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RATIONAL FORESTRY.

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THE time is rapidly approaching when rational forestry must command the attention of every lover of his country. But before that time arrives there must be a better knowledge disseminated as to what the science of forestry really means, or perhaps, what is more important, what it does not mean. The popular idea has apparently been that it consists of two propositions: first, the suspension of further cutting of the forests of the country as far as possible to do so, by congressional or legislative action, and by moral forces; second, the indiscriminate planting of trees, with the half-formed idea that in some way or somehow this will pay in the dim future.

It must further be taught that the Creator did not clothe the earth with forests from any mere sentimental or æsthetic motive, but for the good of His creatures who were to inhabit it to the end of time; therefore, that the forests are grown to be cut for the benefit of mankind for fuel with which to cook his food and to warm him in winter, and for lumber with which to build a shelter over his head. These are the actual necessities of humanity, if it would be in any degree above a savage; if man would not continue to eat his food raw, dress in skins or woven grass and dwell in caves.

These wants of the human animal mark the first step in mental and moral development. The next step, the production of food other than the wild game of the forest, presupposes the cultivation of vegetable products suitable for his nourishment. This cannot be done in the uncut forests; and as man's first wants compel his living in a wooded area, he must destroy a portion of the forest that the ground it occupies might be turned into fields, and ultimately into pastures for tamed beasts suitable for food, as the dependence upon wild game became more precarious and the chase irksome; his development carrying this a point further to include domesticated beasts of burden.

Had man been content to go down the ages satisfied with the gratification of these simple wants, the inroads upon the forests, even to this day, would be small. But the Great Designer of his destiny decreed otherwise. It was necessary to man's perfect development that the finer, the æsthetic part of his nature should be cultivated. This demanded something better than a hut of bark or logs. With this demand came the one for better tools than were found in the stone axe and the saw shark's teeth. The metals lay in the earth at his feet. But to utilize them required the further destruction of the forest to feed the smelting furnace and the forge. The development of the human race, beginning slowly, increased rapidly for a time, then ebbed almost back to barbarism, again flowing forward, sometimes almost stationary, but always forward to the culmination of the 19th century. The log cabin gave place to the cottage, the cottage to the mansion and palace. The forest trail gave place to a bridge, the canoe and paddle gave place to the ship with sails, and finally the apotheosis of progress came with the modern railway and the Atlantic steamship.

Each step upward in the human scale has made its demands upon the timbered area.

In all ages the husbandman has been the great destroyer of the forest, and logically so. He has ever been the pioneer. He must first advance into the wilderness and create a demand for a town as a market center, and a demand for lines of transportation. The city is born of the wants of a given territory. Primarily the settler has cut down the forest, first to make a shelter for himself and family and his various belongings, and

for fuel, and secondarily to make room for fields and pastures. Incidentally some portion of the fallen timber has been utilized for economic purposes outside his immediate wants. It has gone to build the town that has grown up behind him, to build ships, railways, bridges and vehicles of transportation and fuel for towns and manufactories.

Speaking specifically of our own country, it is only within little more than half a century that lumbering as a special industry has begun to destroy the forest simply for the sake of merchandising its products. But that half century has wrought such a violent change in the states where lumbering as a special business has been followed, that it has roused the thoughtful to ask the question: What will the end be if the present destruction continues with no attempt made to modify its wastefulness? That there has been wastefulness by both lumbermen and farmers is beyond question. But the past is behind us. We may deplore its extravagance, but we must admit that there are extenuating circumstances. Artificial wants of modern civilization often made the farmer settler extravagant in his treatment of his woodland, while the professional lumberman has been impelled to the same thing by the necessity of making a profit from his operations. The enormous demand for lumber from non-lumbering sections has forced the production, while costly transportation to market has obliged him to leave all the coarser and low-valued products unutilized, not more than 20 per cent. of actual bulk of the forest growth ever producing any profitable return.

It is a fact that only quite recently has science discovered the means of utilizing forest waste by converting it into by-products of great value in small bulk, thus overcoming the problem of transportation to market at a profit. Until recently the only use of lumbering waste has been to convert it into small completely finished articles of every day use, and this could only be done in the older portions of the country where the market was contiguous, transportation charges small, and lumbering carried on on a small scale. But to-day there is less excuse for waste. Nevertheless all discussion of rational forestry must begin with the proposition, which is akin to an axiom, that forests were given by the Almighty to be cut for man's benefit, and that lumbering is a business for profit as much as raising wheat and cotton. It must also be granted that the owner of a tract of forest land in fee simple has as much legal right to harvest his crop of trees as the owner of a cultivated farm has to harvest his crop of corn when it becomes ripe in the fall. The state, having once granted the fee to land, cannot control the usufruct except by enactment in the original deed of conveyance, which must be understood and assented to by the grantee. But methods of usufruct can and should be controlled by the state. Our hurried, feverish national growth has caused this point to be greatly overlooked. Should the state act upon it at once, the further destruction of forests by fire could be practically prevented. To accomplish this should be work for practical, rational forestry.

Such points can only be barely suggested in this paper, but they include all methods of both lumberman and pioneer farmer, which in any manner imperil the interests of others; while outside of the mere legal questions there are great moral obligations, relating to the general welfare of the commonwealth, which must be discussed by forestry advocates, and up to which all classes must be educated. And these moral obligations relate not only to the present but to the future, to generations yet to come. Methods that affect climatic conditions, the water supply, destruction of navigable waterways by producing arid conditions; all these may be legal or simply

moral questions. It is the legitimate province of rational forestry to determine this by careful discussion and examination, and having done so to pursue the remedy.

This is a utilitarian age. Man works for the profit there is in it. The most practical part of rational forestry relating to existing forests is to convince the owner of a forest, be he a lumberman or a farmer that it is for his interest to improve upon his present methods of treating it. When he shall be made to see plainly that it will pay him and his children to handle his timber as a periodical crop, to be preserved with care, to be cultivated in a certain sense, to be protected from everything that might endanger it, as he would protect his cornfield from weeds and insects; then will rational forestry have performed its great mission. The work of that branch relating to the mere planting of trees and the reforestation of denuded areas is play in comparison.

THE INVENTION OF THE MATCH.

HISTORY does not give to any one man the credit of inventing the match. That useful article reached its present state of perfection by a long series of inventions of various degrees of merit, the most important of which resulted from the progress of chemical science. Starting from the tinder-box and fyrstan of the Saxons, the first attempt to improve on the old sulphur match was made in 1805 by Chancel, a French chemist, who tipped cedar splints with a paste of chlorate of potash and sugar. On dipping one of these matches into a little bottle containing asbestos wetted with sulphuric acid, and withdrawing it, it burst into flame. This contrivance was introduced into England after the battle of Waterloo, and was sold at a high price, under the name of Prometheans. Some time after a man named Heurtner opened a shop in London. It was named the Lighthouse, and he added the inscription to the mural literature of London:

"To save your knuckles, time and trouble,
Use Heurtner's Euperion."

An open box, containing fifty matches, and the sulphuric acid asbestos bottle were sold for a shilling. It had a large sale, and was known in the kitchen as the Hugh Perry. Heurtner brought out "vesuvians," consisting of a cartridge containing chlorate of potash and sugar and a glass bead full of sulphuric acid. On pressing the end with a pair of nippers, the bead was crushed and the paste burst into flame. This contrivance was afterward more fully and usefully employed for firing gunpowder in the railway fog-signal. The next was Walker. He was a druggist at Stockton-on-Tees, and in 1827 produced what is called "congreves," never making use of the word "Lucifer," which was not yet applied to matches. His splints of potash paste, in which gum was substituted for sugar, and there was added a small quantity of sulphide of antimony. The match was ignited by being drawn through a fold of sandpaper, with pressure; but it often happened that the tipped part was torn off without igniting, or, if ignited, it sometimes scattered balls of fire about. These matches were held to be so dangerous that they were prohibited by law in France and Germany. The first grand improvement in the manufacture took place in 1833, by the introduction of phosphorus into the paste, and this seems to have suggested the word "Lucifer," which the match has ever since retained. When phosphorus was first introduced to the match-makers, its price was \$21 per pound; but the demand for it soon became so great that it had to be manufactured by the ton, and the price quickly fell to \$1.25 per pound. Many inventors then entered the field, and matches were sent in shiploads to all parts of the world.