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FUTURE TIMBER SUPPLY FOR COAL MINES:
WHAT ONE COMPANY IS DOING.

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Introduction

One of the problems which the coal-mining industry must solve in the next few years is the reduction of its ever-increasing timber bill. This includes pit posts, mine ties, timber sets, and brattice boards. As an example of this increase, the following table of timber prices from the records of a coal company in Western Pennsylvania, in a district where the supply of most of the different kinds of timber used can be shipped from points within the State, is self-explanatory:

| Kind of timber | Size | Price each, cents. | | |
|---|-----------------------------|--------------------|-------|--------|
| | | 1914 | 1918 | 1926 |
| Posts | 6 - foot | 8 | 15 | 14 |
| " | 6 1/2 - foot | 9 | 17 | 15 1/2 |
| " | 7 - foot | 10 | 18 | 17 |
| " | 7 1/2 - foot | 11 1/2 | 21 | 19 |
| " | 8 - foot | 14 | 23 | 20 |
| " | 9 - foot | 20 | 28 | 26 |
| " | 10 - foot | 28 | 35 | 38 |
| Hardwood ties | 3 in. by 5 in. by 5 1/2 ft. | 10 | 20 | 15 |
| " | 4 in. by 5 in. by 5 1/2 ft. | 14 | 29 | 22 1/2 |
| " | 5 in. by 6 in. by 5 1/2 ft. | 19 | 33 | 27 |
| " | 6 in. by 8 in. by 6 ft. | 27 | 50 | 42 |
| Oak heading timbers, per 1000 board ft. | - - - - - | \$30. | \$50. | \$48. |
| Mixed oak plank, per 1000 board ft. | - - - - - | \$30. | \$50. | \$48. |

There are several reasons for this increased cost: Scarcity of raw material, higher freight rates and increased labor costs.

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Present conditions seem to indicate the continued upward trend of the cost of mine timber, although the regrettable calamity that has visited the chestnut timber in Pennsylvania may temporarily hold the price of some types of mine timber on a level basis. On account of the chestnut blight, many farmers will undoubtedly begin to convert their chestnut trees into timber before they become a total loss. This may provide, for the time being, a sufficient supply of mine timber to check the steadily rising prices.

The local lumber producers are turning their attention to the production of the larger sizes of timber and lumber on account of an unfavorable price on mine ties. From the foregoing table, it is seen that the average advance in the price of ties during the period 1914 to 1920 is 52 per cent, while timber sets and mine car plank increased in value 60 per cent. A more striking illustration is the fact that a 6 by 8 inch by 6 foot tie sells for 42 cents or at the rate of \$17.50 per 1000 board feet; yet mine car plank and timber sets have a value of \$48 per 1000 feet, an advantage of \$30.50 in favor of the heavier timber.

The supply of coal in Western and Central Pennsylvania will last for a long period and it is for the possible future demand for timber that the coal companies must provide. While steel, concrete, and other materials may, in many cases, prove an acceptable substitute, there is no doubt that timber will always be in demand.

Reforestation Program.

With these points in view, one of the large bituminous coal companies in the Central Pennsylvania district has for several years been carrying on a systematic program of reforestation which is intended to provide for the needs of the company in the far future.

The company is a pioneer in the State in this work and now controls about 24,000 acres of surface land which is either in forest at the present time or is available for future reforestation. A large part of this surface was acquired by the company when the title to the coal was taken and, outside of the timber which may yet be standing, is of little value, and yet the company is required to pay a tax on the assessed value of the surface as well as on the coal itself.

Timber Land Taxes.

In connection with the taxation of growing timber the Pennsylvania Auxiliary Forest Act of 1913 provides that any surface upon which trees are planted, seed sown, or natural reproduction, for future growth may be classified as auxiliary forest reserves. When such a tract of land has been placed in the auxiliary forest reserve the annual tax is determined on an assessed value not to exceed \$1. per acre. In addition, a yield tax equal to 10 per cent of the stumpage value is to be paid at the time the trees are cut.

Organization of Forestry Work.

The reforestation work of the company is under the direct supervision of a forester. In order to supplement the conservation work of planting trees and forest protection for future mine timber, the company also operates two sawmills which use to the best advantage the timber after it is cut. These mills are also under the supervision of the forester; this seems to be a logical arrangement, because he then has an intimate knowledge of the varying demands of the mines and can plan his logging operations to the best advantage and is in a position to prevent any wastage at the mill.

Observations have been made by the forester as to those woods most suitable for mine timber and which, at the same time, are best adapted to the particular soil and climate common to that part of the country.

Nursery for Seedlings.

In order to carry out the experimental work the company maintains a nursery where many thousands of seedlings are grown for a year or two before they are transplanted to the future forests. Nearly all of the trees grown at the nursery are conifers - white pines, spruce, Scotch pine, and hemlock. The hardwoods, such as the different species of oaks, are best grown in their native forests where the young saplings are carefully protected.

Artificial Propagation of Hemlock Trees.

Of the conifer trees mentioned, the hemlock is the most difficult to grow under artificial conditions and the original methods employed are worthy of consideration: Experimentation showed that it was necessary to reproduce as nearly as possible the conditions of light and shade found in the primeval forests, and also the peculiar characteristics of the soil of the woods in which hemlocks naturally grew.

Ordinarily, the soil in the forest contains a large amount of woody material from the decay of fallen trees, needles, and leaves. In the nursery this condition was simulated by mixing a large proportion of sawdust with the soil. This mixture was made into a bed approximately 100 feet long and 5 feet wide and covered in winter with a layer of straw. Hemlock seed was then sown in this sawdust bed. In a hemlock forest, the light is generally dim as the penetration of the sun's rays is partly obstructed by the dense upper growth of the trees themselves. In order to produce a similar effect on the bed in which the hemlock seedlings are growing, a grating of common laths was built over the entire bed. When the seedlings have sufficiently grown they are transplanted to the tract of land where they are intended to grow to maturity.

Other Species Grown.

The other species of trees mentioned are also grown in beds but without the special preparations made for the hemlocks.

The seeds are sown directly in the beds under shade, as it has been found that trees grow best under conditions as nearly natural as possible. A period of one or two years is necessary for the growth of the seedlings before they can be transplanted.

Cost Per Tree.

The cost from a seedling in the nursery to the time when it has been transplanted to its final growing place is estimated to be 1 to 1-1/2 cents a tree. About 75 per cent of these transplanted seedlings live.

An illustration of the increase in value is shown by a 17-year old pine from which five pit posts averaging 5 feet in length had been cut. A fair price for these posts would be 15 cents each which, however, includes the cost of cutting and splitting the tree, and hauling it to the mine.

Trees Especially Adapted for Reforestation.

In connection with the trees that are favored for reforestation, the company's experience has been that the Scotch pine and the wild cherry meet their conditions better than almost any other type. The wild cherry is especially adapted for mine ties as it grows straight, is a hardwood and is well suited for preservative treatment. Last year 700 trees of this species were planted.

Systematic Cutting.

A great factor in the timber conservation and reforestation plans of the company is the systematic plan of timber cutting. When the coal was bought, as stated above, the title to a large amount of surface was also acquired and there were many acres of woodland.

The present timber is carefully cut, and replaced by young trees and it is estimated that a period of 80 years will elapse before an acre of present cutting will again be reached.

No tree under 10 inches in diameter is cut, unless the tree shows signs of decay, disease, or injury.

About 15,000 feet of lumber, exclusive of props, is used a day and the estimated daily growth of timber on the company's lands is 30,000 feet.

Methods of Utilizing Timber.

One of the most important contributions to the economic success of the timber conservation plan of this company is the way in which the raw material is worked into shape for use in the mine.

Preparation of timber for use by the most economical labor and modern machinery driven by electric power, reduces the cost over the preparation by hand labor at the mines. Inasmuch as the company maintains a plant for the preservative treatment of a large part of the timber used in the mines, it is

necessary to have as little cutting of the treated timbers as possible when they are being put in place; cutting of treated timber when it is done in such a manner as to leave exposed untreated portions subjects the timber to the lodgment of the spores which are floating in the air and which quickly germinate and produce the timber-destroying fungi. To prevent this, carefully prepared schedules of standard timber sets, switch ties, and lagging have been worked out, and whenever a set of timber is needed an order is sent to the mill, stating the size of the timbers required and this order is put through the mill and treatment plant.

Brief Description of Mill.

At one of the company's mills the logs are brought by truck, or by railroad if shipped from other than the company's forests, or distant company's forests, and unloaded into a small pond at the upper end of the mill.

A 10-mile haul is the limit for trucks. The logs are then floated, as needed, to a conveyor which carries them up a slight incline to the circular rip saw by which the log is converted into boards of no particular width but of a specified thickness - 1 inch, 2 inches, or more. From this point it is automatically carried to a second saw which cuts it to the several standard widths. A cradle-like attachment receives it from the second operation and feeds it to a pair of automatically spaced crosscut saws which cut it to the lengths ordered.

The finished lumber is then carried on a hand truck through the opposite end of the mill to the storage yard where it is neatly piled for future use.

Use of Waste Lumber.

Those slabs which are too narrow to be made into standard size timber are put into a separate pile and cut into narrow strips - $1/2$, $3/4$, or 1 inch size - when such material is needed.

The short ends cut from the slabs as they are made into standard length boards are used for cap pieces and wedges in the company's mines or sold to other coal companies for the same purpose at 1 cent each. These caps and the strips cut from the narrow slabs almost pay for the operation of the mill, so that the lumber cost from pond to yard is about \$2. per 1000 feet. In this item, the power cost is from $1-7/8$ to 2 cents per kilowatt-hour and labor 50 cents an hour.

During 1925, 21 tons of coal was mined for every tie put in place and 43 tons for every cross-bar in place. There were 1,555,000 linear feet of props and 250,000 cap pieces placed for a total production of 1,357,525 tons of coal.- Reports of Investigations, Bureau of Mines, Department of Commerce.

