takes place over woody country; but, being struck noiselessly and without resulting injury, they are not noticed. It is doubtless the superior or inferior conductive power of a tree which subjects it to, or exempts it from, harm from lightning; but it is the greater or less moisture of the branches and trunk which regulates the conductive power.

The form of a tree, too, has much to do with its exemption from hurtful strokes. The Lombardy poplar is about the best form, because its branches, pointed upward, are like so many lightning conductors. The oak is about the worst form, because its branches and limbs are nearly always (in those trees which are mostly damaged) placed across the course of the electric fluid. The Lombardy poplar also is of much moister and softer substance than the oak, and consequently gives freer passage to the electricity.

The best conductors of electricity are not those that are "struck" by a discharge from a cloud, but those which silently convey it to the earth without being shattered or injured in any way. That many trees do this seems certain. In all probability trees whose leaves present many sharp points are the best conductors of electricity. Each point attracts electricity, and is the means of directing it through the branch and trunk to the earth. The amount conveyed by each is so small that no part of the tree sustains any damage. Leaves like those of the holly tree are admirably formed for attracting electricity. The points on the foliage of fir are of the desired shape to attract electricity, but the resin in the fir tree serves to make it a poor conductor.

In a flat and nearly level country like our western prairies lightning does not always "strike" the highest objects. It sometimes enters the side of a building instead of discharging itself on the chimney, the highest place on the roof, or other projecting point. The presence of suitable trees next a house, or at some distance from it in the direction toward the course of the prevailing thunder clouds, would serve to protect the dwelling. Trees that are better conductors than the materials of which buildings are composed would protect them as well as metal rods.—*Chicago Times.*

OPPORTUNITIES FOR WASTE.

In a large establishment where several batteries of boilers are at work to supply the steam consumed, we are waiting for shutting down time to commence work upon the engine. Strolling around the building a large drop of very hot water upon the neck compelled attention to a large valve overhead, from the stem of which issued a jet of steam which would have been a decided improvement upon the performance of some safety valves we know of, together with numerous drops of the hot water aforesaid. Moralizing upon this outlet for the escape of heat without the performance of useful work, our thoughts went out over the long line of opportunities for waste which exist in the ordinary steam plant. One of the most prolific of these is the blow-off. Leading as it usually does by closed pipes to some concealed drain, a very serious leak may exist at this point without attracting the attention of an unobservant attendant. Our first experience in this line was in a printing office, where the boiler and engine were in charge of the pressman. One day the boiler worked badly. The fire was driven and coal shovelled with commendable energy, but frequent stoppages had to be made for steam. The state of affairs being called to the attention of the manager, he declared the boiler to be dirty, ordered the fire hauled, and to show his practical acquaintance with the subject shut down his roller top desk, stripped off his coat and bathed in soot, ordered the boys about and raised a general hubbub for half an hour, when the boiler was pronounced all right. Meantime the writer had noticed that the pump was running although the draught of steam from the boiler had stopped, and that when the pump was stopped the water lowered in the glass. The blow off valve appeared to be closed when tried, but the pipe beyond the valve was hot, showing that hot water from the boiler was passing the valve. The valve was opened wide, then closed tightly, the water stood stationary in the glass, and the continual drain of heated water, caused probably by a bit of scale under the valve, being stopped, the boiler did its work nicely when started up, to the infinite delight of the manager who of course laid it to his clearing.

Another favorable opportunity for hidden waste is in those establishments where the circulation of pipes for heating is connected so that the exhaust may be used in it. If the exhaust valve is not tightly closed when live steam is on the building it will find an open passage through the exhaust connections into the open air.

About the engine are two little opportunities for waste, the first of which should be on its face so apparent that its frequency is surprising; that is the practice of allowing the drip cocks to remain open while the engine is running. Although it must be apparent to the operator that an opportunity is thus afforded for steam of the cylinder pressure to blow directly to waste, it is a very common practice with the runners of small engines. The second is more occult and less liable of detection, though we have met with a number of instances of it. We allude to the exhaust valve being late in closing, so late that it does not close until after the steam valve has been open for some time, allowing, of course, the live steam to blow through the exhaust port and out.

Another source of waste lies in the uncovered pipes which abound in places where the heat which they radiate is rather an annoyance than a desideratum. Every square foot of this surface is radiating heat uselessly into the atmosphere instead of retaining it to be conveyed to the engine, and converted in part, into useful work, and how much steam may be condensed in a long whistle pipe exposed to the weather and allowed to stand full of steam instead of being shut off as it should at the boiler.—*Boston Journal of Commerce.*

SHAFT BEARINGS.

In numberless instances, says *Iron Age*, shafting is found small in diameter in proportion to its length, even as regards the distance apart of its supports, and far more so regarding the shaft as a single rod, which from the method of uniting its separate lengths, it becomes. Such a bar, even before pulleys are put on, is anything rather than straight. The load of the pulleys puts it still more out of true, and then finally come both the dead-weight of half the belting driven by it and also the diverging strains of the loads on the driving sides of the belts. All these make a length of shafting serpentine, and this is increased in proportion to the distance of this or that pulley from a bearing. Hence it follows that the bearings must and do suffer; so also does the oil bill and the coal bill. Another source of friction and brass-cutting is to be found in the methods sometimes observable of fixing the hangers or brackets, such as bolting to joists or flooring overhead, either of which is subjected to constant variations of load and consequent alterations of line, or bolting to the members of an iron roof or its supporting columns, which are in perpetual movement by expansion, contraction or from wind stresses. In many cases there is no better way practicable, but then the evil can be met by putting up shafting in independent lengths, each having its own pair of supports and transmitting the rotation power by universal joints, or the simpler expedient of cross-ends plain on one end and "taken on to" by studs or pins fixed on the other cross end. It is probable that not one steam user on a large scale in a hundred can tell how much power is absorbed in overcoming preventable friction in his shafting. Yet it could easily be ascertained. We may also point that brass is used far more freely than is necessary for lay shaft beams. Hardwood, such as hornbeam or beech, is much better and cheaper when the loads are not too heavy. Wood bearing will run for years. They soak up oil and come to a beautiful surface, and they never cut a shaft, as brass will do. The virtues of wood are not understood as they ought to be.

THE POPLAR.

In an article on "The Future of the Poplar," a contemporary observes: As is well known, for a nation of shopkeepers a large number of packing cases have to be annually made, and as, in most instances, these cases are only used once, cheapness and lightness for carriage are great essentials, and these the poplar possesses in eminent degree. For cases in which very heavy weights have to be packed, such, for instance, as tin plates, where a cwt. of metal goes into a box about 20 in. by 14 in. and less than 2 in. deep, it is not so suitable as the elm, as it lacks its strength and will not stand such hard knocks. When it is considered that the tops and bottoms of these cases go at three boards in thickness to the inch this will not be greatly wondered at. There are, however, vast numbers of cases wanted in the drapery, grocery and similar trades, and for such purposes the poplar seems peculiarly suited, as, in addition to the qualities of cheapness and lightness of which we have spoken, it is very white and clean in appearance, and has no properties in it likely to cause injury to the articles packed within it. For such uses there need not be an atom of waste, since left to grow on naturally, and it is not attacked and lopped by the pruner's knife and saw, the poplar produces sound timber and free from knots, and there is no appreciable difference between the heart and sapwood, and the limbs are practically as good as the bole itself; under these conditions it is a very economical tree to cut up. Besides being useful for the packing-case maker, it is suitable for the turner, not perhaps for the more elaborate or lasting work, but for rollers, so extensively used in what our American friends would term "dry goods stores." The same qualities which recommend it for packing cases would be equally applicable here, and no imported wood possesses them in the same degree. Another use to which it is occasionally put is for benches and tables for leather cutters. For this its softness is a great advantage, but in the matter of grain there are woods more suited; but as they are scarcer, and consequently dearer, they have to be dispensed with in favor of the poplar.

THE INVENTOR OF THE CIRCULAR SAW.

In a lonely, secluded spot in the northwest corner of the cemetery, near the ever beautiful little village of Richmond, Kalamazoo county, Michigan, the reader can find, on a pure white marble slab, nearly concealed from view by a large cluster of lilac bushes, engraved the simple inscription "Benjamin Cummings, born 1772, died A. D. 1843." And who was Benjamin Cummings? He was the inventor of the circular saws now in use in this country and in Europe. Nearly sixty years ago, at Burtonville, New York, and Amsterdam, this man hammered out, at his own blacksmith's anvil, the first circular known to mankind. He was a noted pioneer in Richmond; a first cusin to one of the presidents of the United States; a slave owner in New York state; a leading mason in the days of Morgan, at whose table the very elect of the great state of New York feasted and drank freely of his choice liquors and wines; a vessel owner on the North River before the days of steamboats; a captain in the war of 1812, where, after having three horses shot from under him, with one stroke of his sword he brought his superior officer to the ground for insult, and because he was a traitor and a coward; and after being court-martialled, instead of being shot, he was appointed Colonel in his stead. In this lonely grave are the ashes of the man who, nearly 70 years ago, took up and moved bodily large brick buildings, and, to the wonder and admiration of the world, constructed a mile and a half of the Erie Canal through a bed of rock, and who also built, on contract, those first low bridges over the same. He also aided in the construction of the first ten miles of railway built in the United States, and founded both the villages of Esperence and Bostonville, on the old Schoharie, near Amsterdam. The study and aim of this man's life appeared to be to do that which none other could accomplish, and when the object sought was accompliahed, he passed it as quietly by as he could the pebbles on the sea-shore.—*Ex.*

A Good Week's Log-Making.

AYLMER, Dec. 30.—The following work done by one gang of four men, under the management of Mr. George Guertin, in one week on the limits of N. E. Cornier, on the south branch of the Petewawa river, is worth noting. These four men, Moses Thibault, Cyrille Jeauvine, John Renaud and Alfred Perrier cut in six days beginning Monday, Dec. 14th. the following saw logs: Monday, 160; Tuesday, 166; Wednesday, 170; Thursday, 173; Friday, 171; Saturday, 168; total, 1,008 sawlogs, average diameter 16½ inches. The same 1,008 logs were laid up on ten rollways (besides making the rollways) in three days by two teams driven by O'Rooke, Guertin and Tom Guertin, 1st day, 356; 2nd, 307; 3rd, 345; total, 1,008.

DECEMBER 25th, during a thick fog, the British bark Arabella, lumber laden from Montavideo, South America, while in tow of the tug Pilot, went ashore on the rocks at Trail Island, a few miles from Victoria, B. C. Both vessels stuck fast, and the Arabella became a total wreck. She had 500,000 feet of lumber on board.