OUR NEW HAMPSHIRE FORESTS.

AN ADDRESS

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BY

JOSEPH B. WALKER.

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OUR NEW HAMPSHIRE FORESTS.

New Hampshire has four principal natural resources:

1. Her Soil.
2. Her Water-Power.
3. Her Invigorating Climate and Scenery.
4. Her Forests.

Just in proportion as she wisely develops these, she increases her wealth and enhances her importance in the sisterhood of American States. The talk assigned to this hour is to be upon our forests; and wisely, for of these and of their proper management there is less known and said than of our soil, our water-power, or our scenery.

OUR FOREST AREA.

I took particular pains, some six years ago, to ascertain the existing forest area of this State. From a careful study of the census returns of 1880, I reached the conclusion that something over one half (nearly fifty-nine per cent) of its entire surface was in forest. And if we look back, we shall also find that this proportion has never been much, if any, less.

This fact, as important as it may be imposing, very naturally raises the question, How happens it that the people of

New Hampshire have, for so long time, left so much of their State in its natural wildness and reduced so small a portion of it to cultivation? The answer is easily found. It has been impossible for them to do otherwise than as they have done. The rugged sides of our mountains and the bowlder strewn surfaces of very many of our lesser elevations have never submitted to any plow but that of the glacier or the avalanche, and, in all probability, never will. Agriculture, in the future as in the past, must be restricted to our valleys and to the smoother surfaces of our hills. Of the nearly six millions of acres which comprise our State's area, less than one million are in tillage and only a million and a quarter in pasture. Some three and a half millions are in forest. And strange, perhaps, to say, for the last few decades our wooded area has been increasing. Wherever one goes, he will see repeated evidences of this fact.*

If now, any one shall ask, "What do these striking facts mean?" I can simply but confidently say, that they mean that the Supreme Maker of New Hampshire has intended the larger portion of it for the perpetual growth of wood and timber, and that it is financially impracticable to devote this to any other purpose. To attempt it is simply to contend with the Almighty. It becomes us, therefore, to accept the situation. By so doing we shall not only follow our destiny but attain to our highest prosperity.

INDUSTRIAL PURSUITS DETERMINED BY GEOLOGY.

Geology largely determines the industrial pursuits of a people. An examination of the different sections of the United States where unlike occupations prevail, incontrovertibly establishes this proposition. Great iron industries have been founded in Pennsylvania, and other States of like geological character, because great deposits of coal and iron

*It must not be forgotten that, although our forest area is constantly increasing, our timber supply is very fast decreasing. Much of our present forest land will not be in fit condition for the axe for twenty years at least.

have attracted them. Cotton culture is found in what is known as the cotton belt because the soil and climate favor its presence there. Similar statements apply to the corn and other areas, which together constitute so much of our national domain. The New England States are alike in many respects, geologically, and hence their industries are greatly similar. The great drift formations, almost everywhere present in this State, have made wood and timber the great staple of New Hampshire. This is geologic destiny and we can resist only to our hurt.

LUMBERING ONE OF OUR EARLIEST INDUSTRIES.

Next to a limited traffic with the Indians, and to fishing, lumbering was the earliest industry established in this State. At the time of its settlement, its whole face was hidden by primeval forests, broken only by limited water areas and an occasional mountain summit towering in rocky barrenness above the reach of arboreal vegetation.

As population crept by degrees up the banks of the Piscataqua and its branches, much of it sought employment by converting the stately trees which lined them into timber, boards, plank, pipe-staves, and ships. The latter, freighted with fish and forest products, were quite often sent to the West Indies, where more or less of their cargoes were exchanged for the products of those islands, and thence to Europe, where both vessels and cargoes were sold. With the proceeds of these, New Hampshire merchants paid for the imports with which they supplied the wants of the home population.

Twenty-one of the thirty-six products of New Hampshire exported to foreign countries ten years before the close of the last century, were those of the forest, as appears from the following—

"*Table of Exportation of lumber from the Port of Pascataqua, from October* 1, 1789, *to October* 1, 1791.

Articles Exported.	To Europe.	W.Ind.	N. Sco.	Africa.	Tot.
1,000 feet of Pine Boards	6,247	11,622	96	69	18,034
Do. feet of Oak Plank	378	26	.....	.....	404
Do. Staves and Heading	1,317	1,608	44	.....	2,969
Do. Clapboards	2	19	.....	.....	21
Do. Shingles	2,689	.....	.....	.....	2,689
Do. Hoops	.....	79¼	7	.....	86¼
Feet of oar rafters	47,000	950	.....	.....	47,950
Tons of pine timber	88½	86	.....	.....	174½
Do. oak timber	251	20	.....	.....	271
Frames of houses	.....	12	.....	.....	12
Pine masts	41	4	.....	.....	45
Spruce spars	13	72	.....	.....	85
Shook hogsheads	.....	2,079	.....	.....	2,079
Waggons	.....	2	.....	.....	2
Pairs of cart wheels	.....	14	.....	.....	14
Sets of yokes and bows	.....	28	.....	.....	28
Boats	.....	30	.....	.....	30
Handspikes	80	.....	.....	.....	80
Quintals of dry fish	250	26,207	.....	.....	26,457
Barrels of pickled fish	.....	501	.....	.....	501
Do. whale oil	.....	120	.....	.....	120
Do. tar	1,613	60	.....	.....	1,673
Casks of flax seed	1,798	2,775	1	.....	1,798
Barrels of beef	.....	2,775	2	.....	2,777
Do. pork	.....	9	1	.....	10
Do. rice	.....	.....	.....	2	2
Bushels of Indian corn	.....	391	.....	2,000	2,391
Oxen and cows	.....	577	33	.....	610
Horses	.....	207	2	.....	209
Sheep	.....	261	229	.....	496
Gallons of New England rum	.....	.....	150	1,449	1,599
Do. Madeira wine	.....	845	.....	.....	845
Thousands of bricks	.....	129	.....	.....	129
Tons of potash	88½	.....	.....	.....	88½
Do. pearl ash	30½	.....	.....	.....	30½
Boxes of candles	.....	28	.....	.....	28

Total value of exportation for two years, 296,839 dollars, 51 cents."

Belknap's Hist. N. H., vol. 3, *p.* 219.

The following table of the imports at Pascataqua (Portsmouth) for the same time, gives a fair idea of the articles received in return for those set forth above:

"Articles Imported from Europe.	W. Indies.	Nova Scotia.	Total.
Gallons of rum	138,911	.....	138,911
Ditto gin	22½	.....	22½
Ditto molasses	270,785	.....	270,785
Ditto wine from Madeira	.....	.....	4,721
Ditto porter 457	.....	.....	457
Lbs. of unrefined sugar	546,648	.....	546,648
Ditto loaf sugar	.....	77	77
Ditto coffee	68,633	.....	68,633
Ditto cotton	17,564	.....	17,564
Ditto cocoa	27,944	.....	27,944
Ditto cheese 1,056	.....	.....	1,056
Ditto tea 2,696	86	.....	2,782
Ditto twine 2,204	.....	.....	2,204
Ditto nails 16,890	.....	.....	16,890
Hundreds of cordage 17.67	.....	.....	17.67
Ditto hemp 940.00	.....	.....	940.00
Bushels of salt (part)	(part)	.....	98,336
Ditto sea coal 3,131	.....	.....	3,131
Lbs. of steel unwrought 16,527	.....	.....	16,527
Ditto bar and sheet lead 4,336	.....	.....	4,336
Grindstones	.....	A few, not ascertained."	.....

Belknap's Hist. N. Hamp., vol. 3, p. 220.

For a century and a half the people of New Hampshire relied upon these two industries, supplemented by that of a slowly growing agriculture, for their support. Nor was the value of the forest then appreciated by those only who were thus dependent upon it. The king quite early learned the fitness of its stately pines for masts and spars for his royal navy and claimed them for his own.* To make sure of them, he appointed officers whose duty it was to affix to all such trees, not previously sold, the mark of the broad arrow, in token of their reservation for this purpose

*Dr. Belknap said, in 1792, that, "The white pine of the forest is the strongest and most durable timber which America affords for masts. It is often advanced by Europeans, that the pines of Norway exceed those of America in strength. This is acknowledged to be true whilst the Norway wood retains its natural juices; but these being soon exhausted by the heat and dryness of the air, leave the wood less firm, and a decay commences much sooner than in the white pine of America. The Norway pine begins to decay in five or six years; but the American, with proper care to defend the mast head from moisture, will last unimpaired for twenty years."

"The British navy for eighty years before the late war, received its masts wholly from America; which is a proof that our pines are preferable to those of Norway."

Belknap's Hist. N. Hamp., vol. 3, p. 210.

and of the severe penalties attaching to an unauthorized cutting of them. Parliament and the provincial assembly both enacted laws for the protection of the forests. On the 10th day of May, 1708, the general assembly imposed a fine of one hundred pounds sterling upon any person "who shall presume to cut or destroy any white pine trees, or mast trees, not being the particular property of any private person, above the growth of twenty-four inches in diameter at twelve inches from the earth, being fit to make masts for her majesty's royal navy."

The cutting of more than one box or notch in a pitch pine tree,* for the collection of pitch for the manufacture of turpentine, was forbidden by a provincial statute, and a penalty of five pounds was incurred by a violation of the same. Tar, boards, plank, pipe-staves, and other forest commodities were made receivable in payment of public taxes and the prices of the same were fixed by the general assembly.

Indeed, for many years, the most lucrative public office in the province was that of surveyor-general of the king's woods. It was a crown office, and when Benning Wentworth was made provincial governor, he was also made surveyor-general of the forests. To the latter office was attached a salary of eight hundred pounds sterling, which much exceeded, in both security and amount, the uncertain sums tardily and reluctantly doled out to him by the general assembly, in compensation for his services as governor. To secure a resignation of this office in Wentworth's favor,

*Fifty years ago, heavy growths of pitch pine trees (*Pinus Rigida*) were to be found upon the sand formations along some of the rivers of the State. Specimens were not uncommon which compared quite favorably with the hard pines (*Pinus Australis*) of the South. But such forests have mostly disappeared. Those pine trees have been cut for timber and the inferior ones for wood, much of which has been consumed by locomotive engines.

Where forests of this wood have been removed, they have shown a disposition to return, with a similar growth; but, in many cases, particularly in the vicinity of large towns, fires have destroyed the second growth before they had attained a size sufficient to endure their ravages. This remark applies with particular force to the hard pine woods in the vicinity of Concord and Manchester. The Dark Plain, so well known to the people of the former city, half a century ago, is to be found now only in history.

its incumbent, Dunbar, was paid the large sum of two thousand pounds.

While in the early days of the province, lumbering was extensively pursued, it rarely enriched those who engaged in it. As the forests retreated and the country developed, agriculture became more and more the support of the people. Lumbering, imperfectly organized and carried on by persons possessed of inadequate means only, became less and less remunerative. As a business it was but imperfectly organized. Its returns were but moderate at best. They were also slow, except in cases where advances were made by factors and dearly paid for.*

Some who pursued lumbering also followed farming. But the two pursuits did not harmonize in their requirements. Those of the former interfered seriously with the work of the fields, and it was found, ere long, that a man could not carry on both to his greatest profit. In most cases work in the woods gave way to that of the farm; and at length, agriculture became the leading pursuit of our people.

Indeed, we may say generally that lumbering has never been a lucrative business in New Hampshire until recently, when improved facilities of transportation, systematic management, and the free use of capital have made it so.

FOREST MANAGEMENT.

How then shall we of to-day manage our forests? This is the question. All the forests of New Hampshire are now

†Dr. Belknap said, an hundred years ago, that the lumber business did not usually enrich those who pursued it; but, rather, that "Those who make the getting of lumber their principal business generally work hard for little profit. This kind of employment interferes too much with husbandry. The best season for sawing logs is the spring, when the rivers are high; this is also the time for ploughing and planting. He who works in the sawmill at that time, must buy his bread and clothing, and the hay for his cattle, with his lumber; and he generally anticipates the profit of his labor. Long credit is a disadvantage to him; and the too free indulgence in spirituous liquor, to which this class of people are much addicted, hurts their health, their morals, and their interests. They are always in debt and frequently at law. Their families are ill provided with necessaries, and their children are without education or morals."

Belknap's Hist. N. Hamp., vol. 3, pp. 261 and 262.

the property of private individuals.* More easily asked than answered. Two systems of forest management which have long prevailed in this State are still in vogue. Of forestry as seen in Europe we have but little, if any, as yet. Thus far, our plantings of forest trees have been made by nature only. Hand planting has been unprofitable and unnecessary. That we may adopt it, by and by, is very possible and perhaps probable. But I doubt if the time is near. Spontaniety of seeding and the high price of labor both oppose its introduction.

* It appears by the record of three deeds in the office of the secretary of state that, the State sold all its interest in its forest lands in 1867. The conveyance was made by three different instruments.

By the first, dated October 17, 1867, for the sum of $500, it sold "all and singular, the lands belonging to the State of New Hampshire, lying and being within a circular area six miles in diameter, of which the centre is the centre of the Tip-Top House on the summit of Mount Washington, in the County of Coös in said State, and extending three miles in any direction from the centre of said Tip-Top House, all situate in the County of Coös aforesaid, and estimated to be two thousand acres in the whole, more or less, meaning and intending hereby to transfer and assign to said Aurin M. Chase, his heirs and assigns forever, all the right, title, and interest of the State of New Hampshire in and unto any and all lands within the limits of the aforesaid circle, however the same may be located and bounded and whatever the number of acres."

By the second, dated October 27, 1867, for the sum of $20,500, it sold "all and singular, the lands belonging to said State of New Hampshire, situate and lying within the limits of the town of Pittsburg, in the County of Coös in said State of New Hampshire, however located and bounded, estimated at seventy thousand acres, more or less, excepting and reserving, therefrom to each of two actual *bona fide* settlers now supposed to be resident upon said lands, if they or either of them shall prove to be so actually resident thereon, so much of said lands as each of said settlers or either of them may have actually improved or inclosed, not exceeding one hundred acres in all to each or either of said actual settlers."

By the third, dated November 5, 1867, for the sum of $4,000, it sold "all and singular, the lands belonging to the State of New Hampshire or in which the said State of New Hampshire has or might have any right, title, interest, or claim in any way whatever, situate and lying within the limits of the Counties of Grafton, Carroll, and Coös in said State of New Hampshire, however located and bounded, estimated at one hundred thousand acres, more or less, meaning and intending hereby to assign and convey to said Woods and Smith, their heirs and assigns forever, all and singular the lands in said Counties of Grafton, Carroll, and Coös, to which the said State of New Hampshire has or might have any claim or title in any way whatever, excepting and reserving from said grants the arsenal lot in Lancaster, in the County of Coös, and any given house lot owned by the State in said Counties of Grafton, Carroll, and Coös, aforesaid."

If the areas as given above are correct, the State received for these lands the very inadequate sum of 14 23-43 cents per acre.

The First System.—Where wood is of value and its production is more profitable than timber, clean cutting has been practiced; sometimes at the ends of stated periods, but usually with no regularity. This course involves the denudation of the land and the removal of its entire growth. This is quite often succeeded by another of a different character, particularly if the one removed be an evergreen growth. The change is less frequent if the trees removed are of a deciduous character, as many of these, like the chestnut, the red and white maples, and some of the birches, sprout at once from the stumps of their predecessors. Hard pines also, particularly on sandy plains where deciduous trees do not flourish, are quite often followed by others of the same species. Where a spruce growth is removed it is rarely followed, if ever, by another of the same kind; a matter of no small interest to parties interested in the preservation of the great forest reservoirs of the State, upon which the manufacturing streams so largely depend for water.*

Lands possessing favorable exposures, fairly dry and of average fertility, will occasionally yield a crop of thirty or thirty-five cords of wood per acre at the end of each succeeding period of as many years. But judging from personal experience and observation, I deem such a crop above the general average, which usually does not exceed three fourths of a cord of growth per acre per annum.

This system of management is the simplest of any, and where wood is valuable, as in the vicinity of large towns, is as profitable. It involves only the cutting and marketing, at stated times, of the growths of stated sections.

*The volumes of our streams are less equable than formerly. In summer they are greatly reduced. Many brooks whose flow was once perennial are no longer to be found for one half of the year. This fact is due to the total or partial denudation of the land from which they flow. So serious an evil had this become, some thirty or forty years ago, that the manufacturing companies upon the lower part of the Merrimack, were forced to construct vast storage reservoirs, at great expense, which can be drawn upon as water is wanted. Winnepesaukee lake and Long pond are two of these. Total denudation at the source of our streams, would convert them into destructive torrents in spring and their channels into dry ditches for the rest of the year.

The Second System.—In localities where only timber is of much value, as is the case in many parts of the State, the practice has prevailed of cutting none but trees of selected varieties, and those only which were of sizes above a minimum standard. Until recently, this custom has been universal in the great lumber districts. But the introduction of portable saw mills, the extention of railroads into the woods,* other improved facilities of transportation, and a call for smaller lumber have led, in many instances, to complete denudation in very remote localities. In individual instances, this course may have best subserved the interest of the operator; but as a general thing, and particularly when that of the public is regarded, the wisdom of this practice is doubtful, to say the least, and for several reasons:

1. A denuded surface dries quickly, and, if a fire gets well started upon it, its arrest is difficult if not impossible. This sometimes destroys not only the ground's covering of leaves and other vegetable debris, but burns the underlying matting of roots and ligneous matter, which often composes the only soil of large areas, leaving bare the barren underlying rock. After such a burning, a new growth may never start, or, if it does, it will be found that portions only of the tract have been reforested. The summit of Kearsarge is said to have once been covered with trees, but it is bare now and, in all human probability, must forever remain so.†

*Some half a dozen short railroads, in the upper part of the State, have been built into the woods by lumbermen for the transportation of logs. Experience shows that in time some or all of these will be changed to general passenger and freight roads. The Whitefield and Jefferson railroad has already been converted to such a purpose. The Zealand Valley, the Sawyer River, and the Kilkenny railroads are as yet used for the transportation of lumbermen's supplies and lumber only.

†Greater injury to the forests and scenery of the State is to be apprehended from fires than from any other agency. This fact is due, in part, to the carelessness of camping parties, and in part, to a general indifference to their ravages. While the burning of a building, worth an hundred dollars, will at once engage their attention and bring together all persons in its vicinity, the destruction by fire of a distant timber lot, worth ten thousand dollars, will awaken but slight interest in their minds. It is important, therefore, that the owners of such property should so manage it as to reduce its exposure to fires as much as possible; and its injury, in case of burning, to a minimum. This

If there is any sight entirely disheartening, it is that of one of these fire denudéd tracts, from which everything has been swept clean, down to the underlying rocks. Any one who has visited the Zealand valley within the last five years can attest the truth of this assertion. For seven miles up the valley, the fire swept resistless across it from crest line to crest line of the mountains which wall it in. Neither bird, nor beast, nor man, nor tree could endure its arid breath and devouring flame. The river only and the naked ledges, with a few small sections too damp to burn, escaped destruction. As one now looks upon the two towering sentinels of fire-blasted rock which mark the opening of this valley, there blazes into his mind, in letters of living fire, the terrible inscription which Dante in his Divine Comedy placed over the entrance arch to hell, —

"All hope abandon ye who enter here."

2. In case a denuded tract escapes the fire and a new growth springs up from accidental seedings or from the stumps of trees removed, many years must elapse before it has matured and is ready for the axe. How many, will of course depend upon the character of the soil, its exposure, and the variety of lumber sought. No paying crops of timber, however, can be harvested in such localities until the expiration of some forty or fifty years.*

can be best accomplished by keeping woodlands free of debris, and by dividing them into sections by roads or ditches; which, if kept open, will often confine any fires which may have been kindled to limited areas.

*Some persons may maintain that timber grows faster than I have indicated. The statement in the text is based, partly upon general observation, and partly upon actual measurements of fallen trees and counts of their annual rings of increase. As an instance of such measurements and enumerations, I cite the diameters, number of annual rings and average annual increase of forty white pine logs, twenty of chestnut, twenty of red oak, and five of hemlock, all of which grew upon lands in the vicinity of Concord:

Forty White Pine Logs.

Diameters.	No. rings.	Average annual increase.	Diameters.	No. rings.	Average annual increase.
19 inches.	75	.25 in. per an'm.	425 inches.	1,713	5.00 in. per an'm.
22 "	72	.30 "	35 "	92	.38 "
24 "	73	.33 "	27 "	91	.30 "
20 "	82	.24 "	30 "	95	.32 "
21 "	83	.27 "	23 "	92	.25 "
19 "	89	.21 "	16 "	96	.17 "
20 "	90	.22 "	23 "	50	.46 "
19 "	80	.24 "	31 "	91	.34 "
14 "	87	.17 "	21 "	54	.40 "
25 "	90	.28 "	30 "	93	.32 "
12 "	80	.15 "	16 "	58	.24 "
22 "	93	.24 "	26 "	80	.30 "
23 "	92	.25 "	25 "	80	.30 "
22 "	91	.24 "	30 "	90	.33 "
23 "	86	.27 "	20 "	91	.22 "
27 "	90	.30 "	20 "	89	.23 "
23 "	94	.24 "	12 "	60	.20 "
30 "	86	.35 "	20 "	86	.21 "
17 "	89	.20 "	18 "	99	.18 "
23 "	91	.25 "	38 "	164	.23 "
.....	.....	.....	22 "	107	.22 "
425 inches.	1,713	5.00	908 inches.	3,471	10.60
			Av. diameters 22.70 in.	Av. no. rings. 86.77	Av. annual increase .265 inch.

Twenty Chestnut Logs.

Diameters.	No. rings.	Average annual increase.	Diameters.	No. rings.	Average annual increase.
			225 inches.	762	2.93 in. per an'm.
18 inches.	49	.37 in. per an'um.	19 "	65	.29 "
16 "	81	.20 "	16 "	70	.23 "
20 "	78	.26 "	20 "	75	.26 "
22 "	87	.25 "	23 "	93	.25 "
24 "	91	.26 "	21 "	97	.27 "
29 "	70	.33 "	17 "	64	.27 "
30 "	80	.38 "	25 "	72	.35 "
27 "	70	.38 "	25 "	71	.36 "
20 "	82	.24 "	14 "	61	.21 "
19 "	74	.26 "	23 "	70	.30 "
225 inches.	762	2.93	428 inches.	1,480	5.72
			Av. diameters 21.41 inches.	Av. no. rings 74.	Av. annual increase .286 inch.

Twenty Red Oak Logs.

Diameters.	No. rings.	Average annual increase.	Diameters.	No. rings.	Average annual increase.
			176 inches.	753	2.52 in. per an'um.
36 inches.	64	.56 in. per an'm.	13 "	58	.19 "
25 "	69	.36 "	26 "	62	.42 "
11 "	35	.31 "	15 "	60	.25 "
18 "	115	.16 "	15 "	79	.19 "
16 "	110	.15 "	18 "	59	.30 "
13 "	100	.13 "	14 "	55	.25 "
19 "	65	.29 "	15 "	80	.19 "
11 "	61	.16 "	36 "	73	.48 "
12 "	70	.17 "	21 "	63	.33 "
15 "	64	.23 "	15 "	60	.25 "
176 inches.	753	2.52	364 inches.	1,402	5.37
			Av. diameters 18 inches.	Av. no. rings 70	Av. annual increase .27 inch.

Five Hemlock Logs.

Diameters.	No. rings.	Average annual increase.	Diameters.	No. rings.	Average annual increase.
			55 inches	195	.85 in. per an'm.
24 inches.	68	.36 in. per an'm.	13 "	53	.24 "
17 "	74	.23 "	18 "	140	.13 "
14 "	53	.26 "	.....	.....	.....
55 inches.	195	.85	86 inches.	388	1.22
			Av. diameters 17.20 in.	Av. no. rings 77.60	Av. annual increase .24 inch.

When the cutting is restricted to trees above a minimum diameter of ten or twelve inches, a small number only of the standing trees are removed; the soil continues shaded and moist; if fires are started, they are more easily extinguished; and although the remaining trees may be immature, they represent growths of from one to twenty or thirty years; for a new crop of which there must be waiting in case of entire denudation. A tree of the size of a goad stick measures little and is of slight value. But it has taken half a dozen years to produce it. It is the predecessor of a larger one, which, without this start, would never be, just as the boy precedes the youth, and the youth the man. The first sys-

tem disregards this fact, wastes the introductory growth of several or even many years, for slight consideration, and starts anew on an unoccupied surface. The second, husbands with care all immature trees, removing only those which are ripe, and starting anew every twenty or thirty years with a crop half grown; just as the orange grower picks his mature fruit and waits patiently for that which is green to turn yellow.

A gentleman, who has had a long and extensive experience in lumbering upon the head waters of this State, recently told me that he pursued restricted cutting and realized a timber crop every twenty years.

Another, who has long pursued the same system in the town of Chatham, remarked some time since, that a certain addition to his timber lands which he thought of making, would enable him and his successors to cut upon their own land a million feet of logs annually and perpetually, inasmuch as his standing timber would grow that much every year. In neither case, could this be done under the system first mentioned.

Which of these two systems is to be preferred, I have, perhaps, already sufficiently indicated. The latter will probably be adopted when systematic management becomes general, for the value of wood is little likely to increase and timber culture only to be profitable.

The following calculation,* based upon the annual re-

*This calculation is but one of a score which might be cited as examples to show the profits to be derived from a well managed wood and timber lot. Results will vary much with the character and exposure of the grounds, the trees raised and the treatment which they receive.

Plantations of small timber, particularly of white pine, cut or thinned at intervals of from twenty to twenty-five years will show better returns than natural seedlings of promiscuous trees. It is now easy to sell at good prices small timber for which there was formerly no demand. Indeed, it is doubtful if it be longer advisable to raise large trees, which attain maturity only at the end of periods of seventy or eighty years. Greater profit comes to the owner of a timber lot from cutting smaller quantities of timber, at the end of shorter periods, than he has been wont to do. By this practice the trees are oftener thinned, the sunlight and air is more freely admitted among them, and their growth is accelerated. When we come to the practice of systematic forestry and assign to individual trees regulated spaces, as we do to our cornstalks, we shall find their growth hastened some twenty-five per cent.

moval from four-acre sections, and its sale for $8 per thousand, of six and a quarter thousand feet of lumber per acre, from a timber lot of one hundred and forty acres, for a period of thirty-five years, at the expiration of which the entire lot will have been cut over, shows some interesting results.

The aggregate sales of $200 per year, without interest, amount at the end of this period, as is readily apparent, to $7,500.00. If the several amounts of the annual sales have been invested at five per cent interest, and left undisturbed, to accumulate, they will be found at the end of each year of this period to be as follows:

35th year's cutting,	$200	and 5 pr. ct. int. for	1 year	= $210.00	
34th	"	"	2 "	= 221.50	
33d	"	"	3 "	= 231.53	
32d	"	"	4 "	= 243.11	
31st	"	"	5 "	= 255.27	
					$1,160.41
30th	"	"	6 "	= $268.03	
29th	"	"	7 "	= 281.43	
28th	"	"	8 "	= 295.50	
27th	"	"	9 "	= 310.28	
26th	"	"	10 "	= 325.79	
					$1,481.03
25th	"	"	11 "	= $342.08	
24th	"	"	12 "	= 359.18	
23d	"	"	13 "	= 377.14	
22d	"	"	14 "	= 396.00	
21st	"	"	15 "	= 415.80	
					$1,890.20
20th	"	"	16 "	= $436.59	
19th	"	"	17 "	= 458.42	
18th	"	"	18 "	= 481.34	
17th	"	"	19 "	= 505.40	
16th	"	"	20 "	= 530.67	
					$2,412.42
15th	"	"	21 "	= $557.20	
14th	"	"	22 "	= 584.06	
13th	"	"	23 "	= 613.43	
12th	"	"	24 "	= 644.10	
11th	"	"	25 "	= 676.31	
					$3,075.10

10th years' cutting,	$200	and 5 pr.ct. int. for	26 years	= $710.13
9th	"	"	27 "	= 745.64
8th	"	"	28 "	= 782.92
7th	"	"	29 "	= 822.07
6th	"	"	30 "	= 863.17
				$3,923.93
5th	"	"	31 "	= $906.33
4th	"	"	32 "	= 951.65
3d	"	"	33 "	= 999.23
2d	"	"	34 "	= 1,099.19
1st	"	"	35 "	= 1,160.41
				$4,116.81

Amount of an. cuttings and int. at the end of 35 years $18,059.90

If these several amounts be condensed at the end of each successive period of five years they will foot up as follows:

At the end of five years to . . .	$1,160.41
At the end of ten years to . . .	2,641.44
At the end of fifteen years to . . .	4,531.64
At the end of twenty years to . . .	6,944.06
At the end of twenty-five years to . .	10,019.16
At the end of thirty years to . . .	13,943.09
At the end of thirty-five years to . .	18,059.90

Should the proprietor be so situated as to require for use, from time to time, portions of these accumulations, the remainder will still increase by yearly additions and by annual interest; while, at the same time, his standing timber is also increasing by annual deposits of new wood. If for instance, he should see fit, at the end of twenty years, to withdraw from these accumulations a thousand dollars, and at the end of twenty-five another, and five years later another still, he will find at the close of the supposed period of thirty-five years, that he has still to his credit the snug sum of $13,069.00.

A PORTION OF EVERY FARM SHOULD BE IN FOREST.

In the old-time notices of farms for sale, this phrase, immediately following the number of acres offered, "suitably

divided into tillage, pasture, and woodland," was very common if not universal. Every farm was then supposed to possess a "suitable" area of wood and timber. If one was without this, it furnished an exception to the general rule. But times have changed and the converse is now too often true. The remaining forests in many of our towns are in a disordered condition and strangers to all systems of management but that of caprice and neglect. In the older parts of the State the amount of standing timber has been fearfully diminished. Hundreds and thousands of valuable timber lots have been thoughtlessly sold by their owners, and immediately afterwards stripped of their growths by their purchasers. By this means, the real estate valuations of towns have often been materially reduced.*

It is often a matter of surprise that a careful farmer, who is unwilling to sell a neighbor a bushel of corn worth seventy-five cents, except after careful and streaked measurement, is willing to sell a speculator, of whom he often knows very little, his entire timber lot, his inheritance, perhaps, from more prudent ancestors and worth thousands of dollars, and to fix the price by guess. And when he has sold it and received his pay for it, he wonders what he shall do with the money, and is led, perhaps, to be cheated a second time in the purchase of high interest promising mortgages on farms poorer than his own, in the arid regions of Western Kansas or Nebraska, brought to his notice by some peripatetic bond pedlar.

The ordinary farmer needs a wood and timber lot as much as he needs pasture and tillage lands, as much as he needs cattle and farm buildings. He cannot be a first-class farmer without it, he cannot have full winter occupation in such a climate as ours. Has it ever occurred to you that the average farmer of New Hampshire is attempting to get a living

*Other considerations than a desire to realize the value of standing timber have, in many cases, led to its removal. In the vicinity of large towns, owners have sometimes been induced to cut it by the fear of fires often carelessly or willfully set. As this kind of property has diminished in quantity, exaggerated ideas of its value has, at times, led to a taxation of it which its owners have deemed excessive, and, to avoid this, they have sold it.

and a competency by less work than is expended in their various avocations by the other members of the community in which he lives? How many of us get in full days' works from the time the ground freezes in the fall until the frost leaves it in the spring? How many of us do much more than tend our stock, get up and manufacture for home use a year's supply of wood, and help break out the roads of our highway districts now and then? And yet, there are no less than one hundred and twenty-nine secular days between the 15th of November and the 15th of April, when the sun is ten full hours or more above the horizon. Forty-one per cent of all the working days in the year lie inside those two dates. It is taking us too long to get rested after our fall plowings. The seats of our pantaloons wear out faster in winter than their knees do. It becomes us to brace up.

Somehow or other, in the industrial world, returns are very largely dependent upon hours of labor. The rules of political economy may be vigorous, but they are generally fair. Indeed, the man who works two thirds of the time, has no right to claim as much compensation as he who works a third more. If he does he will rarely get it. The manufacturer runs his mill every day. So does the trader his store. The professional man and the mechanic do not discontinue their labors in winter. The farmer alone, like the bear and the woodchuck, dens up in winter and mainly because he has little to do. In other words, he has organized for himself no work for that season. To your interrogative surprise that he should lie still so much of the time, he complacently replies, what can a farmer do when the ground lies frozen two feet below the surface of the snow? To this inquiry there is usually but one answer, "put for the woods!"

Until we have organized for ourselves regular winter occupation, we have no right to expect full success in farming. To do so, is to ignore the industrial law which everywhere prevails, and to which all occupations are alike amenable, the law that return is in proportion to outlay. And when cold weather occupation can so easily be found in the woods,

it becomes us to have upon our farms due proportions of forest and to give attention to their systematic management. Their returns may be made as sure as the revolution of the seasons, our whole time will be profitably employed and our axes will ring in harmony with the click of the artisan's hammer and the splash of the miller's wheel.

Walter Scott used to say, that a walk of a mile or two before breakfast was a good thing, and best if it was over one's own land. I know of no walk more agreeable than a winter one through a well kept timber lot, particularly if it be one's own and owes its thrift largely to his instrumentality. And it will be all the better if taken daily for a considerable period in company with sleek-haired cattle and comely horses. The shouts of teamsters and the crackle of broken snow crusts are inspiring sounds in the clear, frosty air, while the solemn sighing of the winds through the columns and beneath the arches of nature's great temple makes grander music than any which rolls beneath the dim vaults of old cathedrals, dun with the stains of centuries, and redolent of associations of a remote past.

OUR ANNUAL FOREST CROP.

I have been unable to obtain as full statistics of the annual forest crop of this State as I have desired. My main reliance has been upon the United States census returns of 1880, which are now eleven years old and less complete than I wish they were. But they are better than any which have preceded them, and, let us hope, to be surpassed in all respects by those we are now so impatiently awaiting.

According to the returns of 1880, the most important statistics of the lumbering interest were:

Amount of capital invested . . .	$3,745,790
Value of the logs of that year . . .	2,159,461

The maximum number of hands employed at any one time during the year ending May 31, 1880, was four thousand one hundred and sixty-five.

The amount of wages paid during the year was $548,556. The products of this year were:

Lumber, board measure	292,267,000 feet
Spool and bobbin stock	3,072,000 feet
Number of laths	49,454,000
Number of shingles	67,086,000
Number of staves	31,354,000
Number of sets of headings	3,491,000
Value of all other products	$58,612
Total value of all forest products	3,842,012

From this statement it appears that the total value of our lumber products during the year above mentioned, was nearly one third as much as the value of our primary agricultural products ($13,035,250.76). The rank of New Hampshire, in 1880, among forty-nine other States and territories, as a lumber producing State was among the first third of its associates, being in importance the fifteenth.

If to the total value of the products above mentioned, there be added that of wood used for domestic purposes, estimated at 567,719 cords and valued at nearly two millions of dollars ($1,964,669), we shall have a total of nearly six millions of dollars ($5,806,681), and that without including the wood exported from the State, or used by its railroads, brick yards, and manufacturing establishments.

It would be hard to estimate the present value of our forests, for the want of sufficient data upon which to base a reliable calculation. The annual value of their products, as just now cited, embraces more or less of labor, the elimination of which, owing to a want of exact knowledge as to its amount and value, is a matter of great difficulty. If, however, we place their net returns at four millions of dollars and capitalize them upon a five per cent basis, we shall be constrained to appraise them at one hundred millions of dollars—an amount nearly twice that of the entire capital employed in our manufacturing establishments ten years ago.

But however uncertain their exact value may be, it is enough, under any method of reckoning, to give them high rank among the leading natural resources of our State.

FORESTRY OF THE FARM.

But it is to the importance of forestry as a part of our farm work that I desire especially to call your attention. I am satisfied that we have erred in the management, or rather non-management, of our wood and timber lands. From many farms they have disappeared almost entirely. With them has gone much of former winter occupation, and with it the income which came therefrom. If we would attain to highest agricultural prosperity, we must invite them back again, thereby enhancing the beauty of our farms and the value of our estates.

During the last twenty or thirty years, the agriculture of New Hampshire, and indeed of all New England, has made great progress on several important lines.

Cattle husbandry is now understood as it has never been before. Fine herds of the different breeds may be found in all considerable sections of the State.

Dairying has been extensively and diligently studied by enterprising persons of acute minds. As a result, its products have been improved in quality and the business has been made a success.

Notwithstanding the roughness of many of our fields, the scythe has largely given place to the mowing machine, the spreading fork to the tedder, and the hand-rake to the horse-rake. The old wooden mould-board plough, made by guess, has become an object of antiquarian curiosity; supplanted by ploughs of cast iron, which have gone through numberless improvements, it is now represented in the field by those of steel or chilled iron, constructed upon scientific principles, whereby the least amount of power is required to do a given amount of work. Similar remarks apply as well to most of the implements in use upon the farm.

We are also giving more intelligent fertilization and better

culture to all of our arable fields, whereby their productiveness is increased. As a consequence, good farmers are raising better crops and making more money, than their predecessors were wont to do. Notwithstanding the high price of hired labor and its unreliableness, the attachment of brute power to well devised machinery has in a large measure overcome these hindrances and bids fair, in the end, to surmount them altogether.

Indeed, there is every reason to suppose that when the husbandmen of New Hampshire shall rise to a determination to apply as much intelligence, perseverance, and skill to the requirements of their work, as do the mechanics, manufacturers, and traders to theirs, their association will become as remunerative.

On one line of their business, however, the farmers of today have exercised less care and been more wasteful than were their fathers. On most farms, forty years ago, was found a wood and timber lot bearing fair proportions to their importance. But where now are these? The farm which is "suitably divided into tillage, pasture, and woodland," is the exception rather than the rule all over the lower part of the State and over much of its upper part.

If we mistake not, the next line of our agricultural departure, should be that of an improved forestry. Forestry should be a part of farm work and to it should be devoted more or less of the one hundred and twenty-nine days already alluded to, for which too many of us have too little to show. And when I speak of forestry, I mean a treatment of our woods as intelligent and systematic as we bestow upon the arable portions of our farms. This may require study and perseverance, persistently pursued, year after year. But it will be repaid over and over again by an enlarged income and the broadened intelligence of every person who thus rises to the plane of his opportunities.

And, fortunately, we can turn to the consideration of this subject with pleasant anticipations, encouraged by the fact that the errors of the past are not irremediable. While we

have denuded too many of our wood lots thoughtlessly and foolishly to our injury—very much as an improvident farmer cheats himself by half starving his cattle in winter and helps perpetuate that wretched phrase, "spring poor," but knows the while, that the early feed of the pastures will restore soundness of form to the kine—we know that time and good management will make thrifty our neglected woodlands. He has been cruel and foolish. We who may have mismanaged a wooded inheritance have been simply foolish. But to blunder knowingly is almost equivalent to a crime.

The time is not distant, and in fact now is, when landed estates will be sought within our borders by persons from without; many of whom possessed of large capital, desire to spend a part of their time each year in the country. There is something in the old English nature of the New Englander, unextinguished by time or town life, which makes him seek a rural abode, just as instinctively, as a duck takes to water. As soon as a competency permits, he seeks a home in the midst of acres which he can call his own. Of the hundreds of thousands who come to us every year for sojourns of different periods, more and more are acquiring land and houses for their summer occupancy.

Some of these estates already acquired are extensive and remind one of similar homes in the old world beyond the Atlantic. The Corbin park of twenty-one thousand acres; the Shaw park in Carroll, of some four hundred; the Hutchins farm of some six or seven hundred, on Governor's island in Lake Winnepesaukee; and that of Mr. Hay on the shore of Sunapee lake are samples of the more important of these estates. Others less extensive, scattered everywhere are becoming more and more numerous every year. Within the last two years, some three hundred of our thirteen hundred abandoned farms have been re-occupied by summer residents as summer homes.

Wherever such persons come and improve their purchases, they enhance the value of adjoining property, and increase the valuations of their localities. They also bring to quiet

neighborhoods much of the spirit of the active communities from whence they come. With them come also intelligence, refinement, and attractive social life. Wherever one such family makes its home, it is likely, sooner or later, to attract others and cause a demand for adjoining estates which may chance to be for sale.

But persons who purchase grounds of considerable extent desire forests as well as open fields. Inasmuch as it is easy to transform a thrifty piece of woodland into a pleasing park in a few years' time, land of this kind is often a *sine qua non* in a proposed purchase. In fact, one of the leading charms of New Hampshire scenery are its forests.

It therefore becomes every farmer to keep in good condition his wooded area. This renders his farm more desirable, if at any time he desires to sell it. It will pay him a surer profit than his grain or grass fields if he chooses to keep it. It requires neither ploughing nor planting. Its increase is the gift of God. It grows while its owner is sleeping.

Thus, Mr. President and gentlemen, imperfectly, indeed, but as best I could, I have spoken of our forest area, determined largely by the configuration of the States' surface; of our lumbering, an industry imposed upon us by geological necessities; of the possible profits and the management of our woodlands; of the forest crop of 1879; of the demand for forest property by persons coming to reside with us, for a part or the whole of the year and of the very great importance of bringing forestry into the common round of farm work.

This last proposition I desire to emphasize, for I am convinced, both by my own personal experience and by observation that the reckless treatment of our woodlands has greatly impaired the value of our estates and injured more or less the beauty of the scenery around us, and that we have reached a stage of social development when this has a cash value and will bring cash in the market.

But although we have gone on blindly and made mistakes on this line, Nature, kindly forgiving, will soon reclothe these

mutilated areas if we will but allow her to do so. Let us then, not only accord to her that permission, but, in every possible way, aid her in her beneficent effort.

Prof. Brewer: A number of years ago I paid a good deal of attention to this matter of forestry both from the theoretical and practical side. I may say that we prepared the first land map of the country that was ever prepared. At the the time of the census of 1870, General Walker, who was superintendent of that census, got up a district map of the United States, and he came to me and wanted me to take hold of the woodland part of it. He said that he would supply the agricultural portion. In making that map the county was the smallest unit used and we had to go over the statistics of every county in the United States and get the relative portion of woodland that was returned. That was the basis on which we began, and I got all the information that I could from other sources. The map was published in an atlas by congress about 1873. I became very much interested in the subject at that time.

I have not the slightest doubt but what in our older States we have got to go to planting trees. It is not yet certain what kind of trees can be planted with the best results in New England. The time will shortly come when it will be realized that it is just as important that trees should be planted and the forests looked after as that the other crops should be planted and looked after. As a matter of fact all over Europe except in England, schools of forestry were established and maintained before the schools of agriculture, and here in America we will have to give more attention to the subject than we have done. The time is coming, I haven't a shadow of doubt, when, after we have cut off the timber from our woodland instead of leaving it to grow up to bushes or instead of burning it off, we will go through and plant in those trees that we expect will be of value to us afterwards. I delivered a lecture on this matter a number of years ago. One man gave his experience in this direction. On land which was not more than five or six dollars an acre,

white pines were set out, and, as it stands in my memory, it was only thirty years afterwards that the timber on that land was sold for one hundred dollars an acre.

We have not yet determined what kinds of trees can best be set out in New England. We have not succeeded in planting oak economically, but white pine can be set out, I think, and grown with profit. It is very certain also that certain of the larches may be, although how far that is to be depended upon, we do not know. There is to-day a tremendous consumption of young trees for railroad ties. The destruction of these young trees is something enormous. In the course of time we have to correct this, and I believe the time is close at hand when we have got to do it. This is a matter of national importance, not only on account of the future necessity for timber, but also on account of the effect the cutting of these trees will have upon our water power. I do not believe the amount of woodland seriously affects the rainfall, but it does affect the flowage of the streams enormously. Of that there is no question. I tell you that it is an error to believe that the mountain denuded of timber and burned off, clothes itself again with timber. I do not know of any mountain that has been denuded of timber by the ravages of fire or the cutting of the timber that ever succeeded in clothing itself with timber—with good timber, I mean. It has been found in the Old World that such forests have had to be planted and that trees would not spring up spontaneously in the places of those that have been cut off.

Considering the large amount of money that is left here every year by tourists who come here to enjoy the scenery of your mountains and of your forests, and considering the importance of the water power of the State, it seems to me that there ought to be some form of state policy regarding the care of the woodland. I do not know of any subject which the Board of Agriculture can keep before it, or the people, that seems to be more useful for the general prosperity of the State than that one of the woodlands. I am very glad to see it brought up here in this meeting.

Mr. Walker: I want to say one word. Professor Brewer has alluded to the value of our scenery. Our scenery has a cash value. You may say that is all bosh; that is all sentimentalism. It is not. There is a cash value to our scenery. Mr. Bachelder, Secretary of the Board of Agriculture, in 1889 sent out his circulars and found that the summer boarders left in New Hampshire in 1889 five millions of dollars. Let us measure that by the corn crop. The corn crop of New Hampshire according to the last census was a million and a quarter bushels per annum and a little more. If that corn crop was put on the market and sold for one dollar a bushel,—which is twenty-five cents more than it could be sold for,—it would bring $1,250,000, which is only a quarter of the amount that these summer boarders have left here. Now the reasons for a far-reaching policy of forest maintenance are various. In the first place we want to preserve our forests so far as we can and preserve the scenery. As Professor Brewer says, we want to preserve the mountain rivers of the State, and we cannot do that if those mountains are denuded. Look at the presidential range of mountains and the other mountains of the State. Covered with forests, as they are, they act like a great sponge which holds the excess of rainfall, it is gradually squeezed out, and we have as the result the reliable Merrimack, which at all times of the year provides our manufactories with water and yet never becomes a fierce destroyer. But if we cut the forests from these mountains and then burn the ground over with fire so that there is no vegetation left, what do you think we would have? In March and April when the snow was melting up in these mountains, we would have a tremendous torrent coming down, which would destroy everything, while during the dry season, there would be but little more than a brook. The regularity of the flow of our streams depends upon the preservation of our forests above here, and to a greater or less extent the preservation of this city depends upon that great sponge up there, which we ought to see is protected from the attacks that are being made upon it.

Prof. Brewer: Take woodland, and there is this sponge, as Mr. Walker has called it, under the trees. The snow does not melt off so fast in the spring since it is shaded by the trees, nor does the ground freeze so deeply where there are no trees. Where the trees are scattered the ground freezes and becomes hard and then when the snow melts it flows off very rapidly. The great floods of the United States bear evidence to this. The floods come from the cleared lands rather than from the forests. As the ground is frozen in these agricultural lands the whole tendency of the surplus water is to run away in torrents. Now of all the water that falls in rain or snow, about five eighths flow away in the streams and about three eighths evaporate from the forests and soil. Now, of this five eighths that flow away in streams, the greater portion in the early spring comes down in torrents where the land has been cleared off. The Ohio river is an instance of this. The lands around the upper waters of the Ohio have been largely cleared off, and I have no doubt but what these floods of which we read will continue, because the water flows off so quickly from the denuded lands, and it is not held back by this sponge around the roots of the trees or by the woodland swamps.

The President: Mr. Walker remembers the spot of the king's marked on the trees. About twenty-five or thirty years ago, I was looking through some timber in Boscawen, and I came across a number of trees with those marks upon them. I do not know but there are some there to-day. The distinct marks were there at that time.

Mr. Walker: I want to say one word here in regard to our president. Some years ago I was more enthusiastic in regard to this forest question than I am now. His Honor, Mayor Humphrey, he was at that time, was running a manufactory of kits up at West Concord. I asked him what he was paying for white pine wood — not timber but wood. He said that he was paying $4 a cord. He was taking that wood to his mill, cutting out the knotty parts, leaving the sticks about fourteen inches long. From that wood, by

means of his machinery, he was cutting out mackerel kits and sending them to Boston. After he had told me what the wood cost him, I asked what a cord of it was worth after it was manufactured into mackerel kits and ready to go to Boston. He said, "That is considerable of a computation, and requires a little figuring." Two or three days afterwards he told me that he had figured it up and he said: "That cord of wood after it has gone through my mill is worth $26." "Well," said I, "you have then paid $4 and made $22." "No," he replied, "I have not." I asked him where it went to then. He said, "It went into the pockets of my men." "Where then did it go?" "It went into the stores at Concord village, went to pay the storekeepers and market-men." That was the only industry that used to keep alive that little village of West Concord.

Now the moral to which that points is here: The Almighty has said to us, You have got to raise timber here. You cannot plow these hills and mountains, they are too rough; the rocky formations are set up edgewise, and it is impossible for you to plow these hills, and you cannot pasture very many of them. You should raise timber. Then, what? Then go to work and take care of your wood and timber lands. What next? Then instead of cutting them off and sending them in the log to Turner's Falls and various places in Massachusetts to be manufactured, manufacture them in the mountains and take the difference between the rough log and the manufactured product and put that into your pockets. Then there grows up a little village for the support of these manufacturers and their operatives, and then there grows up a market for the surrounding agricultural portion of the community. I take it that that is our destiny. In the first place we should accept what God has given us, be careful of it, and then work out our own salvation on the line that he has shown us.

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