FORESTRY PROBLEMS IN GENERAL

The Town Fire Warden System.

In the report of the State Forester for 1909–1910, it was recommended as strongly as possible that the system of town fire wardens should be abolished and that in its place a well organized system of forest fire patrols should be provided. During 1908 the reports of the fire wardens showed that 1,200,000 acres were burned over, with a loss amounting to $9,000,000, and in 1910 some 892,000 acres were burned over with a loss of $5,000,000. During these same years the losses from forest fires in Minnesota and Michigan had also been enormous, and in order to work out a better system of fire prevention the Governor of Minnesota invited representatives from Michigan and Wisconsin to attend a Lake States Forest Fire conference, which was held at St. Paul on December 6th and 7th, 1910.

The conference was an unusually strong and representative one, headed by the Governors of Minnesota and Wisconsin, members of the legislative committees on forestry from the Lake states, and also lumbermen, foresters, and so forth.

The sense of the meeting was that the enormous annual forest fire losses in the Lake states were a public disgrace; that the old system of doing nothing until the fire occurred had always and everywhere proved to be little better than no system at all, and that the only sensible, practical plan was to concentrate the efforts of each state to building up the best possible system of fire prevention.

At the end of the two days' meeting the following resolutions were unanimously adopted:—

Resolved, That we recommend to the legislatures of our States:

First. That the forest fire protection of each State and such other branches of state work as may be deemed best to combine with it, be placed under the control of a non-partisan Commission empowered, as fully as possible under the Constitutions of the different States, to carry on the work, and under civil service rules. Such Commission should represent all the interests involved as far as possible, and we recommend that such Commission place the work in charge of a Chief Forester who should be a professional graduate Forester and that the Commission employ such trained Foresters and other assistants as may be necessary; define their duties and fix their salaries; said employes to

be engaged under such civil service regulations as the Commission may prescribe.

Second. Resolved, That it is the sense of this Conference that the present Forest Fire Warden Service of Michigan, Wisconsin and Minnesota, is totally inadequate to meet the existing fire hazard to both life and property, and that forest protection service, to become efficient, must be greatly extended. To this end we recommend an adequate Forest Patrol System, maintained by the State, organized and operated by the Commission referred to.

Third. We further recommend, that the Commission be authorized to coöperate with the National Government, the several adjoining States, and such associations and organizations as the Commission may find necessary to best protect the timber resources of the State.

Fourth. Resolved, That this Conference is opposed to a general slash burning law, as experience has proven it unsatisfactory, impractical and dangerous. We recommend, however, that the Commission should be given authority to order the disposal of dangerous slashings sufficient to establish a safe fire line around standing timber or other valuable property.

Fifth. Resolved, That this Conference advocates legislation providing strict regulation of the burning of brush and debris in clearing land during the dry season, such burning to be under the direction of the State fire patrolmen under such regulations as the Commission may prescribe.

Sixth. We further recommend, that the burning of all debris on the rights of way of the various railroads be under the control and direction of the State Forest Patrol. Further, that under special conditions as directed by the State Forest Patrol the railway companies maintain a patrol, properly equipped following their trains, also that all railroad and logging locomotives and traction engines must be equipped with the most practical spark arresting devices subject to inspection and approval of the Commission.

Seventh. Whereas, The building of fire lines around exposed property including settlements, villages and towns, has proven a most effective means for the control and extinguishment of fires, we recommend, that one of the principal duties of the patrolmen working under the direction of the Commission, should be to establish such fire lines where necessary for protection of property.

Eighth. We recommend, as the most effective measures for preventing and fighting serious fires, adequate means of transportation and communication, to include trails, telephone lines and lookout stations, and that the efforts of the Commission should be exerted toward the construction and establishment of the same as rapidly as consistent.

Ninth. The appalling sacrifice of life and the continued great loss of State and private property resulting from fires in our forested area, are a disgrace to our civilization and a most serious drain upon our natural resources, and we believe that the expenditure of such amount as may be necessary to prevent these losses is fully justified.

We therefore recommend, that the appropriation by the State Legislatures to maintain forest protection should be sufficient to provide for a Forest patrolman for each forty thousand acres requiring protection as well as for the expenses necessary to successfully carry out all of the measures suggested by these resolutions.

Tenth. We recommend, in addition to the Patrol System, an auxiliary County fire fighting force to be appointed by and under the direction of the Commission, to be paid by the State and charged back to the Counties. Such expense to be ultimately borne by the Counties or towns in which the fires occur.

Further Be It Resolved, That as it is shown by statistics that there are a large number of fires set each season through the carelessness of the general public, including campers, fishermen, hunters and others, we recommend, that a campaign of education be energetically carried on through every possible channel to the end that this hazard be reduced through a better understanding of forest conditions by all the people.

It will be noted in the second article of the above resolution the Conference stated that the town fire warden system was totally inadequate and recommended a forest patrol system maintained by the state.

A bill was introduced in the Wisconsin legislature of 1911 to provide for a state forest fire patrol, but the legislature refused to appropriate state funds for this purpose, and the legislative committee changed the bill so that all lands benefited by the patrol would pay a special tax of 2½ cents per acre, per annum. The timberland owners refused to agree to this amendment with

the result that the bill was killed. Wishing to accomplish something, the legislature passed a law providing that town chairmen should act as town fire wardens, and that road supervisors should be deputy town fire wardens. The idea of this law was to place the responsibility for and the cost of, fighting fires directly upon the local community where they occurred. It is only a makeshift, however, and is especially weak and inefficient for the following reasons:

1. Some of the best men in the towns are elected as town chairmen and road supervisors, but because they are good men it does not naturally follow that they have the strength and endurance or the knowledge of how to fight forest fires. The impression seems to prevail that anyone can fight forest fires. Almost any fairly able-bodied man can assist very materially, but the men in charge of the work must know the country thoroughly, and, more important still, must know just where and how to attack the fires. Experienced woodsmen should be in charge of the fire warden system in each town, and not simply some good man who happens to hold an office and upon whom it is easy to assign another duty by law.

2. The towns that have the most timber are always, for that very reason, either without any settlers at all, or else both settlers and roads are very few. Such towns, as a rule, have no road supervisors, and as a result, where the fire warden system should be the strongest it is in fact the weakest, and vice versa.

3. The town chairmen and road supervisors almost never take any action until the fire actually occurs. In other words, the present law makes the same old mistake of providing for fighting fires, but not preventing them. Prevention is the watchword of any successful fire warden system, and this has been proved in every state from the Atlantic to the Pacific. No city of any size would think of being without a fire department, and no town containing a large area of timberlands should be without a strong fire warden system which would devote its efforts in the first place to preventing fires.

Forest Fires in 1911 and 1912.

It is a great pleasure to be able to report that during the forest fire seasons of both 1911 and 1912 there was so much rain and the rain was so well distributed throughout the summer months

that only a few thousand acres in the entire state were burned over, and the losses were almost nothing as compared to recent years. Unfortunately, under the new law of 1911, which makes all town chairmen fire wardens, it has been found impossible to secure enough reports to compile any fairly accurate statistics for the last two years, but enough reports have been received to show that the losses have been very small.

This fine showing is due almost entirely to wet seasons, and compares as follows with the losses in the three years before:

	Acres burned	Loss
1908	1,200,000	$9,000,000
1909	166,751	104,012
1910	892,833	5,000,000

We are now apparently in a cycle of wet years and may have two or three more rainy seasons. But these cycles are not well defined, and therefore we must always be prepared for a dangerously dry season, and because we have been so fortunate in 1911 and 1912 there is the more danger in the next few years.

Some thirty small fires occurred on the state forest reserves in 1911 and 1912, but they were quickly detected and extinguished by the forest rangers and patrols before they did any considerable damage. These wet seasons were taken advantage of to the fullest by building up the permanent protective system of roads, fire lines, lookout towers and telephones on the state forest reserves, but unfortunately almost no protective work has been done on any of the privately owned timberlands of the state, and another dry season will again bring enormous forest losses unless a strong, well organized fire patrol system is built up at once.

Emergency Fund for Fire Fighting.

The state forest reserves after seven years of almost continuous selling of scattered and agricultural state lands, and purchasing non-agricultural lands in the permanent forest reserve area, are gradually being consolidated into fairly solid blocks, and it is a comparatively easy matter to prevent the spread of destructive forest fires in a solid body of timberlands.

The reserves have been divided into districts with a forest ranger in direct charge of the work in each district, and when a fire occurs in the reserves, it is quickly detected by means of the lookout towers, and help is promptly summoned by means of

the telephones, which connect the lookout towers with the Headquarters camp, ranger cabins and nearest towns. As the protective system of roads, fire lines, telephones, lookout towers, etc., is extended to cover all portions of the forest reserve, the danger of a destructive, wide-spread fire, which would get beyond control, becomes less and less, but nevertheless each season has its dangerously dry periods and therefore the Department must have available at all times sufficient funds to fight any forest fires that may occur.

The forest reserve fund into which is paid all the proceeds arising from the management of the forest reserve, is considered first of all as an emergency fire fighting fund, and after a safe reserve has been set aside the balance of the fund is used in purchasing land and for the improvement and protection of the forest reserve.

It is felt that the forest reserves are now fairly safe from destructive fires, and that they will be very well protected in a few years, and also that the forest reserve fund will be a sufficient emergency fund in most cases. Unfortunately, the situation in the northern timbered portion of the state, outside of the forest reserve, is quite different, as there is practically no protective system and the danger of forest fires is very great. The legislature of 1911 provided that all town chairmen should be town fire wardens, and superintendents of highways deputy town fire wardens, and that the expense of preventing or extinguishing forest fires should be borne by the road district within which the expense was incurred. In addition the law provided that in cases of emergency, or where a town has no highway superintendent, or is unusually large, the State Forester might appoint special fire wardens, and that the expense of preventing or extinguishing forest fires by these special fire wardens should be borne on the basis of one-half by the county in which the fire occurred, and one-half by the state. The law continues,

2. No payment shall be made to any claimant under this section until he shall have presented an itemized account, and made oath or affirmation that said account is just and correct, which account shall be approved by the county board, and audited by the county clerk. The county clerk shall thereupon issue to such claimant his warrant upon the county treasurer for the sum to which such claimant is entitled, and the county treasurer shall pay the same.

3. The county clerk shall transmit the original oath and copy of the warrant to the secretary of state, who shall audit such claim, and one-half thereof shall be paid out of the general fund of the state treasury by warrant issued by the secretary of state upon the state treasurer in favor of the county which paid such claimant, and such amount shall be forwarded to the county treasurer of such county. However, no county shall expend more than five thousand dollars under this act in any one year.

From the above it will be clearly seen that it was the intent of the legislature to create an emergency fire fighting fund of $10,000 for each county, but a very bad feature of the law is that the men who are called out to fight fire must wait for their pay until the county board can meet and approve the bills. Anyone who knows lumberjacks knows that they are a very shifting population, who are always hard up, and if they were obliged to wait several months for their pay for fighting fire, they would flee from the next summons as they would from the evil one. In order to be a practical workable law some way must be found to pay men promptly who are called out by the fire wardens to fight forest fires.

It is recommended that the bills should be promptly paid by the state treasurer when approved by the fire warden in charge of the fire and also by the State Forester, and that the state treasurer should collect from each county one-half the expense of fighting forest fires, but that in no case should any county be called upon to pay more than $5,000 in any one year.

Spark Arrester Inspection.

The passage of chapter 494, laws 1911, gave Wisconsin one of the strongest and most practical laws in the country for reducing the number of forest fires set by railway locomotives, donkey, traction and portable engines. The following provisions of the law are worthy of special note:

1. Between March 1st and December 1st all logging locomotives, donkey, traction or portable engines, which are operated in, through or near forest, brush or grass land, and which do not burn oil as fuel, must be equipped with screens or wire netting on top of the smokestack, and so constructed as to give the most practicable protection against the escape of sparks and cinders. "The term logging locomotive as used in this act shall be construed to mean any locomotive operated on a railroad, branch line or division, the chief or main business of which is the transportation of logs, lumber, or other forest products." The great value of this provision of the law will be at once apparent to any forester, as it compels every locomotive which is operated through the forests to be equipped with the oldest, simplest, and yet by far the most effective device for preventing the escape of sparks or cinders, namely, a screen or hood over the smokestack.

Locomotives that are operated on main through lines and that make long runs, could not be equipped in this way, for with the smokestack covered with a hood the front end of the engine would clog up with cinders, and then of course the engine could not steam or pull its load. Therefore the law provides that "all locomotives operated on any railroad other than a logging railroad shall be equipped with the most practicable spark arresters so constructed as to give the greatest possible protection against the escape of sparks and cinders from the smokestacks thereof, and each such engine shall be provided with the most practicable device to prevent the escape of the coals from ash pans, and fire boxes, and such devices between March 1st and December 1st shall at all times be maintained in good repair."

2. The law provides that the superintendent of motive power or equivalent officer on each railroad shall designate an employe of such railroad at each division point and roundhouse, who shall examine each locomotive each time it leaves the division point or roundhouse between March 1st and December 1st, and such employe shall be held responsible for the proper carrying out of the provisions of this section, but without relieving the company from its responsibility hereunder. This provision of the law has proved very effective in keeping the locomotives in proper condition, and also in bringing about real coöperation between the state and the railroads.

3. It will be noted that the law provides that screens or hoods on the smokestacks must give the "most practicable protection" and that spark arresters must be constructed so as to give the "greatest possible protection." The question naturally arises as to who shall decide as to the most practicable device and as will be noted, this is provided for in the following section which is the strongest part of the entire law:

3. Any locomotive inspector designated by the state board of forestry shall have the power to reject from service immediately any locomotive, donkey, traction, or portable engine which, in the opinion of the said inspector, is deficient in adequate design, construction, or maintenance of the fire protective devices designated in sections 1 and 2 of this section, and any such locomotive, donkey, traction, or portable engine so rejected from service shall not be returned to service until such defects have been remedied to the satisfaction of the state board of forestry. In case of disagreement between said inspector and the owner of the locomotive, donkey, traction, or portable engine so rejected from service as to the efficiency or proper maintenance of said protective devices, then the owner of said locomotive, donkey, traction, or portable engine may appeal to the railroad commission of Wisconsin for a decision of said matter, but pending such decision the said locomotive, donkey, traction, or portable engine shall not be returned to service.

Particular attention is called to the fact that any defective engine can be ordered out of service and that it cannot be re-

turned to service until the defects have been fully remedied. This provision of the law is extremely important and is far more effective than the usual fines, for any railroad company that was inclined to disregard the law would be quickly brought to its senses by having its locomotives ordered out of service.

4. Minor though important provisions of the law are:

a. Railroads must provide patrols for duty along their tracks in dangerously dry weather, and if any railroad company fails to provide such patrols after due notice, the State Board of Forestry may employ patrols and the cost shall be charged to the railroad company.

b. Every railroad must at least once every year cut and burn, or remove from its right of way all grass, weeds, brush, logs and refuse material.

c. No railroad company shall permit its employes to deposit fire, live coals or ashes upon their tracks outside of the yard limits, except they be immediately extinguished.

d. Engineers, conductors or trainmen who discover fires along the right of way, or on lands adjacent to the railroad, shall report the same to the agent at the nearest telegraph station. The railroads of Wisconsin have come to realize within the last few years that they are more directly interested in preventing forest fires than any other great industry in the state, and as a result of this realization they are anxious to do their full share in putting a stop to forest fires that are caused by the railroads.

The main causes of railroad fires are sparks, which escape from the smokestacks, and live coals, which are dropped by the ash pans. The Chicago & Northwestern railway has been coöperating with the state for the last three years in an endeavor to perfect a spark arrester which would prove entirely satisfactory in preventing the escape of sparks, and though great progress has been made, complete success has not been secured as yet. It is a comparatively simple matter to get an arrester that will stop a locomotive from throwing sparks, but very difficult to find one that will also allow the engine to steam freely and pull its load.

The State Board of Forestry has a locomotive inspector, who devotes his entire time from March 1st to December 1st to inspecting locomotives in the forest regions of the state, and he is constantly working with the railroad officials to perfect improved devices. Following is a brief summary of his report for 1912:

Spark Arresters.

The Chicago & Northwestern railway now uses the Slater box front end on nearly all of their engines operating in the forest reserve regions. This front end is a big improvement over the old style known as the Master Mechanic front end. Fifteen night runs were made on engines equipped with the box front end, and several on engines equipped with the old style front end. Less sparks are thown from the stack when the box front end is used, and it is estimated that less than five per cent of the sparks are alive when they strike the ground. They are nearly all self cleaners while the old style are not, but the engine crews state that they are harder to steam with than the old style and that they use considerably more fuel.

The Great Northern railway has experimented during 1912 with a new spark arrester which is known as the Cannon or Conical front end. Four night runs were made on engines equipped with this arrester and one night was also spent in the tower at Saunders, Wis., watching 25 engines which passed. Very few sparks are thrown from the stack, and only occasionally would one reach the ground alive. The engine crews do not appear to have any fault to find with this arrester.

A number of other spark arresters are being tested and the necessity for finding the best possible device is so great that the investigations will be continued along all possible lines.

Hoods and Screens.

The Chicago, Milwaukee and St. Paul railway during 1912 has used a very satisfactory hood on all its engines, operated through forest lands. The hood is fastened to the top of the smokestack with a hinge at the back, and at first engineers and firemen were inclined to tip the hood back when they thought there was not much danger from forest fires, but close supervision and the fact that one or two men were laid off by the railroad for doing this, has largely put a stop to this dangerous practice. This is considered to be the best hood in use, the only objection to it being that the cinders are apt to fly back into the engine cab, but in August a device was perfected that overcomes this trouble to a certain extent.

The Chicago & Northwestern railway, early in the summer of 1912 used a hood that did not prove a success as the engines do not steam well after they have been run 8 to 10 miles. Later in

the season another hood was tried which apparently promises to give very good satisfaction.

Some of the smaller railroads and a number of lumber companies used the old diamond stack, with a large top and cone well down in the stack. This type of stack has been found very expensive to keep in good repair, and the front ends sometimes choke up as they collect a lot of cinders. It would appear that an entirely satisfactory hood has not been worked out as yet, but the type of hood that is used by the Chicago, Milwaukee & St. Paul railway is fairly satisfactory.

Ash Pans.

Hopper bottoms. There are many of this type now in use, but frequently a hopper ash pan that is supposed to be in perfect condition is found upon close examination to still allow room for some live coals to fall through. It seems absolutely impossible to make a sliding or tilting door that will not warp or crack and that will always come up tight.

The Chicago, Milwaukee & St. Paul engines are equipped with one of the very best types of hopper ash pans now in use. They are an improved Chicago, Burlington & Quincy railway ash pan and are considered to be a great improvement over the original. The doors open at the ends and are equipped with an automatic latch which is easily opened and which cannot be jarred open. About forty of these ash pans were inspected during the season and only one defective door was found.

The hopper ash pans which were in use by the Omaha railway early in the season of 1912 were found to be a very inadequate type and in bad condition. The many forest fires that occurred along its lines in 1908 and 1910 were undoubtedly very largely caused by these ash pans. In the latter part of July, 1912, this road began to equip its engines with a new ash pan which is known as the swipe pan, and which has a sprinkler blow-out. This type of ash pan gives promise of proving very satisfactory. The following tables show the condition of the engines that were examined during 1912.

LOCOMOTIVE INSPECTION 1912.

Examination.		Condition.					
Date.	Place.	Total no. engines.	Good.	Fair.	Bad.	In shop for repairs.	Ordered out of service till repaired.
Chicago, Milwaukee & St. Paul Railway Company.							
May 23	Green Bay, Wis.	14	8	2	2	2	.....
24	Green Bay, Wis.	24	10	7	4	3	.....
28	Iron Mountain, Mich.	1	1	.....	.....	.....	.....
June 18	Wausau, Wis.	6	3	3	.....	.....	.....
19	Tomahawk, Wis.	11	8	2	.....	1	.....
Aug. 14	Green Bay, Wis.	8	7	.....	1	.....	.....
Sep. 11	Tomahawk, Wis.	10	8	2	.....	.....	.....
20	Portage, Wis.	8	5	1	2	.....	.....
21	Madison, Wis.	7	.....	1	6	.....	.....
23	Watertown Jct., Wis.	4	2	1	1	.....	.....
25	Milwaukee, Wis.	6	2	3	1	.....	.....
Oct. 1	Janesville, Wis.	7	4	2	1	.....	.....
		106	58	24	18	6	.....
Wisconsin & Michigan Railway Company.							
May 21	Peshtigo, Wis.	5	1	1	1	2	.....
21	Peshtigo, Wis. John Marsh. Eng.	5	1	1	.....	3	.....
Aug. 17	Peshtigo, Wis.	1	1		.....	.....	.....
		11	3	2	1	5	.....
Bayfield Transfer Railway Company.							
Apr. 22	Bayfield, Wis.	2	.....	1	1	.....	.....
		2	.....	1	1	.....	.....
Wisconsin Northern Railway Company.							
May 18	Crandon, Wis.	1	1	.....	.....	.....	.....
29	Shawano, Wis.	2	1	.....	.....	.....	1
		3	2	.....	.....	.....	1
Marinette, Tomahawk & Western Railway Company.							
May 1	Tomahawk, Wis.	2	2	.....	.....	.....	.....
June 19	Tomahawk, Wis.	2	1	1	.....	.....	.....
		4	3	1	.....	.....	.....
Lake Superior Terminal & Transfer Railway Company.							
June 29	Superior, Wis.	14	.....	1	10	2	1

Examination.		Condition.					
Date.	Place.	Total no. engines.	Good.	Fair.	Bad.	In shop for repairs.	Ordered out of service till repaired.
	Illinois Central Railway Company.						
Sept. 21	Madison, Wis.	1	.....	1	.....	.....	.....
		1	.....	1	.....	.....	.....
	Chicago, Burlington & Quincy Railway Company.						
Oct. 3	La Crosse, Wis.	7	6	1	.....	.....	.....
		7	6	1	.....	.....	.....
	Northern Pacific Railway Company.						
June 22	Ashland, Wis.	2	.....	1	1	.....	.....
		2	.....	1	1	.....	.....
	Duluth, South Shore & Atlantic Railway Company.						
June 29	Superior, Wis.	1	.....	1	.....	.....	.....
July 5 & 6	Thomaston, Mich.	3	3	.....	.....	.....	.....
		4	3	1	.....	.....	.....
	Green Bay & Western Railway Company.						
May 24	Green Bay, Wis.	16	.....	9	5	2	.....
Aug. 15	Green Bay Wis	11	3	.....	4	4	.....
26	Grand Rapids, Wis.	3	.....	1	1	.....	1
		30	3	10	10	6	1
	Yawkey Bissell Lumber Company.						
May 10	Arbor Vitae, Wis.	1	.....	1	.....	.....	.....
June 5	Tomahawk, Wis.	1	.....	1	.....	.....	.....
July 12	Arbor Vitae, Wis.	3	2	.....	1	.....	.....
Aug. 2	Arbor Vitae, Wis.	3	1	2	.....	.....	.....
		8	3	4	1	.....	.....
	Omaha Railway Company.						
Apr. 19	Ashland, Wis.	2	.....	1	1	.....	.....
June 22	Ashland, Wis.	5	5	.....	.....	.....	.....
Apr. 19	Spooner, Wis.	12	7	4	1	.....	.....
Apr. 20	Itasca, Wis.	10	3	6	1	.....	.....
July 18	Itasca, Wis.	5	3	2	.....	.....	.....
Apr. 22	Washburn, Wis.	1	1	.....	.....	.....	.....
July 26	St. Paul, Minn. W. End Shop	4	3	1	.....	.....	.....
	St. Paul, Minn. E. End Shop	7	4	1	2	.....	.....

Examination.			Condition.					
Date.	Place.	Total No. engines.	Good.	Fair.	Bad.	In shop for repairs.	Ordered out of service till repaired.
	Omaha Railway Company—Continued.						
July 27	Altoona	17	9	3	2	1	2
Aug. 27	Marshfield, Wis	1	.....	.....	1	.....	.....
Oct. 4	Wyeville, Wis	2	1	.....	1	.....	.....
		66	36	18	9	1	2
	M. St. P. & Sault Ste. Marie Railway Company.						
June 3	Rhinelander, Wis	3	1	.....	2	.....	.....
21	Ashland, Wis	13	4	2	2	5	.....
27	Superior, Wis	15	6	4	4	.....	1
July 16	Superior, Wis	11	9	.....	2	.....	.....
18	Weyerhaeuser, Wis	6	3	1	2	.....	.....
27	Chippewa Falls, Wis	7	7	.....	.....	.....	.....
27	Shoreham, Minn	35	25	8	2	.....	.....
Aug. 23	North Fond du Lac, Wis	18	16	2	.....	.....	.....
27	Stevens Point, Wis	13	11	2	.....	.....	.....
		121	82	19	14	5	1
	Chicago & Northwestern Railway Company.						
May 18	Antigo, Wis	8	5	2	.....	1	.....
21	Marinette, Wis	2	2	.....	.....	.....	.....
25	Green Bay, Wis	40	18	12	7	2	1
28	Iron Mountain, Mich	1	1	.....	.....	.....	.....
28	Strambaugh, Mich	5	2	3	.....	.....	.....
29	Wabeno, Wis	1	.....	.....	1	.....	.....
June 10	Watersmeet, Mich	5	.....	.....	5	.....	.....
21	Ashland, Wis	10	8	1	1	.....	.....
Aug. 6	Antigo, Wis	14	10	3	1	.....	.....
7	Eland Jct., Wis	6	4	.....	2	.....	.....
16	Green Bay, Wis	17	9	2	1	5	.....
20	Marinette, Wis	1	1	.....	.....	.....	.....
21	Kaukauna, Wis	7	5	.....	.....	2	.....
24	North Fond du Lac, Wis	14	10	2	2	.....	.....
27	Marshfield, Wis	5	4	.....	1	.....	.....
Sept. 21	Madison, Wis	5	3	2	.....	.....	.....
23	Baraboo, Wis	6	4	1	1	.....	.....
23	Watertown Jct., Wis	2	2	.....	.....	.....	.....
26	New Butler, Wis	10	3	2	5	.....	.....
Oct. 1	Janesville, Wis	13	8	3	1	.....	1
2	Galena, Ill	3	1	2	.....	.....	.....
4	Wyeville, Wis	7	5	1	1	.....	.....
5	Wausau, Wis	3	2	.....	1	.....	.....
		185	107	36	30	10	2
	Great Northern Railway Company.						
July 2	Allouez, Wis	5	.....	5	2	.....	.....
3	Superior, Wis	17	6	3	6	.....	2
17	Allouez, Wis	9	2	3	4	.....	.....
18	" "	10	1	4	5	.....	.....
18	Superior, Wis	22	5	8	3	6	.....
		63	14	21	20	6	2

Logging Railways.

Examination.		Condition.					
Date.	Place.	Total No. engines.	Good.	Fair.	Bad.	In shop for Repairs.	Ordered out of service till repaired.
1912.							
Apr. 30	Buswell Lbr. Co., Buswell, Wis.	1	.....	.....	1	.....	.....
May 11	Vilas County Lbr. Co., Fosterville, Wis.	1	.....	.....	1	.....	.....
13	Brown Bros. Lbr. Co., Rhinelander, Wis.	1	.....	1	.....	.....	.....
17	Hackley-Phelps-Bonnell Lbr. Co., Hackley, Wis.	2	.....	.....	2	.....	.....
17	Keith & Hiles Lbr. Co., Crandon, Wis.	1	1	.....	.....	.....	.....
17	Forster-Mueller Co., Hiles, Wis.	1	.....	.....	1	.....	.....
28	Menomonee Bay Shore Lbr. Co., Wabeno, Wis.	1	1	.....	.....	.....	.....
June 19	Roddis Lumber Co., Park Falls, Wis.	2	1	1	.....	.....	.....
19	Mellen Lumber Co., Glidden, Wis.	1	1	.....	.....	.....	.....
20	Atwood Lumber Co., Park Falls, Wis.	7	.....	1	6	.....	.....
20	Foster-Latimer Lumber Co., Mellen, Wis.	2	1	1	.....	.....	.....
Aug. 29	Rib Lake Lumber Co.	4	2	.....	.....	.....	2
		24	7	4	11	.....	2

SUMMARY OF LOCOMOTIVE INSPECTION.

No.	locomotives examined	651	100%
"	in good condition	327	50%
"	in fair condition	145	22%
"	in bad condition	126	19%
"	in shop for repair	41	7%
"	ordered out of service	12	2%

County and Town Forests.

Chapter 77, laws of 1909, authorizes any town board to acquire by purchase or otherwise, a sufficient tract of land to use and maintain as a woodlot, and to preserve and reforest the same under regulations approved by the State Board of Forestry. It is estimated that in northern Wisconsin there are from twelve to thirteen million acres of wild and uncultivated land. Of this amount it is estimated that fully ten million acres are suitable for agriculture and will eventually be cultivated. This leaves, then, about three million acres of land in the twenty-two most northern counties of the state that are unfit for agriculture, and that must be depended upon to produce a large part of the future forest products of the state. It will probably be impossible for the state to ever acquire all of this land and place it under forestry management, and even if it could do so it would not be well for the state to attempt to own and manage many of the smaller and more isolated tracts of forest land. The state will have all it can do for many years to come to manage the large forest reserves upon the headwaters of the Wisconsin and

Chippewa rivers, and the counties and towns should acquire the smaller tracts.

This is a comparatively new idea in America, but in Germany, France, Norway, Sweden, Switzerland, and other European countries there are many communal forests and even city forests. These have almost universally proved most successful and in many instances the revenue from the communal forests has been sufficient to pay all taxes and to build splendid roads.

If the towns and counties in northern Wisconsin will gradually acquire the non-agricultural lands, at reasonable prices, and then place them under forestry management, they will find that they will secure an increasing revenue, provide work for many of their settlers during the winter months, and not only retain but add to the number of their small wood-using industries.

Closer Utilization of Forest Products.

The Forest Products Laboratory, located at Madison, Wisconsin, which is a branch of the United States Forest Service, is especially organized and equipped to study all the various problems connected with the closer utilization of forest products. The following summary of the report of Mr. H. S. Betts of the Laboratory force, illustrates only some of the chief results accomplished by the Laboratory along lines that are of especial interest to the wood users of Wisconsin.

WOOD PRESERVATION.

Conditions in Industry.

Number of railroad ties used for new track in 1910..	22,255,000
Number of railroad ties used for replacements in old tracks	125,976,000
Value of railroad ties used for replacements in old tracks	$64,200,000
Proportion of ties treated in 1910	20%
Annual saving possible by treating ties, poles, posts, piling, mine timbers, shingles, and lumber exposed to weather	
Material	6,000,000,000 bd. ft.
Value	$71,700,000

Problems of Industry.

(1) To bring the advantages of wood preservation to the attention of wood users.

(2) To determine the best methods of treating various woods.

(3) To determine the merits of various preservatives.

(4) To determine the best methods of operating various types of plants.

(5) To determine a method of rendering wood fireproof.

Work Done by Products.

(1) Tests to determine the life of both treated and untreated material are being carried on in coöperation with railway companies, cities (paving blocks), telephone companies, and mine companies. It has been shown that the life of wood used in exposed situations or in contact with the soil or water can be increased at least three times by treatment with preservatives. Forty-two sets of test material in various parts of the country are inspected at regular intervals by Products and the results published from time to time. Information of this sort shows definitely the saving in both material and money due to preservative treatment. In one instance the installation of a small treating plant by a coal company reduced their annual consumption of timber to one-half of the amount previously required, though only part of the timber used was treated.

(2) The Service has designed some twelve wood preserving plants for wood-using companies and assisted in the design and preliminary operation of many others. The industry is now well established. A large amount of information on the best methods of treating certain woods, of operating various types of plants, and of handling certain preservatives is being constantly supplied in reply to inquiries. In 1904 there were 30 plants in operation, while in 1910 there were 84. From 1909 to 1910 there was a gain of over 45 per cent in the quantity of material treated annually.

(3) Tests have shown that many woods of comparatively little value, such as loblolly pine of the Southeast, jack pine of the Northeast, and lodgepole pine of the Rocky Mountain states, can be easily treated with preservative and are suitable for ties. The use of these pines for tie purposes has doubled in the last five years.

(4) Tests have been made on 23 preservatives, including creosotes and salt solutions, to determine their properties, such as effectiveness in checking the growth of fungus, ability to penetrate into wood, effect on the strength of wood and permanency. As from 50 to 75 per cent of the cost of treating is for the preservative, accurate data to guide a selection are important. Such tests have shown the necessity of careful analysis and grading of the creosotes used as wood preservatives, and laboratories have been established by the largest water-gas tar company in the United States and by one of the largest creosote companies for the better handling of their wood preservatives.

(5) As a result of tests to show the possibilities of treated loblolly pine for pole construction a plant has been constructed in the South and is operating on this species.

(6) Tests to show the advantages of treating silo timber have resulted in silo companies furnishing treated material.

(7) The results of investigations of the treatment of paving blocks have been utilized by the city of Chicago in drawing up specifications for city pavements.

(8) The specifications for wood preservatives adopted by the American Railway Engineering and Maintenance of Way Association and by the National Electric Light Association are based on work done by Products in analyzing and grading preservatives.

(9) The methods of treating poles by the brush and open-tank process adopted by the National Electric Light Association are based on the recommendations of Products.

MECHANICAL TESTS OF WOOD.

Conditions in Building Trades.

Amount of wood used in 1910	20,000,000,000 bd. ft.
Value of wood used in 1910	$300,000,000

Problems of Industry.

(1) To determine the strength of woods commonly used for structural purposes and the effect of defects, such as knots, checks, and shakes, on the strength.

(2) To determine for comparative purpose the mechanical properties (strength, stiffness, hardness, toughness, shrinkage, swelling, etc.) of woods grown in the United States in the form of small, clear pieces.

(3) To show the relative strength of standard woods and proposed substitutes in the form in which they are used, such as boxes, spokes, axles, poles, mine timber, etc.

Work Done by Products.

(1) The grading rules for structural timber formulated by the American Railway Engineering and Maintenance of Way Association, and also the rules formulated by the American Society for Testing Materials, are based largely on the results of tests made by Products.

(2) The National Association of Hickory Manufacturers incorporated the results of a series of tests on red and white hick-

ory wagon spokes in their grading rules, allowing red hickory to appear in higher grades than before, thus making better use of material that was formerly considered inferior.

(3) The portion of the new building laws for New York City that relates to wooden construction is based largely on the results of Products tests.

(4) Tests made by Products on telephone poles of various species have shown that woods heretofore considered unsuitable have the requisite strength for pole purposes. The tests have resulted in the increased use of lodgepole pine and Engelmann spruce in the West as substitutes for the less plentiful and higher priced cedar.

(5) Formerly timbers cut from trees tapped for turpentine were thought to be weaker than timbers from untapped trees, and only unboxed timber was accepted. This discrimination has caused a waste of about thirty-seven billion board feet of longleaf pine timber, valued at $111,000,000. Tests made by the Forest Service have shown that tapping trees for turpentine has no effect on the strength, and the use of boxed timber is becoming general.

(6) Tests on packing boxes of various types, including boxes with and without battens, dove-tailed boxes, and wire-bound boxes, have shown wire-bound boxes to be the most economical form of construction. These results effect the use of some 4,000,000,000 bd. ft. of material. The tests have resulted in the revision of the specifications of the Interstate Commerce Commission for boxes used in shipping explosives.

(7) Tests on shortleaf pine and white cedar cross-arms in standard sizes have shown these species to possess ample strength for this purpose, as well as the commonly used species, Douglas fir and long leaf pine.

(8) Tests on California tanbark oak have shown it to be entirely suitable for many purposes for which eastern oak is used. Approximately 400,000,000 bd. ft. of tanbark oak have been left in the woods to decay after the bark was removed for tanning purposes. Tanbark oak flooring was used in one of the large hotels recently rebuilt in San Francisco.

(9) The practice of steaming timber before preservative treatment has been practically abandoned as a result of tests that showed the strong possibility of weakening the timber and also that air seasoning was preferable to steaming as a means of rendering timber more easily treated.

WOOD PULP.

Conditions of Industry.

Number of paper mills in the United States in 1909..	787
Value of products	$267,869,000
Wood used for pulp	4,000,000 cords
Annual sawmill waste suitable for pulp (Slabs and edgings)	5,000,000 cords

Year.	Proportion of spruce used.	Proportion of spruce imported.	Cost of spruce per cord.		Imports of pulp.	Exports of pulp.
			Domestic.	Imported.		
	per cent	per cent			Tons.	Tons
1900..	76	23	$4 80	$6 50	82,000	14,000
1909..	60	32	9 30	11 30	307,000	10,000

Problems of Industry.

(1) To find satisfactory substitutes for spruce.

(2) To determine the paper-making possibilities of species not now used.

(3) To find methods adapted to making paper from the waste of sawmills and other wood-using industries.

(4) To find methods of raising the yield and quality of pulp obtained in average practice.

Work Done by Products.

(1) Tests have shown that pulps of commercial value suitable for use in the manufacture of news and wrapping paper can be made by the sulphite process from eight species of native woods, several of which grow in large quantities on the National Forests. Some of these woods are now used to a limited extent, others not at all. Mills have started to use red fir, white fir, and lodgepole pine. Other species are under investigation.

(2) Tests have shown that three native species, jack pine, tamarack, and hemlock, of which large quantities are available in the Lake States, can be satisfactorily substituted for spruce in the ground-wood process in making the cheaper grades of paper such as news and wrapping. Several mills have begun grinding these woods. A number of western woods are now being tested.

(3) Tests have shown that pulps suitable for book or wrapping paper can be made from 12 new species of native woods by

the soda process; several other native species show commercial possibilities as soda pulpwoods. One mill that will operate on western yellow pine is in course of construction in the Southwest.

(4) Tests have shown that the highest grades of "Kraft" paper can be made from longleaf pine by the soda and sulphate processes. Three paper mills in the Southeast are now using longleaf pine, a fourth is under construction, and plans are under way for a fifth.

(5) A number of methods of increasing the yield of pulp from the raw material without decreasing the quality of the product have been found.

(6) Tests by the sulphate process, now little used in the United States, have shown especial possibilities as a means of making paper from mill waste. A number of mills are now operating on waste.

DRYING LUMBER.

Conditions of Industry.

Amount of lumber dried or seasoned before use 1911	30,000,000,000 bd. ft.
Proportion of waste in drying conifers	3%
Proportion of waste in drying hard woods	10%
Value of material wasted in drying	$21,375,000

Problems of Industry.

(1) To find methods of drying or seasoning lumber that will reduce the present waste.

Work Done by Products.

A kiln has been designed which has shown greater efficiency than is the case in average practice. A carload of water oak wagon felloes furnished by a large vehicle manufacturing company, and claimed by them to be of little value because they could not be seasoned without checking and warping, were dried with a loss of only 2 per cent of the material. A kiln of the new type has been constructed in coöperation with a California lumber manufacturing company, and another one is being built in coöperation with a hickory manufacturing company in Illinois.

WOOD DISTILLATION.

Conditions in Industry.

Wood used in 1910	1,452,000 cords
Value of raw materials	$4,728,000
Value of products	$9,600,000
Number of distillation plants	147

Wood for distillation is used in the form of cordwood, small pieces, and to some extent as sawdust. The products are acetate of lime, wood alcohol, turpentine, pine oils, and charcoal.

Problems of Industry.

(1) To investigate the possibilities of wood not used at present.
(2) To find methods of raising the yields and quality of the products.
(3) To find methods of using the waste from wood-using industries in distillation plants.
(4) To secure information that will make possible more uniform standards in grading wood distillation products.

Work Done by Products.

(1) In hardwood distillation over 90 per cent of the material used is beech, birch, and maple, and practically no attempt has been made to utilize other species. Tests made by Products have shown that commercial yields of acetate of lime and wood alcohol can be obtained from hickory, oak, tupelo, and red gum. Mill waste consisting of oak and red gum is now being used by at least one plant.

(2) Commercial methods used in hardwood distillation are generally crude and only part of the possible products are obtained. Tests have shown that it is possible to increase the yield of acetate of lime 50 per cent over present practice. This means a possible annual increase in the amount of acetate of lime produced from the same amount of raw material of over 38,000 tons.

(3) Steam distillation as an industry is still in an experimental stage. Methods of operation vary widely. The Service has made tests to show the effect of varying conditions in the steam distillation process on the yield and cost of operation. This information has been of service to operators in standardizing methods and raising the efficiency of their processes.

(4) The American Chemical Society, the American Society for Testing Materials, the Navy Department, and the Isthmian Canal Commission have used the results of tests made by Products in formulating specifications for wood turpentine.