

FOREST FIRES. BY PROF. C. S. SARGENT, BROOKLINE, MASS.

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The necessity of devising methods for preventing the spread of forest fires cannot, with the growing demands of a larger population upon our forests, be longer safely neglected. The forest question has become a question of dollars and cents; we cannot afford to allow our forests to burn. The proportion of actually productive forest to population is in New England already too low, and we have long imported most of our forest supplies from Canada, from the Western pineries, and from the South. The center of lumber distribution has moved westward from New England to beyond the Hudson, and then to the shores of Lake Michigan.

The extent of the loss which the country experiences every year from the destruction of woodlands by fire is enormous, and could the actual amount of such losses be computed they would astonish even those most familiar with the condition of the American forests. The division of the tenth census which has been specially engaged during the past three years in studying the forests of the country, has endeavored to gather statistics of the extent and value of the forests burned during the year 1880. The results obtained from this investigation have not been published yet. The information is often vague and untrustworthy, and even after the most careful analysis is so liable to mislead that it will be safer, for the present at least, to use the results as a basis for general discussion, without drawing actual deductions so far as the whole country is concerned from statistical statements in which the danger of error is of necessity considerable. Enough, however, will be shown to indicate, with all due allowance for defective returns, that the extent of forest fires throughout the country is infinitely greater than has ever been seriously supposed.

In Massachusetts, to be sure, the amount of property destroyed in this manner is shown to be comparatively small, and it is fair to assume in a community like this that estimates are more carefully made and more accurately returned than in the thinly settled forest regions of the far Western States and Territories. And yet in Massachusetts, in the year 1880, according to these returns, 13,899 acres of woods were burned over, the loss been given at over one hundred thousand dollars. In Pennsylvania, where the value of forest property is more appreciated than in Massachusetts, and the lumbering interests are only second to those of Michigan, 685,738 acres of forest are reported burned over during the year, with a loss of over three million dollars. It is not probable that these statements are exaggerated, and in the case of Pennsylvania they undoubtedly do not fully represent the actual loss from this cause. The returns show that 3,988 acres of the forest destroyed by fire during that year in Massachusetts were situated in Barnstable County; that Berkshire County lost 1,377 acres; that Hampshire lost 1,150; Essex, 1,780; while in Bristol, Dukes and Hampden

the loss was in each case below 1,000 acres, and that Franklin only suffered a loss of one hundred acres.

During the present year a great tract of tree-covered land, probably nearly 7,000 acres in extent, not very valuable forest to be sure, still of very great prospective value at least, was burned over in Barnstable County, and the average annual losses by forest fires in Massachusetts may probably be safely put down at some 10,000 acres. The loss is considerable, but hardly enough to cause any serious anxiety if it was confined to the actual destruction of the wood growing upon the land. But forest fires destroy not only the growing wood but the fertility of the soil itself and its capacity to produce valuable trees again; they destroy, moreover, the confidence of the community in the value and stability of forest property. The destruction by fire, then, of the wood standing upon a few thousand acres, more or less, does not by any means represent the entire or more than a small portion of the loss which forest fires entail upon the State. Sufficient attention has not been paid to the effects of forest fires upon the soil and the subsequent growth of plants. We have been accustomed, in treating forest fires, too generally to consider the damage done to the growing wood alone, and have not considered the much greater loss the land itself suffers from being burned over. If only a portion of the trees growing on a tract of land are cut, a sufficient number being left to protect the soil and produce a supply of seed, if these are guarded from fire and browsing animals which, next to fire, are the most active and destructive enemies of the forest, the same species will continue to grow almost indefinitely and a constant succession of young trees will regularly spring up to replace those which have been removed.

This is a system of forest management very often adopted, especially with certain varieties of trees, where scientific forest management prevails; and it is on many accounts a very sensible and economical method, although, of course, susceptible of very considerable modifications to meet peculiar cases of forest growth or climatic conditions. If, on the other hand, a forest is destroyed by fire which kills the trees and undergrowth of shrubs and herbs, the same species, except in the case of some of our least valuable trees, rarely spring up again. Let us take the case of a White Pine forest, because the White Pine is probably the most valuable forest tree today in New England and because we are all familiar with its habits of growth. If a forest of White Pine is destroyed by fire this tree does not spring up again. The land which, if only a part of the trees had been cut, would have continued to produce pines indefinitely, is not covered again with any growth of trees for a considerable period. The fire-weed first makes its appearance. The light seed of this plant is often blown for a long distance, and falling upon the bare ground germinates quickly, and finally covers the burned surface with vegetation. Birds drop the seeds of raspberries and blackberries, which find sufficient nourishment and light for germination. These, as they grow, cover the ground, and afford protection to the stones of the little mountain cherry, dropped by birds also, or the light seeds of the Gray Birch, or some of the Willows or Poplars, which are constantly blowing about, and which will germinate anywhere upon unshaded ground, however barren. These are generally the first trees which succeed a White

Pine forest destroyed by fire; but years often elapse before the ground is covered even with such trees.

Nature works slowly, and the wounds made by fire on the earth's covering of trees are only healed under the most favorable conditions through the gradual growth and decay of many generations of plants. The Cherries and the Birch and Poplars are short lived, and unless burned up, when the same process of recovering the soil commences again, are succeeded by more valuable broad-leaved trees. Squirrels and other animals deposit acorns and nuts in the ground, and the wind brings the seeds of Maples, Ashes, and the valuable Birches. Such seeds find protection among the Poplars and Willows which had sprung up on the burned land, and as these die, the more valuable trees get a chance to grow and gradually occupy the ground. This new forest of hard-wood trees, if protected from fire, will long occupy the ground, and the original Pine forest will not appear again until the land, long enriched by an annual deposit of leaves, has been again stripped of its tree-covering, and mellowed by years of cultivation. Such land nearly all over New England, if freed from the plough and the scythe, and guarded from tire and pasturage, grows up again with Pine. The different processes, however, by which White-Pine land, on which the forest has been destroyed by tire, has been again brought into the condition to produce spontaneously another crop of Pine, have occupied a long period of time, so long, indeed, that it must extend through generations of human life. The forest fire, then, which destroyed the Pine trees growing upon the land, destroyed, also, the capacity of the hind to produce again, during a period which may be set down at from fifty to one hundred years, a similar crop of trees.

The damage inflicted upon the land by forest fires is, of course, not irreparable in a climate like that of New England, where the annual rain-fall is sufficient to always ensure a growth of trees of some sort, if the ground is left entirely undisturbed, and sooner or later, in the ordinary workings of nature's laws, forests will succeed each other here. But in some parts of the country where the rain-fall is so slight that there is a constant and severe struggle between the forest and the plain, and where trees under the most favorable conditions barely exist, a forest fire not only kills the forest but it makes any future growth of trees impossible. We, in New England, are more fortunate, and it is entirely within our power to regulate the composition of our forests, and maintain a proper proportion between forest areas and farming land. If, however, forests are subject to constant and unnecessary danger of destruction by fire, there can be no proper system of forest management introduced into the usual economy of the community. There is little inducement to plant a forest, or protect and encourage the growth of natural woodlands, so long as the condition of public sentiment is such that the authors of forest fires are not held responsible for their acts.

A man cannot be expected to expend money or labor on his trees, or allow them to grow a year after he can find any market for them, if he has the danger of forest fires constantly before his eyes. There is no inducement, under these circumstances, to allow a forest to mature for timber; it is safer to cut it off for cord-wood at the earliest

possible moment, and thus reduce the risk of probable loss by fire. Under these circumstances it is useless to adopt any of the methods of thinning or pruning by which the value of young forest trees for timber may be vastly improved, or to guard the woods from roaming and destructive cattle; and it follows that a large portion of the profits which our forests could be made to yield, under a different policy, are lost. The forest fires, then, destroy the trees. They destroy the capacity of the land to produce again during long years similar trees; and, finally, they so shake the public confidence in the permanent value of forest property that, even in a State like Massachusetts from which the original forest has long disappeared, and where the value of all forest products is enormously high, capital will not engage in forest production, which, with the condition of our forests, could certainly be made enormously profitable, until the risks from fire are reduced to a minimum.

This is a matter of special interest to New England to-day, because upon it largely depend the country's supply of White Pine, and the greatly enhanced value in the early future of much New England land. Not a small part of central and southern New England, no longer profitable for agriculture, is now growing up with White Pine; and this White Pine, if it can only be protected, will, in a few years, it is safe to predict, exceed in value the net profit all the New England firms can produce during the next fifty years. In some parts of New England this second growth of Pine has been growing for a considerable time, and has already given rise to large and profitable industries. The value of logs cut in Massachusetts during the census year, reached nearly two million dollars; at least one-half were second-growth White Pine. More than one hundred million feet of second-growth White Pine were sawed during the same year in Vermont and New Hampshire, and nearly if not quite as much more in Maine. The manufacture of wooden ware, an important and growing Massachusetts industry depending upon this second-growth pine, has made Winchendon, Worcester County, the great center of this business in the United States, if not in the world.

These young forests of Pine are already, then, of great value to New England; at no very distant day, they must become one of the most important factors in its prosperity. The problem growing out of the actual condition of the country's supply of White Pine, and the effects which any serious diminution of this supply must have upon our prosperity as a nation, need not be considered here at any great length. The entire supply of White Pine growing in the United States and ready for the axe does not to-day greatly, if at all, exceed eighty billion feet, and this estimate includes small and inferior trees, which, a few years ago, would not have been considered at all in making such an estimate. The annual production of White-Pine lumber is not now far from ten billion feet, and the demand is constantly and rapidly increasing.

The publication of these facts a few months ago has greatly increased, and in some cases more than doubled, the value of Pine lands in parts of the country; and it does not require any particular powers of foresight to be able to predict that the price of White Pine must

advance to still higher figures. Enough is now known of our forests to permit the positive statement that no great unexplored body of this Pine remains; and that, with the exception of the narrow Redwood belt of the California coast, no North American forest can yield in quantity, any substitute for White Pine, the most generally valuable, and most generally used of American lumber. Under these circumstances, the growing Pine of New England will soon become an important element in the country's supply. In no other section is there so much young Pine growing; and if we cannot compete with the West or the South in the production of cereals and wheat, we have at least in our favor, soil and climate better suited to grow Pine than any other part of the country. New England cannot allow this opportunity for increased prosperity to be lost. The demand for White Pine is rapidly increasing; the extent of the supply is at last known; no available substitute exists to any great extent; we possess already a considerable quantity of young Pine, and greater natural advantages than other parts of the country for growing a much larger amount.

A market is assured for all that can be produced, and we may look forward with certainty to obtaining prices for Pine, *which promise, if we can judge the future by the past*, to make the value of land covered with thrifty growing Pine, much greater than that which can ever be obtained for the best agricultural land in the State. The single danger which threatens property of this nature, is the danger, real or imaginary, of destruction by forest fires. If this danger, and the dread of it, could be removed, or at least greatly reduced, an investment in young Pine growing, in New England, would promise to capital, in the long run, larger returns than could be derived from almost any other legitimate business enterprise; but so long as this dread of fire exists, capital will naturally content itself with smaller and more certain returns.

If under these circumstances it is desirable to foster and develop the growth of New England forests, better legislation than now exists for their protection must be secured; and then the public mind must be educated to the importance of forest protection, that the enforcement of such laws as may appear necessary for this purpose may be possible. Legislation in advance of public sentiment cannot be expected to accomplish any very marked results; and unless we can learn to appreciate the rapidly increasing value of our woods in their commercial aspect, the passage of laws, however carefully prepared, will not avail a great deal.

But to return to the immediate question of forest fires in Massachusetts. The census investigation showed that during the year 1880, fifty-two such fires were set by sparks from locomotives; that forty spread from carelessly burned brush-heaps; that hunters caused thirty-seven; that nineteen careless smokers dropped their lighted cigars or burning ashes from their pipes and so caused disastrous conflagrations. In three instances the origin of forest fires is ascribed to the burning of charcoal, and in only eight cases to malice. It appears, then, that the railroads are responsible for the greatest number of these fires; and that the remainder may be generally traced to sheer carelessness. The railroads are already held responsible for

the actual damage they inflict upon property in this way; but, as has been shown, the destruction of trees is only a small part of the real damage caused by forest fires. Still the railroads cannot be held responsible under the law for the prospective damage represented by a partial or entire destruction of the plant-producing capacity of soil which they have burned ; nor can they well be made to pay for the loss of confidence in forest property which such fires cause. Such damages can neither be estimated nor collected. Fires set by locomotives can, however, be largely prevented by the general adoption of some effectual spark-arrester. It is true that such a contrivance has not yet been perfected to the entire satisfaction of railroad experts; but if the railroads were compelled to adopt some of the existing patents, American ingenuity and mechanical skill can be depended on to perfect them.

It is a case where supply will quickly follow the demand. As a first step, then, towards checking the spread of forest fires, the legislature should compel all railroad corporations operating within the State, to provide their locomotives with spark-consumers. Such appliances are in general use in Europe, and locomotives should not be longer operated with-out them in this State. One of the principal dangers to the forest, and more especially to the coniferous forest, which we in Massachusetts, when we increase our lumbering operations, shall soon learn to dread more generally than at present, comes from the custom of leaving scattered about the ground, the tops and branches of the trees cut down during the winter. This debris becomes, by the middle of the following summer, as dry as tinder, and furnishes the very best material to feed a fire started in the woods. Any enactment intended to prevent forest fires should contain a provision compelling, under penalty of fine, the collection and careful burning; during the winter in which the trees are cut, of all parts of them not actually carried from the ground. The possibility of successfully dealing with persons carelessly setting fire to forests is more difficult and more remote. Such persons rarely confess their carelessness, and still find protection in public indifference. But until public sentiment makes it possible to convict a person setting carelessly or wantonly a forest fire, and hold him responsible unclear the law for the damage he inflicts, the solution of those questions will not he very near.

The following was passed by the last legislature: — An Act for the Protection of Forests against Fires. Whoever wantonly and recklessly sets fire to any material which causes the destruction or injury of any growing or standing wood of another, shall be punished by fine not exceeding one hundred dollars, or by imprisonment in the county jail not exceeding six months. The passage of such a bill, defective as it is, indicates at least a feeling that at last the forests of Massachusetts should be protected. The law, as it now stands upon the statute book, should, however, be amended. It is not comprehensive enough, and it is not severe enough. It would not be very difficult to draft a bill to cover the necessities of the case if the feelings of the community in regard to the value of forest property were more advanced; but with the existing apathy in regard to the subject, and the impossibility of securing now, without a full discussion by the press and the people of the forest question, the enforcement of any

proper law upon the subject, it seems better to present the subject thus generally for your discussion and consideration, without attempting to sketch even the form of such a bill as seems necessary to afford Massachusetts protection from forest fires. The better understanding of the forest question as it exists in New England to-day which must follow any discussion of this subject, is the best guarantee that our forests will in time be protected, and that they will receive the care and attention which in their present economic aspect, if in no other, they deserve at our hands. I commend the subject to the most careful consideration of the press and the farmers of New England. Question. Did you ever know a case where a pine forest that had been cut off, whether the brush was burned or not, grew up to pine again?

Mr. Russell. I never did. Mr. . I understood the essay to say, or I infer from the essay, that if the land was not burned over, it would grow up to pine again. Now, I never knew a case where a pine forest came up again. FOKEST FIRES. 281 Mr. Russell. I think if you will read this lecture over carefully when it is printed, you will see that it states that the effect of burning it off prevents the production of the pine for a much greater length of time than if it was merely cut off. Mr. Sargent says in this paper that, in the ordinary course of nature, the pine will appear in from fifty to one hundred years. Qdestiox. On the same ground? Mr. Russell. On the same ground if it is burned over. The crops that come in the meantime are, first, fireweed. That covers the denuded land with vegetation, and enables it to take up the seeds that are dropped by the birds; first, of the briars; next, of the cherry and similar trees; then the larch, birch, and other inferior trees, which in time are followed by those trees that come from the seeds brought by squirrels, and the maple seeds that are blown by the wind; and, in the course of time, the white pine will again appear; that process being, as I understand from this paper, much slower than if we cut it off in the ordinary course. Mr. Jewett of Pelham. If I understand the law correctly, it provides for the punishment of persons who wantonly or maliciously set forest fires. The fire that burned about two hundred acres in our town last year was caused, not wantonly, but by smoking out bees. I do not think the men intended to burn the forest, and they supposed they put the fire out. Such fires are often caused by hunters smoking out squirrels. They are not set maliciously or wantonly. Mr. Russell. The words of the statute are "wantonly and recklessly." Mr. A. A. Smith. I believe it is considered a law of nature that the same species of trees will not follow; but before we criticise a valuable paper, I think we shall find, if we examine it closely, that the writer did not use the language that, if the pines should be cut off and the land burned over, the same kind of trees would come up, but he said if the pine should be partially cut off, trees of the same kind would come up again. I understood it so. Mr. Shepard. I think that is a fact. The second growth of pine that is used so much in the manufacture of wooden ware are trees that grow up in old pastures. Many of them
282 BOARD OF AGRICULTURE. spring up around, and are cut off as fast as they get large enough to use, and they grow very luxuriantly. I recollect going, some years ago, to a forest that had been used as a family wood-lot, and was cut into every year, and the pines and oaks there were the second growth. There is one point suggested by the

essayist which would seem to be quite a tax upon a person cutting off wood ; that is, that he should be obliged to burn up the brush. Now, 1)erh;ips it would cost five cents a cord more to pay a man to pile up his brush in winrows. He has got to handle most of the brush to get it out of his way, and to put it in winrows would not be any great hardship. I have a case in mind where a lot within a mile of me is being cut oft' this winter. It is covered with chestnut, which was sold for a hundi-ed dollars an acre, and the man has been offered four hundred dollars for his bargain. Three French Canadians are cutting that off, and for their own convenience in hauling, they are piling the brush in winrows ; of course it is more convenient for those who draw the wood off. Mr. Manning. I do not understand that the same kind of forest may not be continued for any length of time, if the trees are thinned out, and the smaller ones allowed to grow ; under such circumstances, the same kind of wood will continue for a long time. Frequently, after a growth of pine is cut off, fire burns over the ground, destroying all small evergreens, and if anything comes up, it is the small deciduous trees that were imder the pines, but not very conspicuous until the pines were taken away. If pines do come up, it will be because there are seed-bearing trees near by. I have seen a case where the fire killed every tree in a certain section excepting a few seed-bearing trees a little higher up on a hill ; and yet, in not more than five years, the land was coming up with a new growth of pines, from seed wafted by the Avind from the few remaining trees. If these trees had not been there, there Avould not have been another growth for many years. The injury to the land and to growing trees of any kind, where fire has burned, is very great. The injury is much greater where the land is dry and rocky than on fertile land and deep soil. Many fires come from locomotives on the FOREST FIRES. 283 railroads, a great many from carelessness, and some from maliciousness. I was at Montreal last August, at the meeting of the American Forestry Congress, where there were gentlemen from various p.irts of the United States and Canada (the organization including members from Canada a-i well as the United States) ; a great many essays were read, and a great many things said, by men who had ample opportunities for observation in regard to this matter. There was one man who said he was cutting lumber near the head-waters of the Ottawa River, near the divide or water-shed between the St. Lawrence and Hudson Bay basins. He was operating on a tract of land fifty miles square. He pays a royalty or stumpage to the government. He said this tribute to the government was a source of revenue of millions of dollars, in the aggregate on all the forest lands which were called the Crown lands. He said that he was satisfied that the loss caused by the destruction of timber by fire in Canada was ten times more than the loss by the legitimate cutting of timber. He said: "There is no comparison ; we cannot tell the extent of the destruction by fire." This is not a new thing. Before lumber had any value, fires swept through the country, and destroyed immense tracts of forest. In 1880, I was among the Rocky Moun- tains in Colorado, at the same time Mr. Sargent was there, although not in his party. He made extensive surveys, that, no doubt led to the ideas presented in his paper. At some points, as far as the eye could distinguish anything, nine-tenths of the forest had been burned over within comparatively few years. There were some dead standing trees, and much fallen timber, but

generally nothing but rocks remained, where it did not seem that trees could grow again. But nature is persevering, and young pines and spruce w^ere again covering the rocks. I was on the east- ern side of the Rocky Mountains, and, in company with others, ascended Pike's Peak, which is 14,345 feet high, — more than 8,000 feet higher than Mt. Washington in New Hampshire. Timber grows up these mountain slopes more than 12,000 feet above the sea-level. We passed through miics of timber that fire had been through within a few 284 BOARD OF AGRICULTURE. 3'ears. Some of those trees were three feet in diameter. Above the fire line, Ave saw trees, at 11,000 feet elevation, sixty feet tall. Some of these trees were limbed to the very ground, and evidently stood alone for generations, for they had a very wide spread of the lower branches, now dead ; but as other trees gre^v up about them, the tops shot up as high as the more slender trees all about. Where the ground had been burned over, there really was no soil left. The fire had burned up all the moss and leaves, and what seemed to be the soil that the tree grew in was literally all rocks ; there was not a shovelful of earth left after the fire. Each time the soil is burned away, the fire pulverizes the rocks more or less, the rains and winds carry it away ; and yet, in spite of all that, evergreen trees from seed were there and of all sizes, six inches to ten feet high, and in time will attain some dimensions, if fire is kept out. On lower ground, you find where some of those finer particles of rock have collected, and there the trees will grow with much vigor. Rabbits and deer gnaw the trees, and do great damage to the forest growth. They eat of the new growth of many deciduous trees, and keep them small and stunted. I do not know that any estimate has been made of the amount of injury done by" animals. But fire is the worst enemy of forests. The most of the Rocky Mountain forests are quite inaccessible for commercial purposes, but serve well to show the disastrous effects of fire. The white pine, as has been said here, is, without any doubt, the most valuable tree we have in Massachusetts. It is easily grown from the seed, and easily transplanted. I had, some years ago, two thousand transplanted, from five to eight inches high. I ordered a ball of earth, two to three inches square, taken up with each one. They came out of pasture land which was rather moist, but not wet, and free from rocks. Out of those two thousand trees, I don't think I lost one hundred in transplanting. If they had been pulled up with no earth adhering, not many could have been saved. Question. At what time of the year were they moved ? Mr. Manning. It w^as in May. This last winter, about FOREST FIRES. 285 this time, one man and two of my sons went into the forest send dug out about three thousand trees. A hirge number were put into nursery rows, and covered up with boughs, until into the spring, and, as far as they were well covered, they are living, but as far as they were exposed to the winter and spring sun and winds, they are about all dead. I think these facts prove that transplanting can be applied to renew our forests, and that trees may be taken from their native growths ; but it is doubtless better, in most cases, to make a young plantation with nursery trees. John A. Hall of Raynham, set out many acres with white- pine trees, planting them ten feet each way. In my native town, Bedford, N. H., I remember a white pine that grew from seed, in forty or forty-two years, to be two and a half feet in diameter. There was nearly a cord of wood in the body and limbs. If that can be done in forty years it

is worth trying for, and I believe it should be the determination of every farmer to plant from a few hundred to a few thousand trees as regularly as he plants his farm crops. The danger of his pine forest being injured by fire is something of a drawback, but he can manage the fires, generally. We need a better public sentiment to encourage forest planting to keep up our forest growth. It is not popular enough to plant forest trees yet. There is no fear about the sale of white pine. It is especially in demand, and always likely to be. I can remember white-pine pastures where there were only a few small trees, which are now, with their good-sized trees, the most available part of the farm to raise money on. The wooden-ware manufacturers at Winchendon and vicinity are seeking such timber, buying whole farms where white pine abounds, and working it up. They are constantly looking out for white-pine lumber. Even small sapling pines, six inches in diameter, are in demand. The matter of forest fires is a difficult subject to deal with. You do not have the sympathy of the surrounding people in trying to get any redress when fires have occurred, and it is very difficult to get proof that will answer the law, or courts to convict the incendiary.

Mr. Cheever. How old were those little white pines, of which you transplanted about two thousand?

286 BOARD OF AGRICULTURE. Mr. Manning. They were four or five years old from the seed. White pines do not bear seed every year, — not more than once in three or four years. I wish I could be a little more definite about that. I remember that fifty years ago my grandfather, who was famous for catching pigeons, used to say they were more abundant certain years than others, and that was when the white pine bore seeds, once in four years. I expect a large crop of seed next year. Last year there were none, in my observation; the year before, none. On my way from the West, in 1880, along the north shores of Lakes Superior and Huron, down the St. Lawrence and along the western shore of Lake Champlain, and all the way home to Boston, I did not see a single cone of the white pine.

Mr. Jewett. I would like to state one item as the result of my own experience in regard to the damage caused by forest fires in Massachusetts. Thirty-eight years ago I cleared off a lot of heavy oak, pine and chestnut timber on land that produced from fifty to seventy cords to the acre. This winter, on cutting the same lot again, I found that until I got to a certain point about half-way across the lot, the trees that had been growing thirty-eight years — almost entirely chestnut — were very tall, straight, handsome tie trees, worth, perhaps, a hundred dollars an acre; but when I got to that point I found the effects of a fire which ran over half of the lot after the trees had been growing from five to ten years, when the sprouts and young trees were from ten to twenty feet in height, if I remember right. The effect of that fire has been to cause the wood on that part through which the fire ran to be worth not more than twenty-five dollars per acre to-day; whereas the tie-timber part that was not burned is worth, perhaps, a hundred dollars per acre. That fire ran miles and miles over a large tract of our hilly, moist land, which grows chestnut very rapidly. I think the previous growth was mostly pine and oak, some large chestnut trees, but no sprouts amongst the large growth. This fact of the reduction of the value of that land seventy-five per cent, where the fire ran for miles and miles over a large extent of hill country, is an item that may be of value in this discussion.

FOREST FIRES. 287 Mr. Slade.

In relation to the experiment mentioned by Mr. Manning, that was tried in Raynham by Mr. John A. Hall, I happen to know something about that. I am not particularly familiar with the plantation that Mr. Hall made, but I am familiar with one that another man set out in consequence of Mr. Hall's experiment. It was set out in 1840. I saw it in 1844, and in 1874 I saw it again, went over it, and it was certainly a remarkable production. The trees were very tall. They were set six by ten feet apart, if I recollect rightly. The gentleman had an offer for it then which people advised him to take. The owner of a box-factory had been trying to get it. I think he was offered something like live hundred dollars for it at that time. The last I knew of it, which was a year or two ago, he was offered seven hundred and fifty dollars for it. I have not seen the trees since 1874. I think then they would average fourteen inches in diameter. They were tall and straight ; they had been kept trimmed pretty well. And here I want to say that, to my positive knowledge, the land that those trees were planted on was not worth six and a quarter cents an acre to cultivate. It was so poor that a weed would not grow on it ; but still that crop of wood has been produced upon it. In consequence of the success of that experiment there have been hundreds — and I don't know but thousands — of acres planted to white pine. The piece to which I refer was planted by Mr. Hall on a contract at six dollars an acre. Mr. Hersey. The other day I had the curiosity to measure a pine tree which was set out twenty-seven or twenty-eight years ago. The tree when set out was not more than six inches high, and it girths to-day, one foot from the ground, four feet two inches and a half. That was the largest tree of quite a number of trees which were set out at that time. But all of them, I think, will girth over three feet. The man who set out those trees was over sixty-three years of age at the time, and yet he lived to see them girth — one of them, at least — over four feet. He lived to a good old age, it is true. Mr. Myrick. If any of the gentlemen have visited the Enfield Shakers, they have seen one of the best examples of white pine planting that there is to be found in New England. 288 BOARD OF AGRICULTURE. land. There is a great deal of this light plain land there, which is of very little value. One of the centre family of Shakers has experimented for a great many years on those plains with white-pine seed. He gets the seed by going to some old white-pine trees and picking up the cones in a wagon and carrying them to the barn, or some shed, and there he lets them dry. In the winter he husks them out with a rake. His long experience has shown him that the best way to plant the seed is merely to strew it right over the ground. He has tried transplanting a great many years, and he has finally concluded that no matter what the nature of the soil is, whether a sandy plain or a rocky hill, the way is to strew the seed on top of the ground : there are places on those sandy plains where he planted the seed in that way years ago, where the trees are now quite large. A few years after the first planting, he planted others, which are also growing, and so on down to within a few years. In another, on top of a hill, where the soil is hard and rocky, and the field is full of every kind of tough grass and small briars, he put the seed on in the same way. There is now a growth of trees there from two to three feet high. Mr. . I beg your indulgence, Mr. Chairman, and the indulgence of this audience for a moment. I have suffered some loss myself from forest fires. Some fifteen

years ago I had fifty acres burned over, and also the fence on three sides of it. It has not recovered to this day. I have never received any remuneration for that loss and never expect to. It not only spoiled the woodland, but the pasture. It has grown up within a few years to poplar, and has almost become a forest. They are now using poplar for making paper, and perhaps some one who lives after I am dead may find a profit from cutting those poplars. Now, in regard to the same wood coming up on the same ground, I have had a little experience in that. When I was a boy, perhaps twelve or fifteen years old, I helped my father cut off" from a piece of land a lot of beech. That was the wood that was on the piece. Immediately there sprung up what we call dog cherry — a complete swamp. I never saw the like. Those poles grew up thirty, thirty-five or forty feet, and we cut them down for fencing-poles. As FOREST FIRES. 289 soon as that crop was taken off, another crop sprung up of rock maple, which is a beautiful lot to-day. I am a little over sixty years old, and within my memory there have been three distinct species of wood grown upon that soil. First, beech ; second, dog cherry ; and now, maple almost big enough to tap for sugar. Now, to go back to the forest fires. If some way can be devised to make people who are malicious or careless enough (whether wantonly careless or not) to cause a fire in the woods, responsible for those fires, by any law passed by our legislature, I for one shall raise my hand for such a law to be passed to make those setting fires, whether carelessly or maliciously, accountable for the damage. Mr. Stedman. I live in a section where we suffer very materially from forest fires, and where the difficulty is increasing year by year. In the town of Chicopee are two large manufacturing villages in which are many people not fully employed, perhaps, or boys who go into the woods chestnutting in the fall of the year, or hunting, and without any purpose on their part fires are set. I know that they have been set apparently for the purpose of clearing the way for the finding of chestnuts, by carelessness in the use of firearms, and sometimes, we have reason to think, just for the sport of seeing the fire. One of those two villages has a section of plain land, which is covered with trees of fifteen, twenty or twenty-five years' growth, twenty and thirty feet high. Last spring I had a woodlot of thirty acres of this kind of timber burned over completely. Now, how are we to get at the remedy, I do not know. It would seem that there is nothing to be done but to set a watch. If Mr. Myrick will allow me, I will make a little correction of one statement that he made. It was Omer Field, of the north family of Shakers, who set out the trees of which he spoke, and there are acres of that white-pine lumber growing which has been raised much cheaper than our friend (Mr. Manning) spoke of from the eastern part of the State. They simply gathered the seeds and sowed them on this almost worthless land. Instead of being six feet apart, there is such a forest that you can hardly walk through unless you hold on to your hat, and almost your head. They 290 BOARD OF AGRICULTURE. are of different ages, from twenty years' growth down to very small trees, and a success in every instance. Mr. A. A. Smith, of Coleraine. As our time is somewhat limited, I move that we dispense with the further discussion of this subject and ask our Secretary to speak upon the breeding of the horse. Capt. Moore. I trust that will not be done until this discussion has gone further. I think this is a very important matter. I hope the

gentleman will withdraw that motion. Mr. Russell. This matter has been brought before the meeting at the motion of the State Board, and the Board requested Mr. Sargent to prepare this paper. There is no more important topic before the people of Massachusetts than this matter of forestry. It is important to the people of the whole country, and we in Massachusetts, in such matters as this, ought to take the lead. As Mr. Moore has said, I trust that it will not be dismissed without a very full discussion, if it takes up to the very last moment. I will say here, what I might say as a prelude to any horse talk, that the least important matter which the farmers of Massachusetts have to deal with is breeding horses. Mr. Smith. I will withdraw the motion. Mr. Slade. I would make a suggestion. We have heard considerable about losses by forest fires ; now, what we want to get at is some method of preventing them. I hope some one will suggest preventive measures, and if no one else desires to speak, I will call on Mr. Moore. Mr. Moore. I do not know that I have any preventive measures to suggest. I think that the paper which has been read is important enough to be discussed in all its bearings, because, if there are any errors in it, we want to have them set right ; otherwise, if the matter goes before the legislature, a committee of the legislature who do not know as much about this matter as the farmers here, or Professor Sargent, might adopt some erroneous notions. I think one thing suggested in that paper would be absurd. Professor Sargent suggests that, in cutting off the wood, the owner should be obliged to collect the brush and burn it. Well, what is the reason ? Because it becomes dry and burns like tinder if fire gets into it. That is all true, if fire gets into FOREST FIRES. 291 it, but we want to stop fire getting into it, and then why should we destroy that brush? It acts on the soil as a mulch. It protects the young trees that are coming up, and in the course of time decomposition takes place, and then it is a benefit to the soil. There is an absurdity to me in that proposition. As I said before, I should have to think a good while of this before I could suggest a proper remedy ; but that there can be a remedy, or a partial remedy, seems plain. It is an important subject, and one of the most important that we could discuss. I understood that paper precisely as my friend Mr. Smith understood it in regard to the pine — that a gradual removal of the forest did not destroy the growth of pine. I know it is so. If you go into a pine forest you will find the young pines growing up all around. If you do not remove all the trees at once, you do not destroy it so but what the seeds of the old pines will renew that forest, which is the profitable growth. I should disagree with Mr. Manning in regard to the seeding of the pine. Mr. Manning told you a few moments ago that there had been but very little pine seed for some years. I never saw the white pines covered with such an abundance of cones as they were a year ago last August or September, so that some of the trees were brown with the cones. But what he says in regard to the white pine seeding is true in a measure ; it does not produce that large crop of cones every year. Then, again, if you want to grow a pine forest, undoubtedly the most feasible way is to sow the seed, but it is not an expensive way to transplant. You need not put the young trees into nursery rows. Any of you living in any town about here where white pine grows, can find plenty of pastures where you will see seedling pines coming up, if there is a pine forest near ; and if

you do not want to have the white pine take possession of the land, you can take those white pines, all the way from eight inches to three feet high, and by cutting a little circle around the trees, you can put in a spade, raise them up, and carry them off, being very careful to protect the root, which is very sensitive to air and heat. Remove them in a dull day and keep them from the sun, and you will not lose more than three per cent, of them if they are

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set out in a mere sand-bank, any time in May. I would say that I would like to plant them just as the buds were swelling, or perhaps open, but not having made much growth. I planted last year some live hundred or a thousand of those pines to cover up some barren spots near my place ; one of them, a spot above my corn-house, where it is nothing but sand. Hardly one of those pines has died ; they have gone through this summer, the driest summer I ever saw, without apparent injury. Of course they were planted a year ago this spring. There is no difficulty in transplanting pines. Ralph Waldo Emerson, who lived near my house, who died this last year, had a piece of white pines, of about four or five acres, that he gave some twenty-five years ago to Henry D. Thoreau, of whom you have all heard as being a very singular man (I suppose if he had lived at the present day they would have called him a philosopher), who lived as a hermit on the banks of Walden Pond, to plant white beans. Thoreau, to illustrate how cheaply a man could live, undertook to live on the white beans that he grew on that land that would not grow anything but white pines. Fire has run through that grove of white pine; still, there is a thick growth of pines, and there are plenty of pines more than one foot through to-day. Then, so far as forest planting is concerned, it would be very interesting to any gentlemen who happened to be in the eastern part of the State to go down near Lynn to visit a place formerly owned by Richard S. Fay, and perhaps in the family now. There are more than a hundred acres, covered with a growth of American and European trees, many of them trees which Mr. Fay planted within forty or fifty years, and, as Mr. Bowditch informs me they have sold a good many thousand dollars' worth of that wood. The subject before this meeting is not so much tree-growing as the protection of our present forests from fire. I do not know what action this meeting desires to take upon that. I have no plan to suggest. Some gentlemen may have a plan, Mr. President, and therefore I will not occupy your time further. Mr. Manning. I should begin to plant the trees as soon as frost was out of the ground, and I should continue it into

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June, or until they had begun to make some growth, but they must not be frozen or dried ; out of the ground a very slight exposure to our hot, drying winds is fatal to evergreens. I do not say that it is necessary to put the trees into nursery rows, but I spoke of the fact that I had done so ; and I believe in transplanting trees from the seedling beds before planting in the forests. Every farmer can frequently find the material on his farm, or in the immediate vicinity of it, to transplant hundreds and thousands of trees, from year to year, and have his farm keep up its growth of wood. Instead of having old pastures, hardly worth turning cattle upon, he may have trees growing there that in twenty or thirty years will be worth twenty times what the pasture is for grazing. I have seen timber that was worth two or three hundred dollars an acre growing on land that, without the trees, would not have been worth

five dollars an acre. I would not confine my remarks to white pine. White ash is a good tree in some soils, and the maple, white oak and red oak, also. Out here in the street is a rock maple tree eleven feet and six inches in circumference ; somebody living remembers when it was planted. The silver maple will make more wood in a given number of years than any other tree. The Scotch larch is a good tree to plant ; it can be transplanted easily, and will grow well. Part of the trees upon Mr. R. S. Fay's place at Lynn were Scotch larches, some of which they have cut down for telegraph poles recently. I was there and saw Mr. Fay in 1857, when the trees were twenty feet high ; he planted his forest eight years before, with larches and various other kinds. I did not go there again until 1879, when I saw young Mr. Fay, and some of the trees that I saw there in 1857, twenty- two years before, that were then three or four inches through and ten to twenty feet high, were two feet in diameter. The only partial remedy I know for forest fires is to keep out the undergrowth, and thin out the trees. Then, if a tire gets into the forest, it will not kill many of them ; but if you leave the trees to grow up thickly, and let the under- growth remain, a fire will have a much more deadly effect. Mr. Shepard. We have other forest trees that are per- haps quite as valuable as pines in certain sections and tl at 294 BOARD OF AGRICULTURE. are not half as much exposed to fire as the pine. One of them is the chestnut. The chestnut is a very valuable tree, especially now, when there are so many railroads in opera- tion ; and my impression is that in many instances fire does not kill the roots of the chestnut, and it springs up again. Then the leaves of the chestnut are soon out of the way, and a fire does not run over them readily. The value of that tree is hardly sufficiently estimated. A chestnut tree will grow in twenty- five years so as to produce ties. If you cut down a chestnut tree, another growth immediately springs from those roots, and you have got another forest growing right oif, and every year or two you can cut off* quite a crop of chestnut ties, which are always in demand. I will mention another thing, and that is, if you cut down a chestnut tree for wood, it is hardly fit for fuel the first year. If you sell a man a load of chestnut wood in summer that was cut the winter before, it is the last load you will ever sell him. Mr. Grinnell. I think this discussion has gone as far as is profitable without any direct action. I had, if you will allow me to say so, a little experience in the legis- lature of last year, having prepared the law now on the stat- ute book, which was all we could get at the time. The law had before provided against the malicious firing of forests, or the setting of fires maliciously that might run on to other land, and the addition was the best we could do, but possibly something may be done this coming year, and I am happy to say that we have here among us, as the senator from this district, one of the most intelligent farmers in this part of the State, who will accomplish as much as any one can. I therefore move that the Board of Agriculture be requested, by this meeting, to bring the question of protection of forests against fires before the legislature as early in the coming session as practicable. This motion was carried unanimously.