

State of New Hampshire

BIENNIAL REPORT

OF THE

Forestry Commission

FOR THE YEARS

1915 - 1916

Concord
November, 1916

MANCHESTER, N. H.
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REPORT.

To His Excellency the Governor and the Honorable Council:

In making its report for the two years ending August 31, 1916, the Forestry Commission is mindful of the deep public interest in forestry which has long existed in New Hampshire, making possible the good work of former commissions and giving active, intelligent support to the present board in all parts of the state.

The first Forestry Commission in New Hampshire was authorized by the General Court of 1881. This commission made an investigation of forest conditions and published a report in 1885, written by the late Hon. Joseph B. Walker, which gives a careful record of forest conditions and recommends many public measures which have now been adopted.

A second commission was appointed in 1889 and there has been one ever since, although not placed on its present basis until 1909. Much credit is due these early commissions for encouraging the public interest in forestry and for the excellent technical papers which were published. From 1903 to 1908 three reports were made in coöperation with the U. S. Forest Service. The first was a detailed study of forests in Northern New Hampshire by A. K. Chittenden with special reference to spruce. The second was a bulletin of forest conditions in Central and Southern New Hampshire made by C. A. Lyford and Louis Margolin, with volume and yield tables for white pine. Good forest maps for the entire state were made with these reports. The third was made by J. H. Foster, covering the subject of forest taxation.

All of these reports recommended the establishment of a forestry department under the commission, with a state forester in charge. A law providing for this was enacted in 1909 and the scope of the department gradually extended until now it embraces fire protection, reforestation, acquisition and management of state forests, and many educational and special projects. During these years the commission has had valuable coöperation with the Society for the Protection of New Hampshire Forests, the New Hampshire Timberland Owners Association, the United States Forest Service, the United States Bureau of Plant Industry, the New Hampshire State College and Experiment Station, the States of Maine, Massachusetts, Vermont and the Province of Quebec, and with many other public and private corporations and societies.

This report sets forth the work that has been done in each branch of the service during the two years ending August 31, 1916. Important points are condensed under the following synopsis and summary of recommendations.

SYNOPSIS.

Fire Protection.

Three new lookout stations have been built, making 27 in all now owned by the state. Of these 19 are now operated by the Federal Government under the Weeks Act. From all the stations 785 fires have been discovered and reported to the fire wardens. A special alidade, an instrument devised by men in the department for making panoramic drawings, is responsible for superior fire detection maps. In addition to regular duties the watchmen have built 7 new towers and done a large amount of improvement work on state **forests.**

The New Hampshire Timberland Owners Association has continued its valuable patrol work; 23 fires were extinguished and over 4,000 persons in the woods were warned to be careful with fire. The association protects much adjoining timberland and has reduced the fire damage for the whole northern part of the state. The region in which it has operated represents over 30 per cent of the timberlands of the state. Since the association began work in 1911 this region has had only about 16 per cent of the fire damage for the whole state. Its patrolmen have put out 500 incipient fires and warned more than 16,000 persons.

Railroad companies have been generally more careful and have caused less damage. Better engine inspection and more patrols following trains are largely responsible. Portable steam sawmills on the other hand have been worse than usual; in 1916 they caused over 50 per cent of all the forest fire damage in the state.

The slash disposal law has worked well along railroads where it has been in force several years, but is not yet working to entire satisfaction in all localities along highways. The latter provision has been in force only about a year. There is an increasing demand for the cleaning of slash strips where cut-over land abuts valuable growth.

Town fire fighting work has been aided by the personal supervision of the district chiefs, and by 43 local fire warden conferences where much educational work was done both in fire protection and in general forestry. The work of the forest fire wardens and deputies is improving constantly throughout the state. During the past five years the average cost of putting out a forest fire has dropped from \$53.47 to \$39.16; and for the past two years 83 per cent of the fires handled by them were extinguished with less than 25 acres per fire burned over.

Reforestation.

The operation of the new law to encourage reforestation has proved very successful; 11 tracts aggregating 231 acres have been deeded to the state. On these tracts 107,450 trees have been set. Planting operations were inaugurated on a large scale on state forests, 286,380 trees being set. Thus, since the new law became effective September 1, 1915, 393,830 trees have been planted on state land, representing about 330 acres.

The state forest nursery has supplied the 393,830 trees planted on state land, sent 263,500 trees to towns and cities for reforesting, distributed 412,808 trees to private owners and furnished 3,000 trees for planting along roads and around rural schools.

Public Forests.

The total area of National Forests in the White Mountains has increased to 350,000 acres.

Two state forests have been received by gift, each of about 50 acres—the Joseph B Walker State Forest in Concord, and the Sugar Hill State Forest in Bristol. Both will be valuable demonstration areas. By purchase 12 state forests have been acquired aggregating 1,316 acres. The average price paid was \$4.29 per acre. A total of 21 state forests aggregating 9,115 acres are now managed by the commission. The value of the growing timber on these tracts (exclusive of the Crawford Notch) is well over \$20,000. Planting and improvement work on each tract is detailed in the report.

A municipal forest of 198 acres has been accepted by the town of Hollis through the will of the late Silas M. Spalding. Planting and improvement work has been started under the supervision of the state forester. There are 10 other towns and cities owning forests. The

total area of such tracts is 5,131 acres. On 6 forests active improvement work is being carried on. The merchantable forest is being rapidly depleted and the burden of waste land is increasing throughout the state. It is the aim of the commission to administer the state and town forests in such a way that a large amount of the waste non-agricultural land will be brought into valuable forest growth.

Educational and Special Projects.

The educational feature has been emphasized in all work of the department; over 10,000 communications are sent out annually, 42 special lectures have been given and a large number of woodlots examined.

Coöperation has been carried on with New Hampshire College and the Society for the Protection of New Hampshire Forests for bringing up to date the investigation on forest taxation made in 1907 by J. H. Foster.

The most important project this year has been field work carried on in coöperation with the U. S. Bureau of Plant Industry and Agricultural Experiment Station on the white pine blister rust. This very dangerous disease has been found generally through the white pine region of the state and constitutes a serious menace. Drastic action must be taken if the white pine is to be saved.

Educational work has been carried on with towns looking toward the careful thinning of roadside growth and the planting and care of young trees. Besides 3,000 trees sent from the state nursery for planting along country roads, larger trees have been bought by the commission and sent at cost for city planting.

RECOMMENDATIONS.

The measures recommended for improving the forestry work of the state are here grouped under the captions used in the synopsis.

Fire Protection.

It must be remembered that fire protection is not an end in itself, but that if well done it is one of the important means of creating a condition in which an investment in growing timber will be safe, whether made by a private owner, a town or the state itself. Careful investigations show that the heaviest fire damage is to the immature crop (the future timber supply) where there is no salvage. As yet there is not in general use any system of insurance for growing timber such as other forms of property enjoy, and no such system can be made practical unless buttressed by a strong public policy favoring protection. With the coöperation of the government, the state, the towns, woodland owners, railroads and other private interests, such as is now being worked out, a condition of general safety may be not far off in New Hampshire. For the immediate progress of this work during the next two years the commission offers the following recommendations:

1. That the fire lookout service be extended to all important timber areas that are not now covered; and that coöperation be re-established with the U. S. Geological Survey for the completion of the topographic quadrangle sheets for all parts of New Hampshire.

2. That active coöperation be continued with the Federal Government and other public agencies; the New Hampshire Timberland Owners Association and other woodland owners; and with railroad companies.

3. That the coöperation with towns be extended, especially toward securing in rural communities better fire fighting equipment (such as that described on Page 38), and arranging for coöperative patrol of dangerous localities and supplementary lookout service during extreme drought; that in order to aid wardens in prompt financial accounting a legal time limit be set within which expenses incurred by fire fighters must be rendered; and that consideration be given to appropriating the fire fighting fund for more than one year.

4. That the general educational work on fire prevention be continued and the feature of local conferences for fire protection and general forestry be extended. It would be advantageous if the appropriation for this work could be biennial instead of annual.

5. That authority be given for using town wardens, deputies and regular employees, such as lookout watchmen and patrolmen, for improvement work on town and state forests and for general forestry work in their respective communities in so far as this work can be co-ordinated advantageously with other town and state work.

6. That consideration be given to the licensing of portable steam sawmills in order to make careless operators more responsible to the town fire wardens for the condition of their spark arresters; and that consideration be given to the compulsory clearing of lumber slash or strips abutting growing timber, the expense of such clearing to be shared by the abutter who registers the complaint.

Reforestation.

It is recommended:

1. That the reforesting of state forests and tracts deeded to the state under the new law be increased.

2. That the state forest nursery be developed for the following special purposes:

To raise trees for planting on state forests and deeded tracts.

To encourage towns and cities in reforestation by furnishing them trees at nominal prices.

To furnish trees to beginners in forest planting work, encouraging more private owners to reforest waste land, turning over to commercial nurseries the larger planting operations of owners who have gained experience.

To raise shade and ornamental trees for planting along country roadsides and around rural schools.

To carry on experimental work in planting on the land adjoining the nursery, and establish a headquarters for all field men of the department. This would promote efficiency by providing steady work between other jobs.

To carry out these purposes the most imperative present need is a building to serve as a barn, shop and packing house.

Public Forests.

It is recommended:

1. That the acquisition of state forests be increased in so far as purchases can be made to advantage; the state forests to serve the following purposes:

To educate woodlot owners in the practice of forestry by demonstration, cooperate with adjoining woodlot owners in forest management and the sale of forest products.

To make waste land productive and furnish a residual timber supply to maintain local forest industries.

To protect the higher lands south of the White Mountains from rapid water run-off, prolonging stream flow and reducing erosion.

To develop the recreational features in so far as they do not interfere with timber production.

To make such tracts financially profitable and build up the revenues in localities where much waste land exists.

2. That acquisition of town forests be encouraged

and substantial assistance be given them in managing woodlands. If necessary some plan of sharing the revenue between the town and state may be worked out.

3. That the income received from National Forests and payable to the counties under the Weeks Act be distributed among the towns from which these federal lands were withdrawn from taxation.

Educational and Special Projects.

It is recommended:

1. That educational work among woodland owners be continued and extended, particularly in connection with any state forest tracts or planting areas.

2. That provision be made for the Professor of Forestry at New Hampshire State College to conduct investigations on important forestry problems.

3. That control of the white pine blister rust be undertaken by authorizing the commission to declare currant and gooseberry bushes pests in localities where the blister rust exists and that adequate funds be provided for eradication.

4. That the commission be authorized to hold examinations for registered arborists, and grant certificates to such persons as pass examinations creditably.

W. R. BROWN,
JASON E. TOLLES,
GEO. B. LEIGHTON,
Forestry Commission.

E. C. HIRST,
State Forester.

THE FOREST FIRE SERVICE.

FOREST FIRE DAMAGE AND COSTS.

Fire Seasons of 1915 and 1916.

The two years covered by this report (September 1, 1914, to August 31, 1916,) have witnessed extremes in weather conditions and in consequent safety and hazard to forest property. During the first fiscal year there was in most sections of the state from four to five months of extreme fire danger. The fall of 1914 and the spring and early summer of 1915 were very dry, and high winds were frequent. About July 1, 1915, heavy rains relieved the situation, and from then on throughout the summer frequent rains prevented the danger from becoming acute. The total damage was nearly \$175,000.

During the fiscal year beginning September 1, 1915, there was a shorter danger period. That fall had enough rainy weather to prevent any serious damage; but a period of very extreme danger came in May, 1916, varying from ten days to three weeks in different parts of the state, when extremely high winds resulted in considerable damage. The rest of the year there was only small damage between spells of rainy weather. The total damage was only about \$53,000.

The following tables show the number of fires, acreage burned, damage, and cost of fighting forest fires for the past two years.

TABLE I.
FOREST FIRE DAMAGE, 1915, 1916.
(EXCLUSIVE OF RAILROAD FIRES.)

Fiscal year.	No. fires reported.	Acres burned.	Damage.	Cost of fighting.
1915	792	29,480	\$174,567	\$32,967.72
1916	128	6,680	40,075	5,013.08

TABLE II.
TOTAL DAMAGE.

Year.	Railroad fires.	Fires from other causes.	Estimated total.
1915	\$37,000	\$174,567	\$211,567
1916	13,000	40,075	53,075

Cost of Fire Fighting.

From the above tables is apparent what a great difference in the damage and cost of fighting forest fires occurs in two years of different general weather conditions. In the fiscal year ending August 31, 1915, the acreage burned and the damage were almost five times as great as in the year following. In the former year the appropriation of \$7,500 for paying the state's share of fire fighting bills was insufficient, and it was necessary for the Governor and Council to use over \$8,000 of their contingent fund to meet the unforeseen emergency caused by the numerous severe fires. In the latter year, however, the short period of dry weather caused much less expense, and enabled the department to turn back nearly \$5,000 of the fire fighting appropriation. In this connection it would be worth while to consider whether or not the fire fighting fund might better be appropriated for more than one year, so that an amount saved in a wet year would be available in a dry year.

One particularly significant and encouraging feature of the forest fire service is the smaller public cost of extinguishing the average forest fire. When the forestry

department was established on its present basis in 1911, a year of extreme fire danger, the average cost of extinguishing a forest fire by the town fire wardens and deputies was \$53.47. This has been carefully calculated for the same class of fires each year since, and has been from \$12 to \$18 less per fire. During the fiscal year 1916, the average cost was \$39.16, or more than \$14.00 less than was the case previous to the present organization, and this is about the average reduction. Since there have been approximately 2,200 fires handled by the town wardens and deputies in the past five years, an average saving of \$14 per fire represents a saving of over \$30,000 in public expenses. This may be due in some measure to the large amount of educational work that has been done by the department during these years, but such work is more effective in the prevention than in the extinguishment of fires. It is more likely due to the quicker notification of fires from the fire lookout stations, prompter action and better handling of men by the fire wardens and deputies, and to the work which the district chiefs have done in organizing the towns to fight fires more effectively.

Fire Damage.

While there is a great difference between the two fiscal years in acreage burned and damage, it is significant that in both years a large part of the damage was caused by a few fires. In 1915, 18 fires were responsible for over 40 per cent of the total damage. In 1916, 7 fires were responsible for more than 54 per cent of the total damage. For the two years more than 83 per cent of all the fires handled by the town fire wardens and deputies were put out with area burned of not over 25 acres per fire and from this down to a few square feet. Only 7 per cent of all such fires reached \$500 damage. This

shows great improvement and is encouraging, but the proportional area of woodlands in New Hampshire is so great and the causes of fires are so constant, that a period of protracted drought is likely to result in some fires of large proportions, even with the most vigilant care.

MOUNTAIN LOOKOUT STATIONS.

New Stations Constructed.

During the past two years three new lookout stations have been built as follows: Crotched Mountain in Frankestown, Smarts Mountain between Lyme and Dorchester, Pitcher Mountain in Stoddard. A new station is being equipped this fall on Mt. Shaw in Moultonborough, the telephone line being connected with a 60 foot tower built by Mr. T. C. Plant, who has given the forestry department the use of the tower for lookout purposes. The remaining 6 stations built by the New Hampshire Timberland Owners Association have been taken over by the state. There are now 27 lookout stations operated throughout the fire season besides 3 temporary stations, which are used only in time of extreme fire danger.

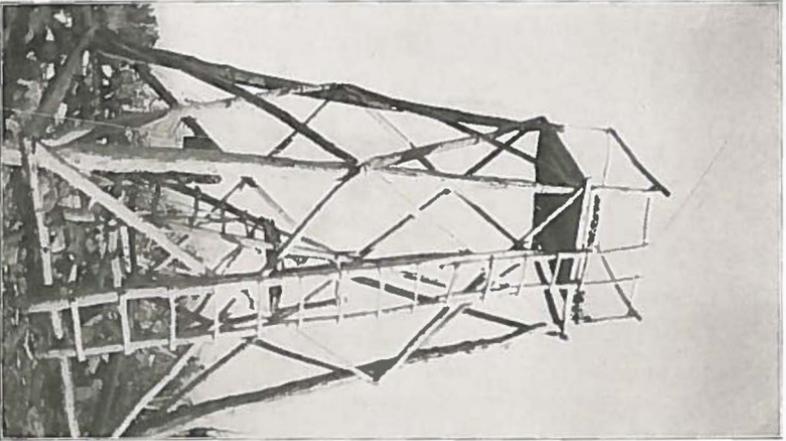
Only a few more stations will be necessary to complete the observation of nearly all woodland areas of importance in the state. The most important localities which should be covered by new stations are:--1. The southern part of Grafton and northern part of Sullivan Counties; 2. The southwestern part of Cheshire County; 3. The eastern part of Merrimack County; 4. The southeastern part of Rockingham County. Stations will be built covering these regions as soon as available funds and general conditions will permit the work to be done to the best advantage.

Operation of Stations.

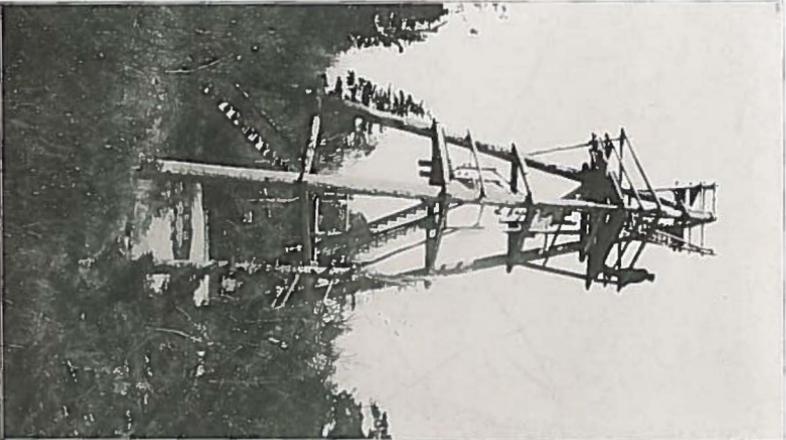
Of the 27 stations operated during the past two years, 19 have been paid for by the Federal Government under the terms of the Weeks Act, \$6,500 being allotted to New Hampshire for coöperation in protecting from fire the forested watersheds of navigable streams in the state. This money is used exclusively in paying the wages of the lookout watchmen. It is on account of this substantial federal assistance that the forestry department is able to use the state funds to make many important improvements in the lookout service, and is gradually completing and perfecting the service for the whole state. Besides the new lookouts mentioned above, new and improved watch towers have been built on the following 6 stations: Deer Mountain, Magalloway Mountain, Cabot Mountain, Pine Mountain, Carter Dome, Black Mountain (Benton), and a new steel tower has been built on Blue Job Mountain. Photographs of three types of lookout towers are shown opposite page 18. The record of fires discovered from lookouts is shown in the following table:

TABLE III.
FIRES DISCOVERED FROM LOOKOUT
STATIONS.

Fire District.	SEASONS OF 1915 AND 1916.		Total.
	Fires Discovered.		
	YEAR.		
	1915.	1916.	
North District (8 stations)	94	19	113
East District (5 stations)	40	12	52
West District (5 stations)	124	28	152
South District (9 permanent stations and 3 temporary)	263	205	468
Totals	521	264	785



Peter Point
Garter-Homes



Mt. Shaw.
THREE TYPES OF LOOKOUT TOWERS.



Blue Job.

Use of Lookout Watchmen for Other Work.

Besides the discovery and reporting of 785 fires the lookout watchmen have been used for other forestry work whenever this could be done to advantage without interfering with their lookout duties. All watchmen are required to keep their stations in proper order and to do necessary improvement work thereon under the instruction of the district chiefs. Their primary duties, therefore, in addition and supplementary to the discovery and reporting of fires, are to keep the telephone lines in proper working order, to repair and improve their towers and camps when necessary, to keep the trails to and from their stations in good condition, and to study carefully the maps furnished them and improve these where possible by adding local landscape features that will enable them to locate fires more accurately.

For the first year or two after a new station is constructed practically all of the watchman's spare time is taken up in making these necessary improvements, and if there is much dry weather it will take him two or three years to get any substantial improvement work accomplished. After a station has been built several years and has been brought up to a high standard of operating efficiency, there may be times during protracted rainy weather when the watchman can be used to advantage on outside improvement work.

Such a condition developed in New Hampshire during the season of 1916, and a considerable amount of outside service was rendered by the lookout watchmen without in any way affecting the lookout service. This outside work was performed for the most part on state forests and consisted of the cutting and clearing of fire lines, improvement and extension of trails and wood roads, tree planting, and liberation cuttings to remove inferior hardwood growth from competition with val-

uable pine and spruce. In this way the lookout watchmen on Mounts Monadnock and Pitcher built wood roads, fire lines, and trails on the Monadnock Forest Reservation; the watchmen on Blue Job and Pawtuckaway Mountains made valuable improvement cuttings on the Blue Job State Forest; the watchman on Black Mountain (Benton) and Smarts Mountain helped in setting out trees on the Sentinel Mountain State Forest; and the watchmen on Mounts Rosebrook, Carrigain, Kearsarge (North) and Israel cut inflammable material along the highway through the Crawford Notch Reservation and opened up a number of vistas along the highways to improve the views of the mountains.

Improvements in Fire Location Maps.

When the fire lookout stations were first started each was equipped with a topographic map of the surrounding country which the observer could cover. These maps were mounted on a plane table at the observation point and were used in determining the location of fires. It was found that not all the watchmen could make proper use of such a map because it did not present a picture of the country as it actually appeared to the observer from the lookout point. On a few of the lookout stations in the White Mountain region panorama drawings have been made and published with the Hitchcock geological atlas sheets of the state. These were copied and used to some advantage.

Five years ago Prof. Frederick B. Knapp of Duxbury, Massachusetts, elaborated on the idea of a panoramic lookout map idea and made such a panorama for the lookout station on Pine Mountain in Gorham. This map he presented to the Forestry Commission as a model, and later spent a short time here attached to the department instructing some of the regular field men in the making of such maps.



Gray Birch Removed from White Pine.
Blue Job State Forest.



Fire Line—Monadnock Forest Reservation.

IMPROVEMENT WORK ON STATE FORESTS PERFORMED BY LOOKOUT WATCHMEN
DURING WET WEATHER.

Since that time nine field men employed by the commission have worked on the making and improvement of these lookout maps either as regular or temporary employees. The following men have developed Professor Knapp's original idea: Martin G. Ferry, Frederick H. Colburn, Chapin Jones, Benjamin K. Ayers, William M. Falconer, Davis W. Lusk, Emanuel Fritz, E. Stanley Atkinson, and Victor A. Beede. Each one of these men has contributed something toward the improvement of the device used for making the panorama. Stuart A. Nims, Assistant Engineer, Public Service Commission, gave his time to prepare the drawings and specifications. As originally conceived by Professor Knapp the device consisted of a straight piece of wood pivotally swung in the center of the drawing table at the observation point and at each end supporting two upright pieces on which were fastened cardboard sights. The observer looked across from the cardboard on the rear sight post and moved the cardboard on the front sight post to coincide with some object, such as a mountain top, in his line of vision. From the height of the cardboard he scaled off the proper distance on the panorama and thus marked the point on the panorama where the object sighted would fall.

To Frederick H. Colburn belongs the credit for first suggesting a device which would do a part of this work automatically and all of it more easily. After considerable demand from other states for the use of this instrument Mr. Colburn had the device patented this year, and for the purpose of dedicating its use to the public had it assigned to Chief Forester H. S. Graves of Washington.

The Relief Alidade.

The device, which is now in use in the making and perfecting of lookout maps in New Hampshire, is shown

in the accompanying photograph. It is used as follows:

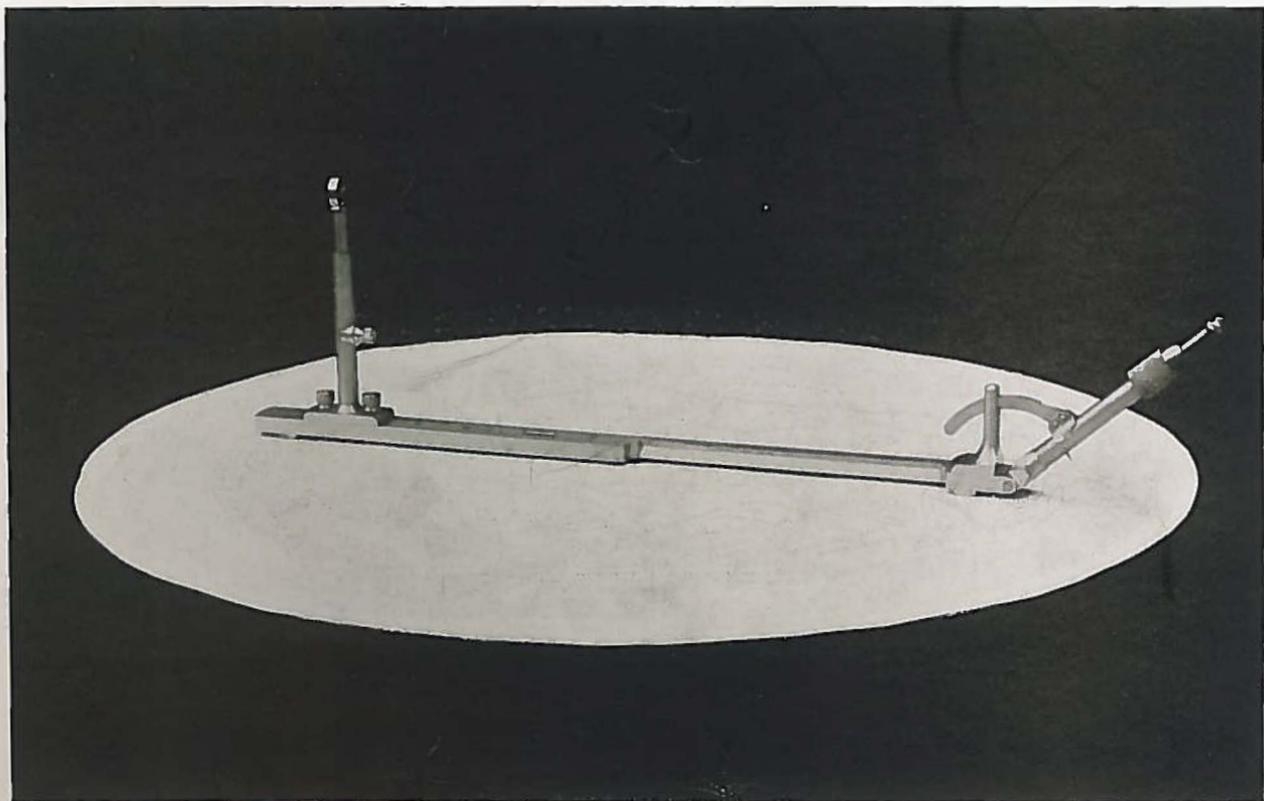
On the summit of the mountain from which a panorama is desired, place a drawing board covered with drawing paper and mounted on a tripod. On this paper a circle with a radius of approximately 10 inches is drawn from a point in the center of the board, leaving beyond an outside margin a little over 3 inches wide. The interior of the circle is for the placing of a plain topographic map of the country around the mountain. The 3-inch margin is for drawing the panorama of the country as it appears from the mountain as a center.

The relief alidade is then set up on the drawing board by placing the pivot, which projects from the base of the alidade, in the center hole of the drawing board. The forward arm of the alidade then extends out to the line at which the interior map ends and the panorama begins.

After adjusting the alidade so that it includes vertically all of the country visible from the station, the rear sight is set and kept at the same elevation until the drawing is finished. With the rear sight adjusted the alidade is then directed at some mountain top or hill which it is desired to show on the panorama and the front sight is raised until it coincides with the line of vision. Then the front arm of the alidade is depressed until the pin on the under side of the arm makes a mark on the paper. This mark is the point on the panorama where the mountain peak or hill top observed will fall. By continuing this for more peaks and slopes the whole panorama may be filled in correctly as it appears to the observer, and thus a picture of the country under observation may be drawn accurately.

The Perfected Lookout Station Maps.

The maps produced by the above methods have been



THE NEW HAMPSHIRE RELIEF ALIDADE,

Used for making Panoramic Lookout Maps.

found of great value in accurately locating forest fires. In observing an incipient smoke the watchman can generally tell from the panorama where this smoke is with relation to the hills and ridges which are drawn in relief and named. Besides being of great value in fire protection, these maps are of especial interest to tourists, and since 27 of them are now set up on prominent mountain tops they have enabled many thousands of people to locate exactly other mountains and landscape features. The map used on the Mount Belknap lookout station is shown herewith as an example. Last year the Forestry Commission had all panoramic portions of these lookout maps copyrighted. It is proposed to have them published in reduced size for sale. The perfection of these maps, as well as maps for other forestry purposes, would be greatly facilitated if the U. S. Geological Survey Sheets for New Hampshire could be completed at an early date.

PATROL SERVICE.

New Hampshire Timberland Owners Association.

The New Hampshire Timberland Owners Association in Northern New Hampshire has continued its valuable coöperation with the Forestry Commission. As originally organized it included over 1,000,000 acres, but on account of recent government purchases in the White Mountains this has been reduced to 804,000 acres at present. There are 35 members and they assess themselves from three-quarters to one cent per acre per year depending on the fire danger. This annual fund of approximately \$8,000 is placed in the hands of the Secretary, Mr. W. H. Morrison, Gorham, N. H., who is also the district chief in charge, of fire prevention for the Forestry Commission in the North District. The

private funds thus placed at his disposal supplement the state and federal funds used for fire protection in Northern New Hampshire and make the system elastic and more efficient. Since the state and federal funds are used for operating the fire lookout stations and for fighting fires, the money furnished by the New Hampshire Timberland Owners Association admirably supplements it by paying for patrolmen to cover the places of greatest fire danger in the wild land regions. During the fire season a force of 10 to 12 patrolmen is kept on duty, and this is quickly augmented by a large number of temporary men when fire danger is great. During extreme drought about 50 men are employed. In the dry weather of the springs of 1915 and 1916, these men saved a great deal of property.

Since the association began work in the spring of 1911, their patrolmen have extinguished 500 incipient fires and have cautioned more than 16,000 persons found in the woods. Its work is of great importance in protecting adjacent private land and amounts to practically a self-imposed tax for all the members. While they benefit directly by getting better protection for their own lands than the state government service affords, their efforts greatly reduce the fire risk for all surrounding lands. The region in which the association has coöperated represents over 30 per cent of the total woodland acreage of the state. During the five years from 1911 to 1915, the actual acreage burned by forest fires in this region was only about 16 per cent of that for the whole state.

Other Patrol Agencies.

Besides the patrolmen hired by the New Hampshire Timberland Owners Association there are four other agencies which help patrol woodland regions either directly or in connection with other work.

State Road Patrolmen are appointed deputy forest fire wardens through coöperation with the State Highway Department. These men are instructed to extinguish immediately small fires which they may discover starting along roadsides. The deputy appointments give them authority to summon help and to apprehend any highway tourists who are careless with fire. There are at the present time 186 state road patrolmen in New Hampshire and, being deputized for this purpose, they add an important additional force to the forest protection service.

Rural Mail Carriers, by an agreement between the U. S. Department of Agriculture and Postoffice Department, are instructed to report any forest fire which they discover to the nearest warden or deputy, or to arrange for the sending of a telephone message to the nearest warden. This coöperation also makes a valuable addition to forest protection. There are 247 rural mail carriers in New Hampshire and they cover more than 5,000 miles of country roads, much of it through woodland districts. They are not required to make records of fires reported and hence no accurate information is at hand, but in a number of instances reports from wardens and deputies have shown that rural mail carriers have given prompt notification of fires.

Town and State Patrol. During the past three years the Forestry Commission has instructed the fire wardens in a large number of towns where serious fires have occurred, to patrol localities of extreme fire danger at the joint expense of the town and state. The method employed is for the fire warden of the town to secure the permission of the selectmen and the state forester to incur the joint expense for patrol purposes. In many instances this has operated to reduce town fire fighting

bills materially. Such patrol work is not of value in all of our rural towns, especially where there are no particular danger places such as fishing brooks, Mayflower grounds, etc. In many places, however, there are such districts and this coöperative patrol measure has frequently been used with good effect. Some towns have found it more effective to station the patrolman on a high point overlooking the town, thus supplementing the state lookout service. In 19 towns where patrol has been used the men have been hired for periods averaging 1 1-2 days (generally for Saturday afternoon and Sunday) during an extreme spring drought. In these towns 38 fires have been apprehended in this manner and extinguished during the past two years. The total cost of this work for the two years was \$460.20, or an average of about \$11.00 per fire. Since the present average cost of a forest fire to the town and state is \$39.16, it may be fairly assumed that in these 19 towns a little over \$1,000 of public funds have been saved by this method of protection.

Railroad Patrol is performed by the section foremen, who are instructed to be always on the lookout for fire and to patrol in dry weather any especially dangerous sections; and by special patrolmen equipped with speeders, who follow the trains. These will be considered in discussing railroad fires.

PREVENTION OF RAILROAD FIRES.

A Change of Policy.

During the past decade the fire policy of the railroads traversing New Hampshire has changed radically. Formerly the forest fires caused by locomotives were regarded more or less as an unavoidable nuisance. After periods of excessive damage, when the railroads were

obliged to pay large sums for settlement of damage claims, sporadic attempts were made to reduce the fire danger from locomotives; but the problem was not treated with systematic, continuous effort.

The Maine Central Railroad was the first to organize fire prevention work and make it effective. The White Mountain Division is divided into patrol sections and a man from one of the regular section crews is detailed to cover each of these patrol sections, following the trains on a velocipede. This work was begun about eight years ago and has prevented much damage to the adjacent forest and saved much money to the railroad company. During the long months of extreme drought in the summer of 1911, only one fire got beyond the right of way of this company in New Hampshire to do any considerable damage.

The Boston & Maine Railroad, following the excessive fire damage of 1911 (\$115,000 in New Hampshire alone), organized in 1912 the Department of Fire Claims to have charge of fire claim adjustments and the prevention of fires. This department is directly responsible for very materially reducing the forest fire damage along the 1,070 miles of Boston & Maine lines in New Hampshire. A coöperative fire prevention plan was worked out between the Fire Claims Department and the Forestry Commission, and in 1913 the coöperative measures which had thus been found effective were enacted by the General Court as part of a railroad fire prevention law. This law requires railroad companies to use proper spark arresters and ash pans, to patrol dangerous parts of the right of way during drought, to enforce among their employees regulations for the giving of fire signals, and to pay for the damage and expense caused by locomotives or employees. It authorizes the state forester to appoint section foremen as deputy forest fire wardens; requires lumber operators to remove lumber slash 40

feet from the right of way of a railroad and allows a railroad company to enter upon private land abutting the right of way and clean the inflammable ground litter on a strip 25 feet wide.

During the extremely dry year of 1911, about 40 per cent of all the forest fire damage in New Hampshire was caused by railroads. For the five years since 1911, only about 25 per cent has been due to this cause. The railroad fire problem is still a serious one, but it is encouraging to note that an effective beginning has been made in New Hampshire toward its solution.

SPECIAL PREVENTION MEASURES.

Engine Inspection.

The three railroad companies have generally improved their spark arresting devices on locomotives. This improvement is due largely to a systematic checking up and reporting of defective engines by the officials and employees of the companies. In addition to this the district chiefs inspect railroad engines from time to time during the fire season. Until some spark arrester is devised and put in general use which will absolutely prevent the escape of live cinders and at the same time permit sufficient draft for power, the present system of careful engine inspection and reporting must be continued with vigilance.

Patrolling Right of Way.

Besides the Maine Central Railroad patrol mentioned above, the Boston & Maine Railroad has developed very efficient patrol with gasoline speeder cars equipped with fire fighting tools by which one patrolman may cover about ten miles of track three or four times a day, following most of the trains. There are 14 of these



The Twelve-Foot Line is Cleared of all Inflammable Material.



DEBRIS BETWEEN FIRE LINE AND RAILROAD WILL BE BURNED FREQUENTLY.
RAILROAD FIRE LINE—MAST YARD STATE FOREST.

cars used during the fire season in New Hampshire. The following is a list of the sections of track covered by them:

Headquarters.

Hampstead
Fremont
Barrington
Windham
Londonderry
Pepperell
Boyce
Garrison
North Woodstock
Auburn
North Conway
Sanbornville
Epping
Goffstown
Nashua

Track Patrolled.

Anderson and Epping
Anderson and Epping
Epping and Rochester
Nutts Pond and Canobie Lake
Nutts Pond and Canobie Lake
Ayer and Nashua
East Side and Northfield
Garrison and Contoocook
Campton and Lincoln
Auburn and Raymond
No. Conway and Sanbornville
No. Conway and Sanbornville
Hedding and Raymond
Henniker Jct. and W. Manchetser
Spare car

The Grand Trunk Railroad has not as yet developed any systematic patrol, but depends upon the section foremen to watch the right of way for incipient fires.

Fire Lines.

Along a section of railroad where the fire hazard is unusually high, fire lines on woodland property paralleling the track have been found very effective means of forest protection. In a number of places through New Hampshire private owners have plowed strips several furrows wide 50 to 100 feet from the railroad track to prevent small fires from crossing into their meadows and woodland. As an example in the use of fire lines the Forestry Commission, in coöperation with the Boston & Maine Railroad, this year constructed a fire line on the Mast Yard State Forest parallel to the railroad track. It consists of a strip 10 or 12 feet wide, plowed and cleared of all vegetable matter

down to the mineral soil, and paralleling the railroad track about 150 feet therefrom. Between this cleared strip and the railroad line the ground cover may be burned over every spring and fall with safety and at small expense, and it is not likely that a fire thereafter could gain enough headway to cross this cleared strip.

The Mast Yard territory is one which formerly produced a large amount of valuable pine timber, but in the immediate region where this fire line has been constructed there has been very little forest reproduction of value since the old growth was removed. A peculiar set of conditions make this territory very hazardous. The land is a flat sand plain and dries out quickly. The railroad runs for a long distance in such a direction that a large part of this sand plain is exposed to the strong northwest wind which drives locomotive sparks into the woodland on the south and east side of the tract. Some of the most serious railroad fires in the state have started on this sand plain. One of them in 1911 caused a total damage and expense of approximately \$30,000 and reached points in the woodland three miles distant. A picture of the fire line constructed is shown in the photograph opposite page 29. It is hoped that this will not only prevent fires on the adjacent state forest which has been planted to pine, but will encourage the woodland owners in the territory back of this state tract to set out trees.

DISPOSAL OF LUMBER SLASH.

Present Legal Requirements.

(Chapter 155, Laws of 1913, as amended by Chapter 100,
Laws of 1915.)

The law as amended requires all persons cutting wood or timber next to a railroad right of way, a public high-

way or a trolley line, to remove the slash caused thereby 40 feet from the edge of a railroad right of way, 20 feet from a trolley line, and 20 feet from the traveled part of a highway. A period of 60 days after cutting is allowed for brush removal, except that for winter operations (later than November) operators are allowed until May 1st in the three northern counties and April 1st in the other counties to clean the slash strips.

The operation of this law has been generally successful, especially along railroads. Operators have not been so prompt in clearing strips along highways. Since the provision requiring this clearance was not enacted until 1915, it is probable that the tardiness in complying with it is in most cases due to the fact that many operators have not yet become fully acquainted with this part of the law. The requirement for cleaning along railroads was enacted in 1913, and during the past three years has been complied with promptly in practically every instance. It is the experience of the Forestry Commission that with legislation of this kind, even after giving considerable publicity to the law, a year or more is generally required to get such a law into effective operation. In many instances where the operators have used foresight the provisions of the law have been largely complied with by felling the trees away from the railroad track or highway. Where this cannot be done to advantage the brush is either pulled back or piled and burned, but by proper felling of the trees a large part of the brush disposal can be avoided. Considering all cases which have come to the attention of the commission it may be said fairly that compliance with the law does not work a hardship on the operators, but is a reasonable and cheap fire protective measure.

SHALL GENERAL SLASH DISPOSAL BE REQUIRED.

Relation of Slash to Fire Damage.

A great step forward in fire protection and in the general practice of forestry would be made if all lumber slash were disposed of while the cuttings are going on or immediately thereafter. In considering the direct causes of forest fires such as railroads, carelessness, brush burning, campers, hunters, fishermen, smokers, etc., it should be borne in mind that lumber slash constitutes a contributory cause which makes the direct causes unusually destructive in regions where lumbering has been recently carried on.

TABLE IV.

Comparative Area Burned in Different Kinds of Forest Growth.

Kind of land.	Grass land, fields, etc.	Woodland recently cut over.	Second growth not yet merchantable.	Merchantable timber.
Relation of burned area on each kind of land to total burned area	9%	33%	40%	18%

The above table shows the per cent of acreage burned on four different classes of land compiled from reports of fire wardens in New Hampshire during the past eight years. Here it is observed that 33 per cent of the acreage burned by forest fires is on recently cut-over land, 40 per cent is on land containing unmerchantable second growth (the future timber supply), and 18 per cent is on land supporting merchantable timber. While the actual damage for which slash areas are responsible cannot be accurately calculated, a study of the reports on which



HALF GROWN TIMBER KILLED BY FIRE SPREADING FROM SLASH AREA.



LUMBER SLASH—A MENACE TO NEARBY TIMBER GROWTH.

this table is based and the examination of numerous burned areas show conclusively that a large amount of valuable forest reproduction is destroyed on the burned cut-over lands which represent 33 per cent of the total burned area. The heaviest fire damage is to the second growth forest represented by 40 per cent of the whole burned area, and adjacent slash lands are responsible in many instances for the spread of fire to the second growth and mature forests. An examination of many of these burns in valuable young growth shows that had adjacent slash been disposed of fires could have been stopped before much of the valuable forest growth was burned.

Practice in Other States.

The benefits which would accrue from general slash disposal are obvious. In fact it is doubtful whether the natural forest lands of the state can be brought to a condition of continued high productiveness until general slash disposal is practiced. The advisability of requiring such disposal depends therefore on the cost and trouble of doing it as compared with the benefits derived.

New Hampshire has made a beginning by requiring slash to be disposed of in the places where the fire danger is greatest (along railroads and highways). Similar laws are in operation in Maine and Massachusetts. Other lumber states have provided various measures for abating the slash danger briefly as follows.

In New York operators are required to lop the branches of all soft wood trees cut, so that the slash shall lie flat on the ground and decay more rapidly. New Jersey, Pennsylvania, Minnesota and several of the far western states have enacted laws authorizing state forest officials to declare an accumulation of slash a public nuisance and require its abatement. In some of the states the abatement of the slash nuisance may consti-

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tute only requiring the owner to have it patrolled during drought. In other states the law authorizes the forest officials to require its actual removal. In Minnesota, the greatest white pine state, such a law has been in operation for a longer time than in other states and seems to have worked well. It does not require the slash to be removed by any specified method, but gives the forest officials considerable latitude in determining the methods that may be used under different conditions.

What Does Slash Disposal Cost?

The cost of general slash disposal per thousand feet of lumber cut varies widely according to the forest conditions under which such an operation is carried on, the important factors of cost being whether the land being logged is steep or comparatively level and the surface rough or smooth, and whether the timber is large-boled with small tops or short-boled with large spreading tops and many green limbs. In the white pine regions of Minnesota and Idaho where the timber is old and of good form and the yield per acre large, general slash disposal has been accomplished at an additional cost to the logging operation of from 10 to 25 cents per thousand feet. Where it has been tried in New England the cost has varied from 25 cents to a dollar per thousand feet. This is due to the fact that the timber cut here is of smaller size, and there is a larger proportion of top and limbs, also that operators in this region are not accustomed to slash disposal. It would be entirely reasonable to suppose that the costs would decrease after the first few years when the woods workers got used to doing it, but it should be recognized that on account of the land surface and the character of the timber growth in this region the cost of slash disposal would always be somewhat higher than in the western pineries. It is doubtful whether the work could be done here, even

after operators got accustomed to it, for much less than 50 cents per thousand feet.

This question has been discussed by the state forester with many lumber operators and the most valid objection which has been offered to a requirement for general slash disposal is that the operators in this state would be placed at a disadvantage to those operating the same kind of timber in an adjoining state which does not make such requirements. This is a reasonable objection. In Northern New England most of the spruce and pine is tributary to the Boston market and, generally speaking, lumber prices are calculated on the Boston base price. It is evident that a legal requirement for slash disposal in one state, which necessitated an extra expense of from 25 to 50 cents per thousand feet on all the operators in that state, would place them at a disadvantage as compared with similar operators in the adjoining states. The problem therefore of general slash disposal is properly a regional one, and laws requiring such work where necessary should be enacted in all states tributary to a common lumber market. There seems to be a tendency toward such legislation at the present time and it would probably be advisable for New Hampshire during the next few years to await developments in other states.

So far as the immediate demand for general slash disposal is concerned it should be noted that such demands are increasing in New Hampshire and the Forestry Commission is more and more often confronted with requests to have specific slash areas cleaned up. Most of these requests are received from abutting owners who have valuable forest growth and are fearful of the spread of fire from the slash areas. In some cases it has been possible for the commission to arrange a coöperative plan between the owner of the slash land and the owner of the abutting valuable growth to have a strip about 50 feet wide cleaned of slash, the two owners sharing in the ex-

pense. The demand for general slash disposal is increasing among this particular class of owners. If the General Court is not ready to enact a law for general slash disposal, it is suggested that the present acute situation may be relieved by a law which would require a strip of slash to be cleared along an adjacent area of valuable timber growth, such clearing to be done upon the complaint of the abutting owner. In order to prevent unwarranted complaints it might be provided that the abutting owner registering the complaint should share with the lumber operator the expense of clearing such a fire break.

IMPORTANT POINTS IN TOWN FIRE ORGANIZATION.

Duties of District Chiefs.

While all the forest fire protection work is supervised by the forestry department and most of the prevention measures are taken directly by the state, the fighting of fires is done through the local town governments. Besides 245 forest fire wardens in the state (one in each town) there are 550 deputy wardens located in different sections of each town and 475 ex-officio deputy wardens, including railroad section foremen, highway patrolmen, etc. The total number of wardens and deputies in the state who are authorized to fight fires is 1,270.

The most important duty of the district chief is keeping up these town organizations. Every town is visited; the selectmen and others in the town interested in fire protection are consulted to see that the best men available are selected for wardens and deputies. After appointments are made these wardens and deputies are instructed in their duties by the district chiefs and to them all questions in regard to forest fire fighting and prevention work in the town are referred by the wardens. By this method a very high grade class of men have been ob-

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tained throughout the state for fire wardens and deputies, and much better service is rendered because men are secured on account of their interest in forest protection. Before this close supervision was inaugurated the fire bills incurred by the towns were much larger in proportion to the amount of work accomplished. It is largely due to the district chiefs that the cost of fighting the average forest fire has been reduced from \$53.47 in 1911, to \$39.16 at present. This means a large saving in public expense.

Besides supervising the fire wardens, lookout stations and other fire protective measures the district chiefs have from time to time been used in other forestry work, such as improvement work on state forests, planting state land, and educational work among woodland owners. Under the direction of the state forester they have given advice on the practice of forestry on private lands. The possibilities of using the district chiefs and the fire organization for accomplishing other forestry work are great and should be developed.

Local Fire Warden Conferences.

In 1912 the Forestry Commission began to hold conferences of the forest fire wardens to discuss the problems of each locality, exchange ideas and give instructions. These meetings were of great educational value. Up to 1915 they were held by large districts, the wardens of from 15 to 45 towns assembling for each conference. In 1915 the commission adopted a new plan, namely, that of holding a large number of small conferences instead of a few large ones. This involved a larger amount of traveling on the part of the state officials, but resulted in many more men getting the benefit of the conferences because they were held by single towns or small groups of towns, and in addition to the fire wardens, the deputies, selectmen, road patrolmen, sec-

tion foremen, and others interested in forestry and fire protection were invited.

The results of these small meetings were very effective. In all 43 conferences were held with a total attendance of 700 local men. At each one the forest fire question was discussed particularly as it affected that locality, and in addition many other questions on forestry were discussed. Through these meetings the commission found that a much greater interest in forestry existed throughout the rural towns of the state than was supposed. The meetings in turn served to develop and crystallize this interest, which is ready to be translated into action as rapidly as the proper means are afforded.

Fire Fighting Tools.

During the past few years the commission has made a special effort to interest the rural towns in the purchase of the proper fire fighting tools and apparatus. Since the ordinary kind of tools are not strong enough for use at forest fires, the commission has arranged each year that the towns may purchase the proper tools at factory prices. A special combination designed for a rural community has been assembled including shovels, rakes, hoes, axes, grub hoes, galvanized iron pails, collapsible hand pails, two hand chemical extinguishers and one water pump. This combination, which equips three to four dozen men, may be bought with a weather proof box for approximately \$80. The following towns have recently installed this combination: Fremont, Hillsborough, Lisbon, Wentworth, Dorchester and Meredith.

The cities and a number of the larger towns have purchased auto chemical engines, which are used for quick calls to forest and brush fires. A number of towns have bought automobile trucks equipped to carry men with fire tools and hand chemical extinguishers, and a number of others have purchased small chemical hand trucks

and placed them where they can be used both for house fires and forest fires. Probably the best combination for a small rural town is to have some kind of a chemical truck at the village, or at each village, if there is more than one, and then to have smaller caches of fire fighting tools at central points in the outlying woodland districts.

Portable Steam Sawmills.

All portable steam sawmill operators are required by law to use a spark arrester approved by the state forester. Most operators are very careful about fire and little trouble is experienced in getting them to keep their spark arresters in proper condition. There are, however, enough irresponsible ones to cause considerable fire danger from this source during dry weather. In addition to being careless about sparks from the smoke stack, a number of cases have occurred where operators have moved to another locality leaving a large burning sawdust pile for the town to extinguish. Such fires have proved very troublesome and expensive. During the extreme dry windy weather in May, 1916, only ten such fires were reported as due to this cause, but they spread so far that their total damage was more than 55 per cent of all the forest fire damage for the year.

The commission immediately took steps to find out the condition of all other portable mills and had a report made on the spark arresters. Each operator who has a satisfactory arrester is given a permit to operate as long as his mill remains in its present location. When he moves to another locality within the same town he is required to notify the town fire warden and to have his permit endorsed that his spark arrester is still in good condition. If he moves to another town he is required to report the fact to the state forester and get a new approval for his arrester. These regulations have been found necessary because it is very hard to keep track of the location of all the mills. There are approximately

100 portable steam sawmills operating in New Hampshire, and as they frequently change location it would be expensive work to have each one inspected every time it moved. On account of the fact that these mills are so difficult to keep track of, it has been suggested that they be licensed by the state, that a license be issued to every operator who keeps his spark arresting device in good condition, and that a small license fee be charged simply to cover the costs of the work.

Clearing Brush and Bushes Along Roadside.

This work is an important fire prevention measure. By an act of 1913 selectmen are required to cut brush and bushes from within the highway limits. An amendment passed in 1915 requires this cut brush to be disposed of within 30 days from the date of cutting. The towns have generally been slow to push roadside cleaning. This work is directly related to the care and preservation of trees along the roadsides and is discussed in detail under that subject on page 119.

WHAT SHOULD A GOOD TOWN FOREST FIRE FORCE INCLUDE?

The commission is trying to supervise the fire protection work in the state so that local duties will fit in to the administration of town affairs as conveniently as possible and the work be done efficiently. The experience gained thus far in administering the forest fire law in all the towns in the state is of great value. There are four main points to consider in developing an ideal town forest fire organization. These are here briefly summarized in order that the purposes to be accomplished may be clearly understood. The accompanying map shows the general plan of town fire organization.

1. The Fire Fighting Force.

FIRE WARDENS AND DEPUTIES.

One forest fire warden, centrally located if possible, and as many deputies as are required to cover each separate woodland district. In cities and large towns the forest fire warden is generally the chief of the fire department or one of his assistants, and the deputies, men connected with the fire department in outlying districts, or land owners interested in fire protection whose regular work keeps them at home most of the time. In the small towns the deputy wardens are interested local woodland owners and the forest fire warden is either such an owner centrally located who can be generally available in case of fire, or a capable man regularly employed on other town work who can be found quickly in case of fire.

VOLUNTEER FIRE FIGHTERS.

The fire warden and each deputy should have arrangements made in advance with a few good men located in their districts and whom they can assemble quickly when a fire starts. This obviates the necessity of calling out more men than are necessary.

FIRE FIGHTING EQUIPMENT.

Tools and apparatus suitable to the needs of the town should be kept at each locality where a fire warden or deputy lives. Preferably the central apparatus, chemical truck or motor barge should be in charge of or available for the fire warden, and small units of tools distributed by protective areas should be located with the deputies.

2. Fire Discovery and Reporting.

LOOKOUT STATIONS.

The reporting of most of the fires will naturally come from the nearest fire lookout station. The warden and deputies should cooperate with the lookout watchman by checking him up on fire locations so that he may become more accurate and serve the town better in this capacity each year.

COÖPERATION WITH FARMERS.

Special arrangements should be made by the warden with farmers who live on high ground at natural lookout points and who have telephones. They should be asked to notify the warden or a deputy immediately upon the discovery of a fire and to reverse the telephone charges. Every such natural lookout coöperator should be provided with a fire call card furnished by the Forestry Commission and containing the name and telephone number of the warden and deputies in the locality.

3. Prevention of Fires.

EDUCATIONAL AND POLICE DUTIES OF WARDENS.

In addition to fire fighting the warden should carry on the

necessary educational and police duties of fire prevention in his town. This includes the posting of notices, placing items in newspapers at proper times, and public announcements when necessary; inspection of portable steam mills when instructed by the state forester; patrol of dangerous fire localities during drought when authorized by the selectmen and the state forester; issuing permits at proper times to persons who wish to burn brush; and when necessary arresting offenders against the law.

BRUSH BURNING.

Besides this work the warden should see that brush and bushes along the highways are properly cut and disposed of and should encourage all owners of cut-over land to burn the slash in a proper manner and at safe times. It would be an excellent thing for each community if the fire warden or deputy became a local expert on brush disposal. Besides his regular duties as fire warden he might be called upon frequently to supervise brush disposal upon the application of a land owner.

4. Use of the Fire Warden for Other Forestry Work.

As forestry develops and its practice becomes more common it is evident that many local men must be found who are familiar with the elementary principles of the science and experienced in carrying on woods work. Many of the town fire wardens and deputies could develop along this line and ultimately find continuous profitable employment. Such work would include the care of shade trees along the highways, reforestation of cut-over land for private owners, and planting, cutting and general improvement work on state and town forests in the vicinity. Wherever possible it is the purpose of the Forestry Commission to furnish the town fire warden with all the information that can be supplied, not only on fires, but on general forestry. In other words make him a local exchange for forestry information.

THE FUTURE FOREST FIRE PROBLEM FOR NEW HAMPSHIRE.

Causes.

Since the forest fire organization has become estab-

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lished and is gradually being perfected the question naturally arises, can we look forward to a time when forest fires will be one of the minor considerations in the development of forestry? For an answer to this we must go back to the fundamental question of the causes of fires and the possibility of the removal of these causes. The following table is the result of a study of the causes of fires carried on during the past seven years and shows the per cents of the total number due to different causes.

TABLE VI.

Relative Number of Forest Fires Due to Different Causes.

(Computed from reports on over 2,000 fires, 1909-1916.)

CAUSE.	Ratio to total number of fires.
<i>Mechanical causes:</i>	
Railroads	29.0%
Portable sawmills	2.6
<i>Human causes:</i>	
Burning brush, grass and rubbish	20.9
Woods travelers—campers, hunters, fishermen, flower and berry pickers, smokers	24.1
Miscellaneous—fireworks, children playing with matches, blasting, etc.	10.8
Incendiary	5.5
Burning building	2.4
<i>Natural cause:</i>	
Lightning	4.6

Broadly speaking there are two classes of direct causes, and one contributing cause (lumber slash), which is discussed on page 30. The direct causes of forest fires are: first, mechanical causes, which are largely preventable; second, human causes, which are reducible but not preventable. The mechanical causes are railroad locomotives, portable steam mills, and other mechanical equipment operated in forest regions. The human causes are due mainly to carelessness and in a few instances to maliciousness. Most of the fires due to carelessness are started by smokers throwing down

lighted matches, cigars or cigarettes; by burning brush in dry windy weather and without sufficient help; and by hunters, fishermen and campers. The only direct cause falling outside of these two classes is lightning. Besides the direct causes there is the great contributing cause of inflammable slash and debris left after lumbering operations. For a satisfactory answer to our questions we must find a practical way to remove or reduce all these causes.

Recommendations for Better Forest Protection.

It must be remembered that fire protection is not an end in itself, but that if well done it is one of the important means of creating a condition in which an investment in growing timber will be safe, whether made by a private owner, a town or the state itself. Careful investigations show that the heaviest fire damage is to the immature crop (the future timber supply) where there is no salvage. As yet there is not in general use any system of insurance for growing timber such as other forms of property enjoy, and no such system can be made practical unless buttressed by a strong public policy favoring protection. With the coöperation of the government, the state, the towns, woodland owners, railroads and other private interests, such as is now being worked out, a condition of general safety may be not far off in New Hampshire. For the immediate progress of this work during the next two years the commission offers the following recommendations:

1. That the fire lookout service be extended to all important timber areas not now covered; and that coöperation be re-established with the U. S. Geological Survey for the completion of the topographic quadrangle sheets for all parts of New Hampshire.
2. That active coöperation be continued with the Federal Government and other public agencies; the

New Hampshire Timberland Owners Association and other woodland owners; and with railroad companies.

3. That the coöperation with towns be extended, especially toward securing better fire fighting equipment in rural communities and arranging for coöperative patrol of dangerous localities and supplementary lookout service during extreme drought; that in order to aid wardens in prompt financial accounting a legal time limit be set within which expenses incurred by fire fighters must be rendered; and that consideration be given to appropriating the fire fighting fund for more than one year.

4. That the general educational work on fire prevention be continued and the feature of local conferences for fire protection and general forestry be extended. It would be advantageous if the appropriation for this work could be biennial instead of annual.

5. That authority be given for using town wardens, deputies and regular employees, such as lookout watchmen and patrolmen, for improvement work on town and state forests and for general forestry work in their respective communities in so far as this work can be coördinated advantageously with other town and state work.

6. That consideration be given to the licensing of portable steam sawmills in order to make careless operators more responsible to the town fire wardens for the condition of their spark arresters; and that consideration be given to the compulsory clearing of lumber slash on strips abutting growing timber, the expense of such clearing to be shared by the abutter who registers the complaint.

The Possibilities of Timber Insurance.

By W. R. BROWN.

FOREWORD.

The following is a tentative plan for the formation of an Inter-Insurance Exchange among the owners of standing timber, growing land and plantations for the purpose of their mutual protection against loss by fire. Nothing of this kind has before been offered and in presenting it for your careful consideration we can but say that the general plan has appeared practical to a number of timberland owners and insurance men.

Lloyds of London, England, are known to have placed insurance on losses that exceed a given amount on individual tracts, or in other words, after the owner had taken most of the risk on a restricted area, they have insured against the slight risk remaining of fire causing an additional amount of damage.

PROBLEM.

The reasons why up to the present time there has been no adequate form of fire insurance offered to the owner of standing timber are:

First. The fire hazard represented in the public mind by a possible general conflagration.

Second. Want of any adequate protective measures, both public and private, for apprehending and extinguishing incipient fires, and combating those which have grown to large size.

Third. The lack of data as to the proportionate loss in value per year by fire, and the absence of any reliable means of securing such data.

Fourth. The difficulty of securing reserves adequate to meet the requirements of the insurance laws of most states, of obtaining charters from legislatures, conforming to multitudinous requirements, and to the restrictions placed upon doing an interstate business.

PROPOSED SOLUTION.

The present answer to these objections would appear to be:

First. That the hazard of a possible general conflagration could be disregarded through the distribution of small individual risks, carefully selected, over a wide section of country, among many owners, possibly under varying climatic conditions. Set-

tlement, resulting in a broken state of the country, is continually making the possibility of a general conflagration more remote.

Second. That five years of practical public and private protection carried on by:

- (1) Over thirty private fire protective associations.
- (2) Fifteen state departments.
- (3) The federal government.
- (4) Town assistance.
- (5) Railroad coöperation.
- (6) Education of the public.
- (7) Enforcement of law.
- (8) Improved field methods,

have demonstrated that the loss by fire can be greatly reduced by an efficient system of patrol and notification, and the prompt apprehension and putting out of small fires.

The United States Department of Agriculture first organized and made effective fire prevention on government lands in 1905, and the first timberland owners' fire protective association was formed in Idaho in 1906. Since that time twenty-nine or more private fire protective associations have been organized in the States of Oregon, Idaho, California, Montana, Washington, Wyoming, Michigan, Wisconsin, Maine, New Hampshire, Vermont, Pennsylvania and West Virginia.

The timbered area in United States is about 460 million acres, with more or less public and private fire protection on 60 per cent or 279 million acres.

In 1913, States spent in fire protection.....	\$409,900
Weeks law (fed. aid) additional	74,000
Private owners probably not less than.....	500,000

Total	\$983,900
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Third. That there is already at hand five years of data collected by the federal government, state departments and private fire protective associations to show that the average loss in value per year is considerably below one-half of one per cent, and that this average loss through increased protection is constantly diminishing.

In the past in computations on loss by fire small attention has been paid to the fact that a large percentage of such fires were in cut-over, and so comparatively worthless lands, and that in the green timber burned there was much salvage. A further reduction of the loss for insurance purposes would

result in disregarding the value placed on soil and young growth. So when we get a more accurate statistic we will see that even the loss through great fires is only a small percentage of the whole when compared with the value of the remaining timber standing in the states in which they occurred. Minnesota with a forest wealth valued at \$280,000,000, during the last ten years has had a computed loss each year of only \$100,000 or about 1/28 of 1 per cent annually. Maine, with a valuation of \$100,000,000, lost in the four years from 1909-12, an average of \$64,000 annually, or 1/16 of 1 per cent.

Below are given figures for sixteen Forest Protective Associations showing percentage of annual loss, cost of protection and acreage patrolled.

ASSOCIATION LOSSES.

Association.	Year.	Area represented acres.	Cost of protection total	Cost of protection per acre Cts.	Damage total.	Damage per cent of 1 per cent.
Twelve Western Forestry & Conservation Associations. (See letter below from E. T. Allen, Forester.)	1910	.....	.....	.....	.....	1-2
	1911	16,000,000	\$270,000	1.7	\$39,000	1-150
	1912	20,000,000	200,000	1.0	114,000	1-66
	1913	22,000,000	200,000	.9	775	1-10000
	1914	22,000,000	200,000	.9	.....	1-15
	1915	22,000,000	200,000	.9	.....	1-220
St. Maurice Forest Protective Association.	1912	7,178,572	20,000	.27	2,000	0
	1913	8,022,400	20,000	.25	2,000	1-68
	1914	8,132,416	29,617	.36	3,000	1-42
	1915	7,892,480	36,509	.46	50,000	2-5
New Hampshire Timberland Owners' Association.	1911	800,000	8,000	1.0	24,125	1-4
	1912	900,000	6,750	.75	23,635	1-4
	1913	1,000,000	10,000	1.00	11,615	1-9
	1914	1,000,000	10,000	1.00	10,000	1-10
	1915	950,000	7,125	.75	19,000	1-5
Northern Forest Protective Association of Michigan.	1912	2,000,000	20,000	1.00	1,000	1-10
	1913	2,000,000	20,000	1.00	.....	1-20
	1914	2,000,000	20,000	1.00	.....	0
	1915	2,000,000	20,000	1.00	8,746	9-10
Michigan Hardwood Manufacturers' Forest Protective Association.	1914	241,000	.....	.....	2,150	1-6
	1915	241,000	.....	.....	100	1-20
Total	.....	31,377,000	.....	87-100	.....	115-1000

LETTERS.

"I have your inquiry of April 25. About all I can do is to compare the feet of merchantable timber destroyed with a very rough estimate of the total stand under protection, which in percentage would apply about equally well to values. This gives us in 1910 a loss of 1/2 of one per cent; in 1911, 1/150 of one per cent; in 1912, 1/66 of one per cent;

in 1913, 1/10000 of one per cent; in 1914, 1/10 to 1/15 of one per cent; and in 1915, 1/220 of one per cent.

"These figures are likely to be a little low because some losses do not get reported, some people understate, salvage is sometimes over-estimated, and the estimates of total protected may be too high. On the other hand, the loss reports are also likely to contain items from areas not entitled to be considered under protection, so it balances fairly well. None knows, of course, but we should guess that as 1914 was as bad a year as 1910 in hazard, and improvements in methods got us through with a tenth of one per cent loss, it is pretty safe to say that, as a year five times as hazardous is almost inconceivable, we shall never equal half of one per cent again unless war or some other disaster destroys our protective system itself."

"E. T. ALLEN,

*"Forester of Western Forestry
and Conservation Associations."*

"Through effective federal, state and local fire protective organizations the amount of timber annually destroyed by fire on the Pacific Coast has become insignificant. The forest fire bugaboo has practically disappeared.

"The privately owned stumpage under patrol in the five states of Oregon, Washington, California, Idaho and Montana aggregates 500,000,000 M feet on approximately 20,000,000 acres. The destruction in 1910 amounted to 6/10 of 1 per cent. In 1915 it was but 1/100 of 1 per cent. Fire loss was inconsequential so far as it is possible to learn—and a forest fire cannot well be concealed—on the additional estimated 500,000,000 M feet of privately owned timber in the territory involved and not included within the protective associations. It is a safe assumption that during the season of 1915 the privately owned timber destroyed in the five states would not exceed 1/200 of 1 per cent of the total estimated volume of 1,013,000,000 M feet.

"JAMES D. LACEY & COMPANY.

"Portland, Oregon, January, 1916."

Fourth. That there are now in practical operation many inter-insurance exchanges and associations among owners of lumber yards, sawmills, flour mills, cotton mills and other industrial properties in the United States with no record of failure, which are conducted at cost for the benefit of the individual subscribers, by the crediting back of the unused balance

of premiums to each account yearly, under management of one mutual agent acting as attorney-in-fact for each subscriber separately. These inter-insurance exchanges by doing no outside business, or business for profit, are less subject to either federal or state supervisory boards, and are easily organized and controlled by a board of directors or supervisors, and a treasurer to audit the accounts of the managing attorney-in-fact. The office is called an exchange, as it is there insurance is exchanged among members.

SOME INTER-INSURANCE ORGANIZATIONS.

Lumber Manufacturers Inter-Insurance Association of New York. Three hundred members. Attorney-in-Fact, Wilcox, Peck & Hughes, No. 3 S. William St., New York. Receive 20 per cent for management expense, except legal expense. Members deposit emergency fund equal to annual premium, and also agree to stand their proportionate share of all losses. Reserve double the amount of annual premium. Limit of liability for each subscriber on one loss equal to one annual premium. Rate of assessment about two per cent.

Lumbermen's Exchange, Kansas City, Mo. Attorney-in-Fact, J. W. Garvey & Co., Kansas City, Mo. Maximum line carried \$4,000.

Lumbermen's Underwriting Alliance, Kansas City. Attorney-in-Fact, Epperson Underwriting Co., are paid 20 per cent of premium for management. Initial deposit equals annual premium. Reserve fund equals twice the annual premium. Liability equals one extra premium per year.

National Lumber Manufacturers Inter-Insurance Exchange. Attorney-in-Fact, Charles F. Simonson, Chicago, Ill. Managed at actual expense which is very low. Has an advisory board of twelve.

INSURANCE POSSIBILITIES.

An average annual loss of less than one-half of one per cent is an extremely low insurance risk. The usual rates charged by the lumbermen's inter-insurance exchanges on ordinary risks average from one and one-half to two per cent, so that if some such rate were paid on standing timber the difference between the rate and losses would form a sum sufficient to pay the salaries and running expenses of the organization and set up a reserve which in the course of time would be ample, and thereafter subscribers would receive insurance at cost.

The obtaining of insurance on timber will create an oppor-

tunity for each subscriber to offer his timber tract as security for a loan, and so liquidate capital tied up. Profit, over interest charges, obtained by the use of this capital should compensate for the cost of the insurance. Should the exchange grow sufficiently in the course of time, a larger line of insurance could be extended to its subscribers, which would greatly facilitate them in bonding and help them to secure a low bond rate.

Insurance is essentially the accumulation of reserve capital to cover uncertain losses, or the acceptance by the individual of a small certain loss per year in order that he may impose on society at large the unusual and extraordinary risk and loss which might otherwise fall upon him alone. In the end his loss becomes more uniform, less in amount and less uncertain as the number of risks included in the group increases. Theoretically the size or extent of the hazard does not affect this principle of diffusing and modifying the losses through a combination of risks, as the larger the degree of hazard the higher the premium rate. Practically, however, extraordinary hazard cannot be taken until it has been reduced by fire protection. There is a nice point here as to the relation of premium to fire protection. Fire protection, however, of usual average of less than one per cent per acre per year on land worth five dollars an acre and up is certainly reducing the likelihood of loss and can be carried much farther without costing more than it will save. It is here required as the basis of any insurance which is attempted and would appear to have reduced the hazard to a point where insurance is possible and not unduly expensive.

Human hazard is reduced by the fire protective associations.

Physical hazard will be reduced by wide distribution and small individual risks.

Conflagration hazard will be reduced as above and by the setting aside of a reserve sum of twice the annual premium. Reinsurance may possibly be worked out after a reputation has been made and established.

A criticism has been made by Professor Lovejoy of the University of Michigan in the Forestry Quarterly, of the expression "Carrying his own insurance," when applied to the large owner, that as a tract of timber which has been wiped out by fire cannot be replaced by growing a new forest at the same cost of the current stumpage value de-

stroyed, there is no adequate insurance possible in a strictly forestry sense.

While this may be true in forest replacement on his one-hundred year rotation basis, it is not true when there is still remaining in America many opportunities to purchase additional areas at approximately the same stumpage price. Is it an admission and veritable exposition of the fact that complete forestry replacement by plantation is financially unfavorable at the present moment in America.

He does show, however, in proving how a slight yearly per cent of loss by fire to uninsured forest property will, by accumulation over one hundred years, wipe out the profit of growth, the necessity of efficient fire protection to forestry, and how financially possible and advisable it is to expend yearly a much greater assessment for fire protective measures than is commonly done.

By the same argument, the financial possibility and advisability of taking out yearly a fire insurance policy as a supplement to the cost of fire protection is proven. Fire insurance has been made possible by fire protective measures, but fire protective measures are limited to the unavoidable natural conditions. They must stop short of the ideal condition of no damage occurring, as lightning will continue to strike and unknown sources will continue to set fires, and when the irreducible minimum is obtained, and that minimum forecasted within reasonable variations, it can be insured. Insurance is practically collecting the present worth of an expectation value and commencing a new period of crop rotation.

PLAN OF ORGANIZATION.

First. A similar agreement on paper will be secured from sufficient timberland owners throughout New England and possibly the Middle Atlantic States, that if the form of association adopted by the majority speak their approval they will exchange insurance among themselves at actual cost, on certain limited, selected areas of their timber, of approximately equal risk, by forming an unincorporated exchange, the details of whose management will be delegated to an attorney-in-fact acting for each member individually, who will receive authority by power of attorney to execute and carry out private identical inter-indemnity contracts among the members, enter into agreements, determine risks and values, adjust and pay losses, dis-

REPORT OF FORESTRY COMMISSION.

tribute unexpended balances and incur proper expenses of management.

Second. Each subscriber will agree to appoint the same individual or firm to act as his agent and attorney-in-fact, under a uniform agreement executed by each subscriber, such agent to also act as secretary-manager of the exchange, sufficiently bonded, and with full powers to make inspections, determine risks, keep accounts and records, collect and distribute all moneys, and in every way carry on the business of the exchange of insurance between the subscribers, subject to a board of five supervisors who shall be appointed at the annual meeting by such members.

Third. Each subscriber will then be offered and agree to take out a line of insurance on standing timber, divided into approximately equally hazardous, definitely specified, widely separated sections of territory, subject to the acceptance and approval of the managing attorney-in-fact as good risks, and as risks approximately equal to those of the other subscribers, no individual risk exceeding five thousand dollars. Each subscriber will agree to deposit as his share in the reserve, cash to the amount of the annual premium, and to pay in advance a premium of two per cent. The cost of any necessary appraisal, except the expense of the managing attorney-in-fact, shall be paid for by each member. When in the judgment of the supervisors an adequate reserve fund has been created and all debts of the exchange provided for, including current losses, cost of management, and unearned premiums on all risks in force, then at the close of any year the supervisors shall order the managing attorney-in-fact to return to each subscriber the unused portion of each subscriber's premium, pro rata, which will result in subscribers obtaining insurance at actual cost, in addition to a pro rata ownership on the reserve fund.

Two losses must be provided for: The usual annual loss and the uncertain extraordinary loss. The greater the number of risks carried the more uniform and less uncertain will be the extraordinary loss. It is customary to set aside twice the amount of the annual premium for such extraordinary losses. At the start the size of the average risk should be kept down, the risks should be scattered over a large area, and only partial insurance should be taken on. Subsequent experience and time will no doubt justify a less conservative policy.

WITHDRAWAL.

A subscriber may withdraw from the exchange at any time on reasonable notice to the management. After withdrawal of a subscriber all the amounts standing to his credit, both in his current and reserve fund account, will be returned to him, together with interest earnings on his money while deposited with attorney-manager, after his account has been assessed his proportionate share as estimated by the attorney-in-fact to cover all losses by fire in the process of settlement, and all cost of management and all debts incurred to the close of that year. Short time premiums of larger per cent will be charged for withdrawals before the close of the year. Such return shall not be made until the subscriber's share of the liabilities incurred up to the time of withdrawal is known beyond question.

MANAGEMENT.

The affairs of the exchange shall be settled by a majority vote of an advisory board of five supervisors elected by the subscribers at their annual meeting. The supervisors shall meet at least four times a year. They shall pass, after the exchange has been formed, upon the continued acceptability of the managing attorney-in-fact and his salary, and exercise a general supervision over his acts; and prescribe the rules and regulations of the exchange concerning new members, risks, adjustments, assessments, distributions, fire protection, etc., their actions being subject to review by the members.

Expenses of management have been found to run about 20 per cent of the annual premium, but sometimes vary from 7 per cent to 25 per cent. The economy possible from this form of organization results from the direct relation between costs and losses, the simple form of administration and the absence of commissions or salaries to agents.

The supervisors shall appoint and place under bond a treasurer, who shall be responsible for all moneys, audit accounts, and countersign with the attorney-manager all checks.

FIRE PROTECTION.

Each subscriber agrees that he is and will continue to be, a member of a fully organized fire protective association with adequate protection facilities, and under favorable report as to payment of assessments and individual care of fire, or that

while a subscriber he will maintain such adequate fire protection upon his land and surrounding territory satisfactory to the attorney-in-fact, and failing to do this the attorney-in-fact may immediately declare invalid policies covering such land until such time as satisfactory protection is established and maintained.

CHANGE OF HAZARD.

The attorney-in-fact or his authorized agent shall make periodic inspections and in case of subsequent adverse change in risk on any lot or parcel of land, the attorney-in-fact shall have a right to decide the extent of same and call for additional premium and may hold such subscriber's reserve or balance in cash, as security for the enforcement of his decision.

ADJUSTMENT OF LOSSES.

Each subscriber agrees that he will submit to the adjustment of loss of value by fire according to the inspection and report rendered of such loss by the managing attorney-in-fact, approved by the board of supervisors. The premiums on merchantable timber will be based on a predetermined estimate of species, quantities and stumpage value submitted by subscriber and approved by attorney-in-fact. On growing lands and plantations premiums will be based on a predetermined value *per acre*, submitted by subscriber and approved by attorney-in-fact. The percentage of loss paid to subscriber shall be the same percentage of the value stated in the policy as the loss sustained bears to the whole value of property insured. Losses by fire shall be adjusted with each subscriber by the managing attorney-in-fact or his agent after personal inspection and after a reasonable valuation has been placed upon unburned timber or the practical salvage in burned timber. If dissatisfied with the adjustment of the managing attorney-in-fact, each subscriber may call for a new inspection and report by a third party, who shall be mutually chosen and paid by the attorney-in-fact and such subscriber, or if they fail to agree on a choice, by an arbitrator appointed by the Superior Judge of the District, and the findings of such arbitrator shall be final and binding upon such subscriber and upon the exchange.

LIMIT OF LIABILITY.

The liability of each member or subscriber for any one year shall be limited to his current annual premium and an amount,

including his interest in the reserve, equal to two annual premiums.

NEW SUBSCRIBERS.

After organization has been completed and insurance placed among the original subscribers upon the terms and conditions as mutually agreed, the attorney-in-fact is empowered to admit new subscribers under the following conditions:

(a) Applications for membership from new subscribers, or for additional insurance from old subscribers will be passed upon by the attorney-in-fact after making an investigation, at the expense of the applicant, on the character, value and risk of the timber the subscriber offers to be insured, the yearly premium which such subscriber should pay, and the reserve which he should contribute, commensurate with all hazards, moral, physical and climatic.

(b) The initial qualification for new membership must be proof of membership in a fully organized fire protective association, or other substantial proof of assured fire protection.

(c) While the rates paid by the original subscribers will be uniform to all the original subscribers for the first year and constitute the basic rate and largest line written, the rates paid by new subscribers will be based on the character of the new risk.

(d) In the case of all subscribers rates may be increased at any time after the first year to correspond to an increased risk. Such subscribers' insurance may be cancelled at any time for sufficient cause by ten days' notice, and the unused balance of their premiums and the reserve subscribed, less pro rata share of debts incurred, returned.

(e) In adjustment of losses and payment of expenses each subscriber will be assessed pro rata the amount that his premium bears to all other premiums in force, and the division of unexpended balances will also be pro rata to the premiums paid in.

SMALL AND LARGE OWNERS.

It is realized that by widely distributing their risks large owners of standing timber practically insure themselves. Therefore such an exchange would be of greatest immediate value to the small owner or the farmer whose tract is small, exposed and subject to total loss. But if the large owners will join in subscribing the small reserve called for and agree to insure and pay assessments on a few small areas in order to start the exchange, together with those more immediately

benefited, then when the exchange has proved a success by adding new members and increasing territory, with the result of more uniform loss, greater reserve and lower premium, opportunity may be created for the insurance of the larger and more valuable tracts of the larger owner.

The difficulty of proper classification of hazard and of correct valuation makes small and well distributed risks at the start more equitable among owners, as there will be less likelihood of the small owners carrying an undue proportion of the large risks or vice versa.

Such an organization would create a new profession, that of *timber actuary*.

It would gather *adequate and accurate data* concerning the fire risk.

It would create a more definite *market for cut-over lands* and second growth.

It would *stimulate* planting.

It would encourage *long time* management of land, and demand for *adequate* protection.

The matter of *classification of insurance risks* will no doubt at the start call for the best of judgment and ability of a trained forester with experience, and call for consideration of kind and character of species, exposure, soils, neighboring risks, accessibility to market, market values, climatic, physical and moral hazard, and many other factors, but it is planned to start in a small way, to proceed with great conservatism, and to ask coöperation and support for a considerable period in order that a new and desirable opportunity may be opened to the timber owner everywhere to fully protect his property and encourage him in the holding of the same.

REFORESTATION.

NON-PRODUCTIVE LAND—A STATE PROBLEM.

Use of Waste Land.

The increasing amount of idle land in New Hampshire is one of the serious state problems, and becoming more serious each year. Lumbering, fire and the reversion of old pastures and fields have reduced materially the areas of productive forest and agricultural lands. Of the nearly 6,000,000 acres of land in New Hampshire careful surveys by the U. S. Department of Agriculture have shown that about 60 per cent of the land surface, or roughly between 3,500,000 and 4,000,000 acres, is better adapted to forest growth than the raising of farm crops—true forest soil. The development of agriculture, which is now making effective progress, will greatly increase the productiveness from the 2,000,000 to 2,500,000 acres of true agricultural soil. As this development in agriculture proceeds it is probable that in many localities readjustments will take place between farm and forest. Areas of light, sandy land or very rough, stony hillsides which have been found by experience unprofitable for agriculture will either slowly revert to forest or be planted with commercial timber trees. Conversely, tracts of good soil which are now in woodland will from time to time be cleared and used for agriculture. It is evident that the ultimate development of agriculture in New Hampshire will leave a large balance for improvement by forestry and it is important to bring into productiveness these great areas of lower grade lands.

Some of the unproductive forest land consists of sand plains which once supported extensive valuable pine forests, but due to heavy cutting and repeated fires have

become largely barren wastes of pitch pine and scrub oak. Most of the unproductive forest soils, however, are on the uplands of the state—the higher and steeper parts of our hills and mountains. Many of these waste lands cannot be brought into productiveness within the next generation except by extensive forest planting.

The Extent of Forest Planting Adequate for State Needs.

The present area of forest land which has not restocked naturally owing to clean cutting, the removal of seed trees, and to fire, amounts to many thousands of acres; 500,000 to 600,000 acres would be a conservative estimate. With the 100 portable steam sawmills and the 275 stationary mills operating in the state, there are certainly 50,000 to 60,000 acres or more of woodland cut over every year, and considerably less than half of this land restocks naturally to valuable forest trees within the first generation. It is evident, therefore, that more than 25,000 acres of land is annually added to our already large non-producing forest areas. The rapid increase in this class of lands constitutes an increasing burden to the owner, the town and the state. To keep pace with the timber cut and bring the non-restocking forest lands into profitable timber growth, reforestation must be inaugurated on a large scale.

In considering the solution of this problem it should be borne in mind that very extensive planting would be a temporary stage in the development of forestry, due to the fact that the merchantable forest has been and is being rapidly depleted. When a large per cent of the natural woodlands are brought into normal conditions of growth, proper methods of cutting and adequate fire protection may be counted on in large measure to secure natural regeneration of the valuable forest trees. But during the next few decades at least 30,000,000 trees (25,000 acres) should be planted annually.

What Has Been Done in New Hampshire to Solve the Waste Land Problem.

The interest in forest planting among private land owners has increased considerably during the past decade. The establishment of the state forest nursery has stimulated this interest and commercial nurseries have been developed which are doing a considerable business in forest tree stock. With all the educational work that has been done there is at the present time only about 4,950 acres of planted forest in the state. This is due primarily to the fact that money invested in a forest plantation is tied up for a long period of years before any income is returned. Such an investment is not attractive to the average person. We may reasonably expect a very considerable increase in forest planting by farmers who can plant ledgy, unproductive parts of their pastures at a small cash charge; by summer residents, because setting out trees improves the value of their land and offers a form of investment which does not require constant care; and by certain classes of corporations who by the nature of their business are large owners of unproductive land, such as certain kinds of public service corporations and a few lumber companies. So far, the results of reforestation operations have been satisfactory in a small way, but in comparison with the amount of work necessary the surface has barely been scratched. The acreage planted by private owners may increase many fold, but it is inconceivable that private enterprise will reforest on a scale adequate for state needs.

REFORESTING OPERATIONS BY THE STATE.

A. New Law to Encourage Forest Planting.

The General Court of 1915 passed an act (Chapter 163, Page 147) enabling owners to deed to the state tracts of land, not to exceed 25 acres in extent, for planting pur-



SPECIAL PLANTING SPADE.



SCOTCH PINE, PLANTED 1912.
Harriman State Forest.

poses. The Forestry Commission holds the land, reforests and cares for it. Any time within ten years, but not thereafter, the donor has the right to redeem the land by paying the state the cost of improvements plus 4 per cent interest. At the expiration of ten years if the donor has not redeemed it, the Forestry Commission may hold the land as a state forest, or may sell it or sell the wood and timber thereon with the approval of the Governor and Council. An annual appropriation of \$2,500 was made to carry out the purposes of the act, and the Forestry Commission was also authorized to reforest any other state lands.

The primary purpose of receiving these small tracts of land and planting them is education. It is the purpose of the commission to have the tracts located in as many different parts of the state as possible, so that many land owners will have a chance to observe them. Each tract is examined carefully before it is accepted and care is taken not to accept land which ought to be used to better advantage for agriculture, and this will be one of the important educational features emphasized. This act became effective September 1, 1915, and up to date eleven tracts aggregating 231 acres have been received. Several of these tracts illustrate very clearly the difference between farm and forest soil, as they have been deeded by farmers and are portions of the farm which have been found by long experience to be unprofitable.

The financial feature should not be lost sight of from the standpoint of the state. No matter whether the donor redeems the tracts or not, the state has not lost anything. If the tracts are redeemed the money spent by the state is returned with 4 per cent interest. If any tract is not redeemed the state may hold it and sell at the time when the forest growth will bring the highest return. The money invested by the state in reforesting these tracts should, therefore, be regarded as a finan-

cially profitable investment, the primary purpose of which is to interest a large number of owners in reforesting waste land.

Table V shows the name of donor, the location of tract, area, and trees planted up to date on the eleven tracts received under the new law.

TABLE V.

Tracts Reforested Under New Law.

Name of Donor.	Location of Tract.	Acres deeded.	Trees planted.
W. D. Baker	Rumney, near Quincy Station.	25	25,200
Jason E. Russell . . .	Mason, near George Arnold's.	25	20,000
Geo. D. Pattee	Campton, near donor's house.	5	6,450
Geo. B. Leighton	Dublin, on Keene road	25	20,000
Chas. E. Tilton	Half-way between Tilton and Franklin Falls	25	10,800
John Q. Hodgman . . .	Amherst, Merrimack road	18	10,000
Charles H. Allen	Concord, northwest corner of town	25	10,000
Edward H. Carroll . . .	Warner, on road to Pumpkin Hill	25	
Ernest R. Kimball . . .	Mason, near Pratt Pond	25	
Charles H. Pattee	Campton, near Geo. Pattee's . .	8	5,000
Charles F. Young	Merrimack	25	
Total area and trees set		231	*107,450

*Of this number 29,200 were planted in the fall of 1916, since the close of the fiscal year, August 31.

Planting on State Forests.

The new law above referred to also provides for reforesting operations on state forests and town forests, the trees to be furnished from the state nursery. The planting work on state lands is paid for from the appropriation made for carrying out the above mentioned act, that on municipal lands is paid for by the town or city. In the spring of 1915 the commission began for the first time to reforest on any considerable scale. Besides the tracts mentioned above, received under the new law,

planting operations have been carried out on eleven state forests, as shown in the following table.

TABLE VI.
Planting Operations on State Forests.

Name of Tract.	Location of Tract.	No. of acres planted.	No. of trees set.
Cathedral and White Horse Ledges.....	Bartlett, opp. Intervale.....	2 ¼	2,600
Haven	Dublin Road	2	15,000
Harriman State Forest	Mink Hills	13	17,200
Nursery Experiment Station	Boscawen, north of Gerrish Station .....	...	36,880
Huckins' Forest Demonstration Tract...	Ossipee, near Duncan Lake..	38	45,500
Dunbarton State Forest	Dunbarton, on road to East Weare	12	14,200
Walker State Forest..	Concord, on Little Pond Road	24	29,000
Davisville	Warner, between Davisville and Dimond Station	6	7,000
Mast Yard.....	Hopkinton, between Mast Yard and Tyler Station	67	87,000
Sentinel Mt.	Piermont, on road to Wentworth	12	15,000
Litchfield	Litchfield, on Derry road.....	14	17,000
Total area and trees planted		190 ¼	*286,380

*Of this number 88,400 were planted in the fall of 1916, after the close of the fiscal year, August 31.

TABLE VII.

Summary of all Public Planting Operations.

Trees planted by Forestry Commission on state land:

On all state land prior to September 1, 1915..	74,000
On tracts deeded under new law—first year, from September 1, 1915, to August 31, 1916	78,250
On state forests, first year under new law....	161,180
On all tracts since end of fiscal year, August 31, 1916	123,600
	————— 437,030

Trees planted by towns and cities:

Prior to establishment of forestry department in 1909	136,000
Sent by forestry department since 1909.....	379,000
	————— 515,000
Total number of trees planted to date	952,030

PLANTING METHODS.

Planning a Reforesting Job.

A brief statement of methods and special features of planting operations, which may be of value to private owners, is here set forth. In planning a reforesting job it is important for the owner to know in advance approximately how much time and expense is involved, what tools are necessary and how the work should be handled. A brief description and estimate is given below for a small and a large operation.

1. **Small Tract, Ten Acres**—The number of day's work required will depend on whether the land is rough or smooth and whether or not the ground cover is dense, sparse or heavy. Estimating that the trees are to be planted 6 by 6 feet, approximately 12,000 trees will be required. If the owner plans to do part of the work himself, he can with the help of three extra men plant the tract in from five to eight days, depending on the character of the land. This is allowing that either the owner or one of his hired men shall work only six hours a day, and therefore be off for morning and evening farm chores. With wages at \$2.00 per day for nine hours this would represent a cash charge of from \$3.00 to \$4.80 per acre for setting the trees. The cost of the trees including expense but not hauling (the owner does this) would be about \$6.50 per acre. The net cash investment would therefore be from \$9.50 to \$11.30 per acre. For such a sized operation the only tools needed are two or three galvanized pails and two or three of either mat-



Opening Ground



Setting Tree.

THREE MOTIONS IN SPADE PLANTING.



Firming Ground.

tocks or planting spades. If the tract were located a considerable distance from the owner's home, so that he would have to hire a foreman or some one to take his place on the farm, pay for hauling the trees, etc., then an extra cash charge of \$1.50 to \$3.00 per acre would be required, making the net cash outlay of from \$11.00 to \$14.30 per acre.

2. **Large Tract, One Hundred Acres**—An operation of this size would require the services of a planting foreman and the organization of the work similar to state planting operations and those done by large commercial nurseries. Unless an owner has time to look after the work himself and has had the experience to carry it on to advantage, it would be well for him to have a commercial forest nursery firm examine the land and submit contract prices per acre. Based on the same prices as quoted above for the small tract, the large tract could be planted by the owner at from \$11.00 to \$14.00 per acre. The prices charged by commercial nurseries now average about \$12.00 to \$13.00. It is thus seen that a large tract can be planted at a smaller price per acre than a small tract, unless the small tract is located where the owner can supervise and help set the trees. The average cost of planting state lands, both large and small tracts, is about \$11.00 per acre. The reduction is due to facts that the trees used are grown by the state and are charged at actual cost and that the planting jobs are known long in advance and a whole season's work can be planned in detail.

Methods of Setting the Trees.

There are two general methods of setting trees corresponding to the tools used, namely, mattock planting and spade planting. Mattock planting is used more generally and is done as follows:

One man digs the holes with the mattock, keeping them evenly spaced by pacing or by carrying a stick ex-

actly the length the trees are to be spaced. The hole should be deep enough to permit the roots to occupy as nearly a normal position as possible and be planted slightly deeper than they were in the nursery. Another man follows with the trees in a pail in which the roots are puddled to keep them wet, and plants a tree in each hole.

During the past year spade planting has been used by the state crews to a considerable extent. A special form of spade has been devised for this purpose, shown in the accompanying photograph. A heavy garden spade is cut at the corners as shown in the picture. It weighs about $9\frac{1}{2}$ pounds and makes a deeper hole with less effort than can be done with the mattock. It does not, however, loosen the ground so much as the mattock nor remove the turf immediately around the newly planted tree. As developed by the state crews, spade planting is resolved into three motions; first, driving the spade into the ground and bending it backward and forward to open up a hole; second, placing the tree in the hole at the side of the spade and straightening out the roots; third, withdrawing the spade and pressing the ground firmly around the tree with the foot. The complete operation is shown opposite page 64.

THE STATE FOREST NURSERY.

Land Under Lease.—New Site Purchased.

The Forestry Commission has maintained a state nursery at Gerrish since 1911. The present site was secured on a ten-year lease, which expires in five years. The first year the nursery was established the Forestry Commission sold to land owners within the state 237,000 trees. This has steadily increased until in 1914, 717,000 were sent out. During the past two years the state nursery has distributed 263,500 trees to towns and cities



WHITE PINE PLANTATION.
Concord Water Department, Penacook Lake.

for reforesting waste land; 393,830 trees for planting on state forests; 412,808 trees to land owners for beginning reforesting operations; and 3,000 larger trees for planting along highways and around rural schools. Besides this 207,500 trees from commercial nurseries were sold to private owners through the Forestry Commission.

In 1914 a tract of land adjacent to the present nursery site was purchased, and the nursery work is gradually being moved over to the new site. The tract acquired will furnish ample room for the raising of all the nursery stock the state will require.

Plans for Developing the State Nursery.

The purposes for which the commission plans to develop the state nursery tract may be briefly stated as follows:

1. To raise trees for reforesting the lands deeded to the state under the new law and the lands acquired as state forests. With the land which has already been acquired and that which is in prospect of acquisition, the growing of trees on a much larger scale than heretofore will be necessary.
2. To raise trees for reforesting town and city lands. Up to the present time 263,500 trees have been furnished by the commission to towns and cities, and so far only a beginning has been made. The development of municipal forests will depend largely on encouragement given by the state.
3. To raise trees to be distributed at a small margin over cost to beginners in forest planting and thus encouraging more private owners to reforest waste land. As the state nursery develops for the other purposes named, it will be the policy of the commission to adhere more and more to the educational feature in stimulating private planting and to turn over to commercial nurseries the larger planting operations of private individuals

who have had experience in this matter. Thus the state nursery would be used primarily for growing trees to plant on state and town land, and by using this as an educational force to interest new owners in planting, it would increase the field of commercial forest nurseries instead of competing with them for private business.

4. To raise shade and ornamental trees to be furnished to the towns and the State Highway Department for planting along roadsides.

5. To develop the forest land around the nursery (142 acres) as an experimental forest. Considerable work of this kind is already under way. This tract is especially adapted for experiments, being where the projects can be watched closely at all times. For more detailed description of the work on this tract see page 78 under "State Forests."

6. To establish a headquarters for field men employed on all general work of the forestry department. This would make for efficiency, as the men who are used both in planting and in other branches of the service could be worked to advantage at the state nursery and on the surrounding state forest between other jobs.

The most imperative present need at the state nursery is a building to serve as a barn, shop and packing house to take the place of the present barn, which it is not practicable to repair. Later a small plain building should be constructed to house the transient labor, which is largely used at the nursery in the spring and fall, and for other employees of the forestry department while they are working there.

LUMBERING ON THE WHITE MOUNTAIN NATIONAL FOREST.



Logs on Skidways.



Condition After Cutting and Brush Disposal.

PUBLIC FORESTS.

(NATIONAL, STATE AND MUNICIPAL.)

SUMMARY OF PUBLIC FORESTS IN NEW HAMPSHIRE.

White Mountain National Forest	350,000	acres
State forests, received by gift or purchase	9,115	"
State tracts acquired under the reforestation law	231	"
Municipal forests	5,329	"
	<hr/>	
Total area public forest land	364,665	acres

OWNED BY FOREST SOCIETIES AND INSTITUTIONS.

Society for the Protection of New Hampshire Forests	830	acres
Appalachian Mountain Club	704	"
Yale Forest School	900	
	<hr/>	
Total	2,434	acres

NATIONAL FORESTS.

Besides the extensive national forests in the West created from the public domain, about 1,450,000 acres have been purchased in the eastern mountains. About 350,000 are in the White Mountains and 1,100,000 in the Southern Appalachians.

The following statement on the progress of federal acquisition and management in the White Mountains is given by Mr. J. St. J. Benedict, Forest Supervisor, Gorham, N. H.

The White Mountain National Forest.

Extent—About 350,000 acres have been acquired or are under purchase agreement in the White Mountain National Forest, about 25,000 acres of this being in Maine and the balance in the White Mountain region in New Hampshire.

Administration—The headquarters office is at Gorham. Permanent ranger headquarters are located as follows:

Bartlett, office in village.

North Woodstock, office in village.

Martin's Location, in Peabody River valley, about six miles south of Gorham.

The following places are headquarters for assistant rangers and guards during the summer months:

Bethlehem, on Gale River near Pierce's bridge.

Benton, about a half mile north of Glenclyff railroad station.

Lincoln, on Franconia Notch road about a half mile north of Flume House.

North Woodstock, short distance north of railroad station.

Jackson, about 5 miles north of Jackson Village, near Fernald's cottage.

Albany, about $3\frac{1}{2}$ miles east of Passaconaway, on Swift River road.

Low and Burbank Grant, on south branch of Israel River about 3 miles south of Boy Mountain railroad station.

Bean Purchase, on Wild River about 6 miles southwest of Hastings, Me.

Permits to camp and build fires may be secured upon application to any of the rangers or the Forest Supervisor at Gorham. Maps of the White Mountain area showing the location of the national forests, ranger headquarters, and other features may be secured upon application to the Forest Supervisor at Gorham.

Improvements—Ranger stations are connected by telephone, and as fast as funds are made available the lines will be extended to points within the forest. Complete plans have been made where telephone lines and

trails will be constructed to best provide for fire protection.

But a small amount of the funds appropriated at the last session of congress for the coöperative construction of roads in the national forests will be available in the eastern forests. As the income from forest uses increases, a sum equivalent to 10 per cent of same will be available for road construction in coöperation with the state and counties in which the national forest is located. Numerous trails have been improved as tracts have been acquired in order that the areas would be more accessible for the purpose of fire protection.

Lease of Cottage and Camp Sites—Certain areas in the forest have been set aside in which no permits will be issued for camp or cottage sites, the policy being to leave these areas in a wild and undisturbed condition. Several areas have been set aside in which term permits will be issued. These areas will be surveyed and subdivided into lots of about one acre each. Two such areas have already been surveyed, one being the open fields west of the Glen Road about five miles from Gorham where some 80 lots have been laid out; another area has been surveyed around Russell Pond in the township of Woodstock. These lots can be leased from the government at prices ranging from \$18 to \$25 per year, and may be leased for a term of from 15 to 20 years. Certain restrictions will be imposed as to types of buildings, and the minimum investment. All correspondence relative to the uses of the forest should be addressed to the Forest Supervisor, Gorham, N. H.

Reforestation.

As yet no attempt has been made to reforest cut-over and burned areas, since natural reproduction is generally very good, but a small appropriation has been made to carry on some planting work next spring. Should it be

found that areas are not reproducing properly, planting work will be taken up.

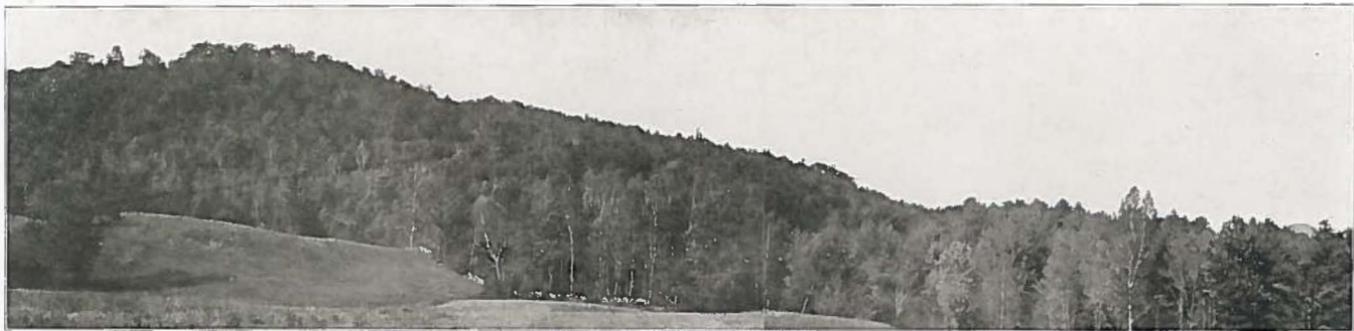
Timber Sales.

Several sales have been made for the hard and softwood timber on areas that the government has already acquired. All timber to be removed is marked by a forest officer. Softwood brush is required to be burned while cutting is in progress. Spruce and balsam fir is utilized to a 4-inch top diameter and in log lengths down to 8 feet. Ordinarily 12 inches, breast height, is the minimum cutting diameter allowed for spruce, fir, hemlock and pine. Hardwoods are utilized down to 4-foot lengths, according to the species being removed. Ordinarily hardwood brush is required to be piled. Such portions of the tops as are not utilized for cordwood must be limbed out so that they will lie close to the ground to insure their rapid decomposition. All timber is scaled before removal from the forest. The cubic foot rule is employed in scaling national forest timber, 161 cubic feet equaling 1,000 board feet Blodgett or New Hampshire rule, which is the standard log rule in the White Mountain region. Invariably fire lines are cleared around each logging operation.

In timber sales amounting to over \$100, the regulations require that they must be advertised in at least one newspaper for a period of at least 30 days previous to the closing of bids. All timber is paid for in advance, and in large sales a bond is required to insure compliance with the terms of the contract.

A small bobbin and sawmill has been installed at Glenciff to manufacture the timber being removed from a sale area in the township of Benton, and it is expected that another similar capacity bobbin mill will be installed close by to utilize the product from another sale area.

A sale of 10,000 cords of hardwoods in Bean's Purchase



SUGAR HILL STATE FOREST GIVEN BY MISS SARAH J. TENNEY, TO CARRY OUT THE WISH OF MISS MARY E. BARTLETT.



BRISTOL VILLAGE FROM SUGAR HILL.

REPORT OF FORESTRY COMMISSION.

has resulted in the renewal and operation of the wood distillation plant located at Hastings, Me., having a capacity of 5,000 cords of wood per year.

A sale of over 2,000,000 board feet of hard and soft woods has been made to supply mills at Whitefield, the softwoods being utilized for building lumber, while the hardwoods will be used in the manufacture of bobbins.

The general policy of the Forest Service will be to make small sales rather than large ones, having always in mind to serve the greatest number of people within and adjacent to the forest, bearing always in mind the protection of the forest cover in the removal of the timber, or in other words, to make improvement cuttings. Close utilization, brush disposal, the improvement of the stand, stream flow, protection and fire prevention are the primary results sought, and the removal of mature timber wherever the conditions warrant.

Under the terms of the Weeks Act 25 per cent of the net revenue from national forests is paid to the state treasurer to be disbursed to the county from which this revenue is derived. On account of the fact that the towns look after local improvements and that federal lands reduce town revenues more than those of the counties and the state, it is desirable to transfer this revenue to the towns. The General Court should therefore pass an act directing the counties to distribute such revenue to the towns from which the national forest lands have been withdrawn from taxation.

STATE FORESTS.

Recent Forests Acquired by Gift.

During the past two years the state has received two state forests by gift, the Joseph B. Walker tract in Concord and the Sugar Hill tract in Bristol.

The Joseph B. Walker State Forest consists of 45 acres on the Long Pond road less than two miles west

of the State House. It was presented by the heirs of the late Hon. Joseph B. Walker, a member of the first New Hampshire Forestry Commission and author of the first Forestry Commission Report in 1885, in memory of his interest and activity in the development of scientific forestry. The tract was cut over in 1913, except for a three-acre piece of thrifty white pine growth about 35 years old, which was reserved by the donors and given to the state. For an account of improvement work done see page 81.

The Sugar Hill State Forest consists of 56 acres less than half a mile north of Bristol village, embracing the summit and the south slope of Sugar Hill. The donor, Miss Sarah J. Tenney, who received this property by the will of Miss Mary E. Bartlett, late of Bristol, gives it to the state to fulfill Miss Bartlett's often expressed wish to have Sugar Hill become a state forest. The variety of conditions on this forest and its accessibility from Bristol will make it extremely valuable as a demonstration tract. There is timber of all ages and the soil varies from strong, moist humus on the lower slope to thin, light soil on the steeper part. There is a considerable body of "second old growth" pine and a large area of thick young pine mixed with young hardwoods; and there are pure hardwood stands of all ages, the younger and middle-aged stands being of good quality. There is little open land. Management in the near future will be chiefly improvement cuttings to stimulate the growth of the better trees by removing inferior ones, and planting the openings where overmature trees are declining.

State Forests Acquired by Purchase.

Beginning September 1, 1914, there has been available an annual appropriation of \$5,000 for the purchase and care of state forests. It has been the policy of the commission to use 90 per cent or more of the appropriation



STATE FOREST OF 100 ACRES, GIVEN BY MR. S. O. HUCKINS, OSS�PEE, TO DEMONSTRATE REFORESTING METHODS.



PINE GROWTH ON STATE FOREST, GIVEN BY HEIRS OF THE LATE HON. JOSEPH B. WALKER.

This pine stand has been thinned three times.

for actual purchase and only a small amount for improvements and care, as far as possible improving the tracts by men employed in the fire work and other branches of the department.

During the year ending August 31, 1915, five tracts were purchased aggregating 602 acres at a cost of \$2,257, or \$3.75 per acre. The sum of \$1,886.37, or over one-third of the annual appropriation, was returned unused because not enough tracts had been offered at low figures. The next year many more tracts were offered, and from these the commission selected only those which were well located and could be secured on favorable terms. Seven more tracts were purchased aggregating 714 acres for \$3,391.50. During the two years ending August 31, 1916, in which the policy of establishing state forests was inaugurated, a total of 12 tracts were purchased aggregating 1,316 acres. The average price paid for these tracts was \$4.29 per acre.

With the 9 tracts received by gift and the 12 purchased there are 21 state forests (exclusive of the Crawford Notch) under the care of the Forestry Commission. A conservative estimate of the forest growth on these 21 tracts, including merchantable timber and unmerchantable yet valuable second growth, but exclusive of natural seedlings or plantations, places the value well over \$20,000. The table on page 76 shows the location, size and year of acquisition by the state for all tracts under the care of the Forestry Commission.

TABLE VIII.

State Forests and Reservations.

NAME OF STATE FOREST.	Date acquired.	LOCATION.		Acres.
		Town.	Locality.	
*Miller Park Reservation	1891	Peterboro	Mt. Pack Monadnock	8
*Cathedral and White Horse Ledges.....	1901	Conway	West of North Conway	40
*Monadnock Reservation	1905	Jaffrey	Mt. Monadnock	493
*Haven Reservation	1908	Jaffrey	North of Jaffrey P. O.	95
*Harriman Reservation	1911	Warner	Mink Hills	210
†Crawford Notch Reservation	1913	Hart's Location	Bemis Brook to Carroll line ..	5,925
*Merriman Reservation	1913	Bartlett	North of Intervale	400
State Nursery and Experimental Forest...	1914	Boscawen	Gerrish	142
*Huckins' State Forest	1914	Ossipee	East of Ossipee P. O.	100
Dunbarton State Forest	1914	Dunbarton	On road to East Weare	56
*Joseph B. Walker State Forest	1915	Concord	Two miles west of city	45
Davisville State Forest	1915	Warner	Southeast part, near Davisville ..	32
Alton Bay State Forest	1915	Alton	One-half mile south Alton Bay ..	209
Mast Yard State Forest	1915	Hopkinton	Between Tyler and Mast Yard	204
Sentinel Mountain State Forest	1915	Piermont	East part on road from Wentworth ..	143
Livermore Falls State Forest	1916	Campton	Between Livermore Falls and Campton P. O.	134
Blue Job State Forest	1916	Farrington	Blue Job Mt.	99
Mascoma State Forest	1916	Canaan	Northwest of Canaan Street	174
Litchfield State Forest	1916	Litchfield	East of Reed's Ferry	122
Salmon Falls State Forest	1916	Rochester	On State road south of Hayes	20
Bear Brook State Forest	1916	Allenstown	On Deerfield Road	413
*Sugar Hill State Forest	1916	Bristol	North of Village	56
Total acreage				9,115

*Acquired by gift of owner or by local subscription.

†Not purchased by Forestry Commission; acquired by Governor and Council under special act (Chap. 130, Laws of 1911).

Improvement Work on State Forests.

All tracts are surveyed and examined carefully before they are purchased, so that in nearly every case a rough plan of management and schedule for immediate improvements are already in mind when the tracts are acquired. As soon as possible after acquisition the management of each tract is outlined in more detail and improvement work is begun. The two principles which the commission has adopted for immediate improvement work are: 1. To plan out and begin improvement work first on all tracts where other employees of the department can be used to advantage along with their regular duties, particularly tracts on which the men in the forest fire prevention force can work during cloudy, wet weather. 2. To start improvement work as soon as possible on tracts adjacent to main roads or near villages where the work done will have the greatest educational value. Frequently, these two principles can be attained coincidentally.

The object sought is to put these tracts in the best possible growing conditions at the least commensurate initial outlay, so they will serve as examples of practical methods for woodlot owners to follow and at the same time become financially profitable for the state. In addition to a net profit of \$117.00, which has been paid into the state treasury, about \$500.00 worth of small wood taken out in the thinning of young growth was applied against the improvement cost. Besides this \$97.80 has been received and paid in for the sale of stone, grass, pasturage, and for the lease of camp sites. This initial revenue of \$214.80 in all probability will increase rapidly within the next few years and within a few decades represent a very substantial income on the investment.

The improvements consist of clearing and burning brush, cutting and clearing fire lines and wood roads, making trails, planting trees on open land, cutting hard-

wood sprouts to relieve pine, thinning immature growth and removing mature or overmature trees. A brief statement of the work done on each tract is here set forth in order that persons visiting the tracts may know by reference to this report the purpose of the improvement operations under way.

STATE NURSERY AND EXPERIMENTAL FOREST.

LOCATION—Boscawen, about $\frac{1}{4}$ mile north of Gerrish railroad station; area 142 acres.

The land owned in connection with the state forest nursery has many different conditions of soil and cover and is admirably adapted to experimental purposes. White, red and Scotch pine, Norway spruce, balsam fir, and European larch have been planted on the different soil sites. In all 23,080 trees have been set.

During the winter of 1914-15 an improvement cutting was made over 20 acres of mixed young pine and hardwoods, removing about 43 cords of wood. Release cuttings in pine have been made, removing gray birch over approximately 40 acres. A fire line has been cleared entirely around the woodland property.

Plans for the immediate future call for the removal of scattered mature pitch and white pine which are interfering with young white pine, and for thinning crowded half grown white pine stands. The corners of cutting and planting plots are being marked telling what has been done, and as rapidly as other work permits, paths will be brushed out so that as results of educational value begin to show they will be easily accessible to the public.

GENERAL MILLER PARK.

LOCATION—Peterboro, summit of Mt. Pack Monadnock; area 3 acres.

Given to the state as a memorial to General Warren Miller, but on account of the small area cannot be used for forestry. This summer there was placed on the summit a flag pole and flag presented by Mrs. B. P. Cheney of Peterboro. If added to by the acquisition of surrounding land, this tract could still serve its original purpose and be also a valuable addition to the state's public forests.

CATHEDRAL AND WHITE HORSE LEDGES.

LOCATION—Bartlett, about 2 miles west of North Conway; area 40 acres.

Most of the area consists of the ledge walls. It was given to the state in 1901 by subscription from many residents and summer visitors in the vicinity of North Conway, largely through the efforts of the late Rev. Daniel Merriman. On the few acres of flat land at the base of the ledges and around one shoulder the rubbish and debris have been cleaned and 2,000 pines have been planted.

MONADNOCK RESERVATION.

LOCATION—Jaffrey, southeast slope of Mt. Monadnock; area, 493 acres.

Given by subscription in 1905 through the efforts of Joel H. and Arthur E. Poole, to prevent the destruction of the spruce forest on the south slope of Mt. Monadnock. It is managed in connection with the fire lookout station on the summit, the watchman looking after improvement work on the reservation. This year during rainy weather the lookout watchmen on Mts. Monadnock and Pitcher cut and smoothed a fire line and wood road on to the reservation, making it accessible for men and tools in case of fire. A trail was also extended across the reservation to the north side. This may ultimately be extended up to the north shoulder of the mountain and there connect with a proposed extension of the Dublin bridle path.

HAVEN RESERVATION.

LOCATION—Jaffrey, north of Jaffrey postoffice; area, 95 acres.

Given in 1908 by Miss Frances A. L. Haven, contains a good growth of pine. Some of it is too crowded and in other parts the hardwoods are interfering with it. A heavy wind in September, 1915, blew over some of the exposed pine next to the Jaffrey-Dublin road. This was cut and sold during the winter and a considerable amount of inferior hardwood growth on a strip along the road was cut. This strip was planted with Norway pine. Future management will require a careful thinning of the pine and the cutting of considerable competing hardwood. A small field on the south side has been leased for pasture. In the spring of 1916, 1,500 trees were planted.

WALTER HARRIMAN STATE FOREST.

LOCATION—Warner, on Stewart Mink Hill; area, 210 acres.

Contains part of the old Governor Harriman farm, given to

the state in memory of the former Governor by his son-in-law, Hon. Joseph R. Leeson. During the winter of 1914-15 a small area of overmature red oak was logged. The cut-over land, already partially stocked with young spruce, will be filled by planting. The open land is being planted, 47,200 trees having been set to date. A splendid example of the rapidity of Scotch pine growth in one of these plantations is shown in the photograph opposite page 64. Future management will be the careful cutting of the heavy spruce forest on the north slope of Stewart Mink to insure a reproduction of spruce; thinning the crowded half grown spruce stands; converting the present merchantable hardwood stands into mixed stands of pine, spruce, ash and bass wood by careful cutting and planting; and planting pine on the remaining open land.

HUCKINS DEMONSTRATION FOREST.

LOCATION—Ossipee, short distance from state road near Ossipee postoffice; area, 100 acres.

A cut-over tract given to the state by Mr. S. O. Huckins of Ossipee, to demonstrate the results of reforesting sand plain land with different kinds of trees. White, red and Scotch pine of large and small sizes have been used and plantings have been made in both spring and fall; 45,500 trees have been set. There will also be a chance to observe the difference in growth of trees set with different degrees of cover. Some of the trees are being set on land cleared of brush and bushes, others on partially cleared land and still others among heavy, young sprout growth. The results will be of considerable educational value.

DUNBARTON STATE FOREST.

LOCATION—Dunbarton, on road from Dunbarton Center to East Weare; area, 56 acres.

Purchased in 1914. Inferior hardwood is being removed among the pine. Open land is being planted; 14,200 trees have been set. Mature popple will be removed where in mixture with young pine.

CRAWFORD NOTCH FOREST RESERVATION.

LOCATION—Hart's Location, south of Crawford House; area, 5,925 acres.

The primary object of the state's owning this tract as stated in the act for its acquisition is "for the purposes of a forest



VISTA OPENED ALONG STATE ROAD, CRAWFORD NOTCH.

Work done by fire patrolmen and watchmen during wet weather.



IMPROVEMENT CUTTING, LIVERMORE FALLS STATE FOREST.

reservation and state park." It therefore cannot be managed for timber production as other state forests, but the commission will endeavor, so far as possible, to improve parts of the woodland as opportunities offer while carrying out the main purposes of the act.

For the past year the commission has had the benefit of advice from Mr. Arthur A. Shurtleff, Boston, a landscape architect, who has generously given his time to examine the Notch and prepare a report recommending the cutting of vistas to give good views of the mountains from points along the highway. These vistas have now been opened up, the work being done by the fire lookout watchmen and patrolmen during rainy weather. The photograph opposite page 81 shows one of the vistas. The edges of the roadway have been cleared of brush by the Highway Department.

Two camp sites which were occupied when the state acquired the land have been leased. It is the purpose of the commission to lease the old Willey House site provided this can be done on terms that will be profitable to the state and will insure the maintenance of a thoroughly high grade tea room or restaurant as a stopping place for tourists. A few other camp sites may be leased but only in places back from the road where the scenic features will not be interfered with.

In September, 1915, a heavy wind blew over a large amount of hardwood timber in the middle and lower part of the reservation. Parts of this blow-down contain considerable sound clear timber, other parts are inferior or worthless. Most of the trees are tipped over, with some of the roots still in the ground so that the timber remains green. The trees blown down next to the highway will be worked into cordwood. All of the remainder that can be sold will be cleared.

JOSEPH B. WALKER STATE FOREST.

LOCATION—Concord, pine, west on Long Pond road; area 45 acres.

The three-acre pine stand has had careful management, having been thinned three times, the last thinning yielding about 2.5 M feet per acre and selling for \$5.00 per M on the stump. It can be thinned again after some years and will serve as a good demonstration plot. Release cuttings are being made where pine and hardwoods are coming up together. The cut-over land is being used for experimental planting; white, red and Scotch pine, Norway spruce, balsam fir, white cedar and white ash are being planted on different soil sites. To date 29,000 trees have been set.

DAVISVILLE STATE FOREST.

LOCATION—Warner, on road between Davisville and Dimond railroad station; area, 32 acres.

Operated to demonstrate the restocking of a woodlot that has suffered from fire and neglect. Inferior hardwood growth and pitch pine are being removed, giving the white and red pine which is already started a chance to develop; 9½ cords have been cut. The burned land and openings made by the cuttings are being planted with white and red pine; 7,000 trees have been set.

MAST YARD STATE FOREST.

LOCATION—Hopkinton, between Mast Yard and Tyler railroad stations; area 204 acres.

On the sand plain above Broad Cove, an area that once furnished high quality old growth pine, but which has suffered so badly from repeated fires that the prospect of natural seeding has gone. The tract is protected by a fire line built in cooperation with the Boston & Maine Railroad. Back of this fire line 40,000 trees were set in the spring of 1916 and 47,000 were set the same fall. A photograph of the fire line is shown opposite page 29. The merchantable pitch pine on the tract will be removed and sold.

SENTINEL MOUNTAIN STATE FOREST.

LOCATION—Piermont, on road from Wentworth to Piermont village; area, 143 acres.

Mountain land containing a small stand of rapidly growing middle-aged spruce. The mountain slope was cleared many years ago and has grown up to hardhack bushes, preventing natural forest seeding. On the upper slope a successful plantation of 15,000 Norway spruce has been established. The nearby fire lookout watchmen helped during rainy weather to set the trees. This fall the hardhack bushes on the lower slopes are being burned preparatory to planting next spring.

LIVERMORE FALLS STATE FOREST.

LOCATION—Campton, above Livermore Falls bridge on road to Campton postoffice; area, 134 acres.

The location, only about 2 miles north of Plymouth, makes this forest of great educational value. It lies between the highway and the Pemigewasset River and is nearly covered with a

heavy mixed growth of white pine and hardwoods. Very little planting will be necessary to insure good yields of timber. Improvement cuttings have been made on a strip of about 9 acres beginning along the highway, thinning out the inferior hardwoods and releasing the pine. The plan is thus to leave a thrifty mixed growth which within the next few decades will produce a crop of clean, high grade hardwood and a crop of pine. This improvement cutting yielded 45 cords of fuel wood. The condition after cutting is shown in the picture opposite page 81.

BLUE JOB STATE FOREST.

LOCATION—Farmington, on east slope of Blue Job Mountain; area, 99 acres.

Managed in connection with the fire lookout station on the summit. During wet or cloudy days the lookout watchman has cut over a considerable area, removing gray birch from among pine and spruce. Another cutting has been made in larger growth, where gipsy moths have obtained a foothold, removing oak and gray birch, and leaving the more resistant ash, poplar and pine. These cuttings have yielded 25 cords of fuel wood. A photograph of the valuable pine and spruce growth left after these release cuttings have been made is shown opposite page 18.

MASCOMA STATE FOREST.

LOCATION—Canaan, on west side of Mascoma River, a mile north of Canaan Street; area, 174 acres.

The land was cut over several years ago, at which time many groups of half grown pine and spruce were left. A large part of the cuttings were well seeded and are now coming up to young pine and spruce. A broad fire line has been cleared around the north side of the tract. Management in the near future will consist in disposing of the piles of lumber slash just enough to allow the valuable young growth to come through and to reduce the fire risk, and then planting the open spots which were not seeded naturally. This will furnish a good example of aiding natural forest reproduction on an old cutting.

OTHER STATE FORESTS.

The Merriman Forest Reservation and the Alton Bay, Litchfield, Salmon Falls, Bear Brook and Sugar Hill State Forests have not as yet had any extensive improvements. Most of these have been acquired very recently and improvements are planned for the coming winter.

A CHANGE IN PUBLIC LAND POLICY.

Disposition of Federal and State Lands.

From the beginning of government in the United States until the latter part of the nineteenth century the guiding principle of the public land policy was to get all the land into private hands as rapidly as possible. The desire to have the wilderness cleared and extend agriculture justified the policy. Grants were freely given to settlers for homes and to companies for all kinds of public and quasi-public purposes. During the latter part of the nineteenth century it began to be realized that while the policy of rapid public land disposition might be the best one to develop agriculture, mining and manufacture, it was very questionable whether or not the continuation of this policy as applied to forest land would best serve the interests of an advancing civilization. The theory of an inexhaustible timber supply was exploded by the diminishing cut in the great pineries of the northern states. It was seen there that the private owner, not being interested in a second crop of timber, made no provision for forest reproduction, and the forest industries vanished with the harvesting of the virgin crop. Gradually the present policy of national forests was developed by which 160,000,000 acres in the West are managed by the U. S. Forest Service. In all this vast domain any land suitable for agriculture is still open to bona fide settlers.

The land policies of the Eastern States in broad outline are similar to that of the Federal Government. Nearly all the land in the thirteen original states belongs to the states individually and not to the nation. Most of it was disposed of by sale or by grants for educational and other public purposes before it really became of large commercial value. New Hampshire's case is typical. By 1869 most of the land in the southern part of the state and the river valleys in the central and northern part had

passed into private hands by the formation of towns and the subsequent division of the land among the town proprietors. This included of course a large amount of land in the hill sections of each town which was unfit for farming. In many towns it was the custom to allot each proprietor a valley farm and a hill lot. In others the town held the undrawn upland lots and later disposed of them by sale or grant.

The large unbroken stretches of hill and mountain forest in the central and northern part of the state were disposed of in various ways. Some of it was granted for educational and other for public purposes. Nearly a half million acres was sold for an average of eight cents per acre.

Acquisition of Land by the Eastern States.

During the past decade the change in the land policies of the northeastern states has been very marked. The purchase by the Federal Government of national forests in the eastern mountains has had unquestionably a strong effect in arousing public interest in forestry, but the tendency in the East is strongly toward state forests. Some of the eastern states began acquiring forest land even before the agitation for national forests in the East was started. While national acquisition will probably continue until a considerable part of the high mountain ranges are included, it is not at all probable that the government will own enough land in the East, especially in New England, to meet the requirements of this region for timber production.

Today there are 2,879,089 acres of state forests which have been acquired by the eastern states, and this area is increasing rapidly each year. At first the public impulse for the acquisition of these state tracts was largely sentiment and a desire to prevent the lumbering of cer-

tain areas of particular scenic value. Also the protection of stream flow for water power has had a strong effect, but during recent years the value of state forests for timber production has been realized more fully by the public. This is particularly true in regions where clean lumbering and fire have reduced large forest areas to barren wastes. The following list shows the area of state forests owned by the eastern states:

New Hampshire	9,100	acres
Vermont	12,000	"
Massachusetts	10,000	"
Connecticut	2,657	"
New York	1,814,550	"
New Jersey	15,938	"
Pennsylvania	1,012,098	"
Maryland	2,746	"
	<hr/>	
Total	2,879,089	acres

Diminishing Forest Resources.

It is fortunate that in New Hampshire the policy of acquiring state forests is now well started, on the eve of a period of land readjustment which seems inevitable. Our virgin forest is all gone except for a few hundred acres of pine in the extreme southwestern part of the state and a few thousand acres of spruce in the extreme northern part. The second growth spruce has been cut heavily for pulp. On old pastures and certain sections of the cut-over forest it is reproducing well. To a casual observer who travels through the mountains only on the railroads and highways it may appear that there is plenty of growing woodland. An examination of these tracts, however, shows that the continued cutting of spruce has converted the greater part of our northern tracts into hardwood forests of inferior quality in which the reproduction of spruce is very scattering.

The pine woodlots in the central and southern part of the state are suffering from overcutting even more severely than the spruce in the north. The old method of lumbering pine by which only the best trees were taken, left others standing to seed up the ground. This practice and the abandonment of many upland fields and pastures are largely responsible for the splendid second growth pine stands which have furnished the capital for many farm communities. Lumbering has been going on in these second growth stands for many years, but no longer by the old methods, for with the advent of the portable sawmill clean cutting is practiced and seed trees are seldom left. The portable mill has made the remote woodlots marketable and the rising prices and increase in taxation have encouraged cutting. In 1908 New Hampshire was the third state in the Union in the production of white pine lumber, for the five years following she was fifth. There are about 100 portable sawmills operating in the state and they are rendering non-productive at least 50,000 acres annually.

A Period of Readjustment.

The New Hampshire coniferous forest is being cut many times faster than nature is producing it. The practice of forestry, which is essentially provision for reproduction of the forest at the time of cutting or afterward, is not yet being done on any considerable area of private woodland in the state. On account of the long delayed return and the necessary risks involved this investment in forest reproduction is unattractive to the average private owner. The reproduction which does take place is largely accidental. Interest in tree planting is growing and a few farmers are beginning to take a little care of their woodlots, but such efforts generally are and will be confined to the more accessible woodlots and old pastures near the settlements. At present probably not 5 per cent of the private woodland in New

Hampshire receives intelligent care, and it is doubtful if 25 per cent ever will. Our productive forest tracts are fast disappearing and are not being regenerated. In their place are increasing areas of waste land which are unproductive to their owners and on which the towns and the state can secure little tax revenue. This must soon increase sharply the taxation on other forms of property, especially in the rural towns. What is to become of these unproductive tracts on our uplands all through the state? Every acre of such land is a private and a public burden. Other states are meeting this problem by state acquisition of such tracts. Is it not probable that in New Hampshire either state or town ownership, or some combination of the two, must ultimately make productive and profitable the waste areas which private enterprise will not seek?

OBJECTS SOUGHT BY STATE FORESTS.

From the experience gained by the Forestry Commission in the last few years since beginning the policy of acquiring state forests, with the possibilities which such acquisition opens up, checked by the experience of other states and countries, there are five distinct objects to be attained. They are herewith stated briefly.

1. **The Timber Supply and the Use of Waste Non-Agricultural Land**

A continuation of present conditions is not only rendering unproductive large areas of our non-agricultural soils, but coincidentally is rapidly diminishing the raw material for our lumber and wood using industries. Forest products contribute to the commercial prosperity of the state through the wages and earnings of approximately 275 stationary sawmills, 100 portable sawmills, and over 400 wood-working plants. Leaving out of consideration the pulp-mills, which get a large part of their wood from Canada, the wage distribution from these

forest industries has been well over \$6,000,000 annually, The significant fact is that it has been declining recently, and this decline will probably be very rapid within a decade.

The United States Department of Agriculture, after careful study of our forest conditions, has estimated that there is enough non-agricultural soil in New Hampshire to produce, if properly restocked and managed, the necessary timber to continually supply all of our sawmills and wood-working plants, and furnish a partial supply to the pulp mills. In other words the three-fold industry of growing timber, cutting it into lumber and manufacturing the lumber into finished products can be continued indefinitely if our woodlands are properly handled. It is inconceivable that such a condition can be brought about with all the woodland in private ownership. State forests located on the uplands of our rural towns would insure the reforestation and proper management of at least a portion of the land tributary to the centers where wood is manufactured. As steady supply encourages manufacturing, such tracts by furnishing a residual supply and by stimulating private forestry would undoubtedly insure the continuity and even the increase of many of our best forest industries. The wealth of the state would be increased not only by the forest growing stock but by the private investments which more stable conditions would encourage.

2. Education and Aid to Small Woodland Owners and Forest Communities.

Most of the state forests purchased so far, especially those along main highways and near villages, will be of chief importance as demonstration tracts, where the application of forestry to specific conditions can be observed and private forestry thereby encouraged. This feature will also be an important function of larger tracts but on a more extensive scale.

It is, however, through actual coöperation in management with private owners of nearby woodlots that larger state forests in our uplands would have their strongest influence on private forestry. For example: A state forest of 2,000 acres in good growing condition could supply logs for a small community sawmill several months each year. With the private woodlots furnishing an equal amount, enough logs could be assured to develop a permanent winter industry. This would give the private owners a steady market and encourage conservative logging and woodlot improvement cuttings, and the sawmill industry would increase normally as more woodland was brought under the coöperative plan, making a larger production unit. The central influence for progress and stability would be the state forest with its steady annual supply and its administrative officer, who would be able to make plans of management for the whole collective group of woodlots and give special advice to the individual owners in addition to supervising the state tract.

In contrast with the present uncertain temporary market conditions, under the familiar method of cutting all of the timber in a community in a few years and then waiting generations for another crop, the lumber industry in these localities would be continuous. The industry with its necessary complement of men and horses would insure steady winter work and a local market for farm products. Such a state forest would be a great aid to the development of any rural community.

3. Protection of Stream Flow.

Water power is one of the strong permanent resources of New Hampshire. Located far from the centers of supply of the great heat and power producing minerals—coal, oil and gas—our water powers are developing to increasing importance with the perfecting of electrical transmission and the growing demand for manufactured

products. Projects are under way continually for the impounding of water in our narrow valleys for power purposes.

The effect of forest cover in retarding water run-off and reducing erosion is no longer a theory. It has been proved by careful investigations of the United States Geological Survey in measuring the rainfall and stream flow in lumbered and uncut valleys in the White Mountain region. It must not be forgotten that the legal justification for the passage of the Weeks Act was the protection of the navigability of rivers by continuing and increasing the forest cover. It was the result of this investigation of the Geological Survey which established this relation as definite for the rivers rising in the White Mountains and made possible the national forests in New Hampshire. It is unlikely, however, that the federal purchases will extend south of the mountains. It is to state forests on the higher elevations of our hills and mountains in the central and southern parts, that we must look to retard the silting of power reservoirs and lakes and to prolong the stream flow throughout the year for power purposes. They may also perform an important function in the protection of public water supplies.

4. Recreational Features Should Be Developed.

The present state forests are open to the public for inspection of the work that is being done, but all of them except the Crawford Notch are too small in area to permit any extensive development of the recreational feature.

The increasing interest in the out-of-doors must not be overlooked in considering state land policies, especially in New Hampshire, a widely known vacation state. First of all should be recognized the essential difference between a public forest which is managed primarily for timber production, and a public park which is reserved

for recreation and the enjoyment of natural scenery. The first produces public revenue, the second uses it. Such a use of public money is justified when it furnishes the only out-door recreation for a large nearby population, or when it preserves for public enjoyment an area of rare natural beauty. In some sections of the country public sentiment for parks is strong; even in our own state the purchase of the Crawford Notch was authorized by the General Court of 1911 to preserve the scenery more than anything else. But in at least one state a decided reaction has set in against the park idea. The use of all state forests of larger size for recreational purposes could be easily accomplished without interfering with timber production when it is once realized that the latter is the primary object to be attained and the former a secondary object.

The number of people who tramp through the uplands of New Hampshire is increasing every year. This is true of our own population as well as the summer tourists who annually leave millions of dollars in the state. Trespass regulations are being enforced more generally, and public pressure for recreation tracts will become strong just in the proportion in which the public is restricted in its opportunities for indulging this natural desire. Would it not be wise to acquire larger areas of state forests and let them supply this recreational demand while serving their primary purpose of timber production? This could be done by making good trails and wood roads, clearing of observation points and the leasing of privileges. Minor financial sacrifices might be necessary in timber cutting, such as leaving a group of trees around a spring or camp site, but in the long run these would be more than offset by the revenue from the lease of privileges.

5. Revenue from State Forests.

The most encouraging fact about the question of state

land policy is that state forests, while serving the public good in the four important ways discussed above, need not be a source of continued expense to the state, but can be made financially profitable. The sale of logs, wood and other forest products and the leasing of commercial privileges under proper regulation for the full use of each tract will increase the state revenue more each year until the forests are brought up to better growing conditions, after which they should bring in good returns on the original investments. Nearly all public expenditures at the expense of taxation are of such a nature that the returns to the public necessarily take the form of better facilities for the living conditions, safety and progress of society. Here is one which will return public benefits in four definite ways and at the same time it may be made to return a substantial revenue to be used for other public purposes. It is entirely reasonable to expect that state forests, when brought up to good growing conditions, will return from 3 per cent to 5 per cent on the investments and ultimately could pay back the principle if desired.

It is true that the acquisition of state forests reduces public revenue slightly by removing the land from taxation. Where large tracts are taken, embracing many thousands of acres in a town, such as the government is purchasing in the White Mountains, the effect on local revenue may be serious. But state forests being smaller in size would reduce local revenue only slightly and at the worst this reduction need be but temporary. For example, a state forest of 2,000 acres, such as that considered on Page 90, is at present a piece of wild hill land which has suffered from overcutting, fire and neglect. By fire protection, reforestation and care of the present young growth it can be developed into a profitable piece of state property, but in its present condition it promises little. Such land can be bought at prices ranging from

\$2.00 to \$6.00 per acre. Suppose it cost \$5.00 per acre or \$10,000, and that prior to acquisition by the state it was taxed for \$7,000, or a little over 2-3 of its sale value ; with a tax rate of \$0.0173 on \$1.00 (the average rate for all towns this year) an annual public revenue of only \$121.10 would be lost on the \$8,000 withdrawn from assessment. Moreover if allowed to continue in its present condition it would be many years before assessment on such a tract could be justifiably increased. However, with the stimulating effect which such a state reservation would have on the improvement of private woodlands in the surrounding region by private reforestation, thinnings, better marketing, etc., such private holdings could after a time without financial burden assume the added valuation to make up the local revenue, should this be found necessary. An added valuation of only \$0.70 per acre on the 10,000 acres (assumed) of private forest in the town would furnish the required amount. In the long run the revenue from the state forest itself would more than make up for loss in taxation.

It is important in this connection to provide that the towns shall share with the state in the net revenue from all state forests of larger size than the small demonstration areas. At the present rate of cutting it cannot be but a few years until many of our rural towns will have their woodland values so depleted as to feel severely the loss of revenue from this source. Little public revenue can be expected from neglected cut-over land. In solving this problem the establishment of state forests would be a conservative investment which might reasonably be expected to build up the local and state revenues.



THINNED PINE—MANCHESTER WATER DEPARTMENT.



PINE GROWTH IN NEWINGTON TOWN FOREST.
BADLY IN NEED OF THINNING.

MUNICIPAL FORESTS.

Law Enabling Towns to Acquire Forests.

The General Court of 1913 passed an act (page 149) enabling towns to purchase woodland and manage it for forestry purposes. Such land is to be managed by the state forester and the revenue is to go to the town.

The town of Hollis was the first to acquire a town forest under this act. The land, consisting of 198 acres, about $1\frac{1}{2}$ miles north of Hollis Village and $2\frac{1}{2}$ miles south of South Merrimack railroad station, came to the town through the will of the late Silas M. Spalding, who had long been interested in such matters. By his will the tract is to be managed under the provision of the law above referred to, and the town is to spend \$100 the first year and \$50 a year thereafter for 10 years in improving the growth.

Carrying out these requirements 15,000 pines were planted this fall on the open land under the supervision of the forestry department. Plans for management in the immediate future call for beginning the removal of hardwood from a thrifty but unmerchantable pine stand, by which all the town buildings can be supplied with wood. The town may thus save over \$50 a year on fuel by improving this municipal woodlot. Each year more of the open land can be planted and another section of pine improved by thinning. In about 10 years the growing stock will thus be brought up to normal and soon thereafter systematic removal of the larger growth may begin. This forest before many years will be a strong financial asset to the town.

Forestry in Other Towns and Cities.

The following table shows the area of forest land owned by towns and cities in New Hampshire. This is exclusive of small town parks. The tracts owned by Concord, Jaffrey, Keene, Manchester and Hanover were

bought for the protection of public water supplies. Others were acquired by gift, tax title or original grant.

TABLE X.

Forests Owned by Towns and Cities.

Town or City	Acres
Concord	400
Franklin	155
Gilsum	76
Hanover and Dartmouth College	1,000
Jaffrey	500
Keene	1,800
Manchester	1,800
Milan	100
Newington	200
Richmond	100
Total	5,131

Forestry Work on Municipal Lands.

The following are brief statements of the actual work that has been accomplished to date on tracts belonging to municipalities. The tracts in Concord, Franklin, Keene, Manchester and Newington have been visited frequently by representatives of the forestry department, where necessary trees have been marked for removal.

CONCORD.

Improvement cuttings removing hardwoods from pine; mature hardwood and pine growth marketed at profit of over \$12,000; open land planted, to date 154,000 trees set.

FRANKLIN.

Plan for removal of moth-infested hardwoods being made; open land planted, to date 18,500 trees set.

HANOVER AND DARTMOUTH COLLEGE.

Open land planted, 20,000 trees set.

JAFFREY.

Planting open land, 50,000 trees set.

MANCHESTER.

Thinning immature pine; improvement cutting in moth-infested hardwoods; planting open land, to date 249,000 trees set.

NEWINGTON.

Small area of mature pine cut, profit \$1,800; cut-over land planted, 8,000 trees set.

Future of Town Forestry.

The purchase of town forests is not likely to proceed as rapidly as state forests on account of the initial investment necessary. Many towns are likely to receive land by gift, however, both for forestry and for parks, as instanced in the case of Hollis. Within the past two years two splendid gifts of municipal parks have been made. The City of Rochester has received a tract of 200 acres of good woodland from Mr. C. A. C. Hanson. The town of Claremont has received 175 acres from Mr. W. H. H. Moody. Advice on the management of both these tracts is being given by the forestry department.

While a town park could not serve the purposes of a town forest, except in a limited way, a town forest could in larger measure serve as a park. It is possible that some municipal tracts may be acquired by purchase to serve both purposes. It is also possible that where tracts are acquired by towns purely for park purposes, larger contiguous tracts may be purchased and managed for timber growth. These and the necessity for further protecting public water supplies seem to be the most natural channels along which municipal forestry will develop in the near future. For the larger tracts of waste land, discussed under "State Forests," it is possible that in some cases a combination of state and town ownership and management may be worked out.

EDUCATIONAL AND SPECIAL PROJECTS.

AID TO WOODLAND OWNERS.

Educational Features Emphasized in All Work of the Department.

In all branches of work carried on by the forestry department the educational feature is emphasized. In the fire protection work, the posting of warning notices throughout the woodland, and in public places where people congregate, is the most familiar form of education. Notices in foreign languages have been distributed extensively in New Hampshire. Besides this the department has arranged with the Commissioner of Motor Vehicles the display of fire warnings on envelopes carrying automobile licenses, asking motor tourists to be careful not to start fires along highways. Paper drinking cups with fire warning signs have been distributed in connection with fair exhibits, and arrangements are being made to distribute these to hunters and fishermen. The 43 local fire warden conferences were of great educational value. Besides fire protection, forestry questions were discussed at each conference, and a strong interest was found in all localities visited. These fire conferences should be continued and developed for education on local forestry questions.

Besides the educational features emphasized in other branches of the service, considerable direct educational work has been carried on. An increasing amount of information is sent out in the form of personal letters, bulletins, pamphlets and circulars. These now amount to over 10,000 annually. Lectures are given by the state forester and assistants, 42 having been given during the past two years, besides the 43 local conferences. For-

estry exhibits have been placed at the agricultural fairs in different parts of the state.

Special Aid to Woodlot Owners.

A very important means of forestry education is the visiting of woodland owners and explaining to them on the ground the methods of forestry practice. The Forestry Commission has made this a feature of the activities of the state forester and assistants ever since the department was organized in 1909. Every year more requests are received from woodland owners than can be complied with. On account of the increase in all branches of the forestry department, the commission has arranged to have the state forester and his assistants, who have charge of the different branches, examine and give advice on private woodlots upon application whenever other departmental business brings them in or near the vicinity of the applicant. This has permitted a considerable number of woodlots to be examined at no extra cost to the state and at very little cost to the owner, but it has not permitted as thorough and detailed examinations of these lots as could be done by a forester making this his special line of work. By this method about 300 woodlots have been examined by representatives of the forestry department and the owners given personal advice, but on less than 100 of these have complete examinations been made and detailed plans prepared for the owners.

On most of these tracts the owners have desired information how to make improvement cuttings in immature growth, and how to log mature or all aged growth to preserve a second cut and insure the reproduction of valuable trees. Whenever possible a representative of the forestry department marked the trees to be removed or marked those to be removed from sample plots, representative of conditions on the whole tract.

Examples of Private Forestry Practiced with Commercial Success.

In presenting instances where private owners have successfully practiced commercial forestry (besides planting) the commission has selected five that are typical of the forest conditions that prevail in central and southern New Hampshire. It is believed that these examples will be of interest to many woodlot owners and they are therefore described individually, so that any owner who lives near one of these lots may visit it and observe the results. The aim is to show in each case how a private owner handled a certain kind of timber growth, what the operation cost him, what return he got from it, and in what condition he left his woodland.

1. ROBERT E. FAULKNER, KEENE, N. H.

Several lots of mixed pine, spruce and hardwoods at West Keene were thinned to stimulate pine growth and secure natural reproduction of pine. Thinnings were made on the different lots from 1903 to 1910. On one lot 11 cords per acre were removed from a total stand of 34 cords per acre. The trees removed were from 9 to 13 inches in diameter at breast height. Brush was disposed of and logs were hauled about two miles.

The following figures of one of the operations give a good idea of the financial results of the thinnings. Felling trees, bucking up logs and burning brush, \$1.10 per cord; hauling, \$1.50 per cord; sale value at mill, \$8 per cord; stumpage profit, \$5.40 per cord. (Figures based on decimal cord measure.)

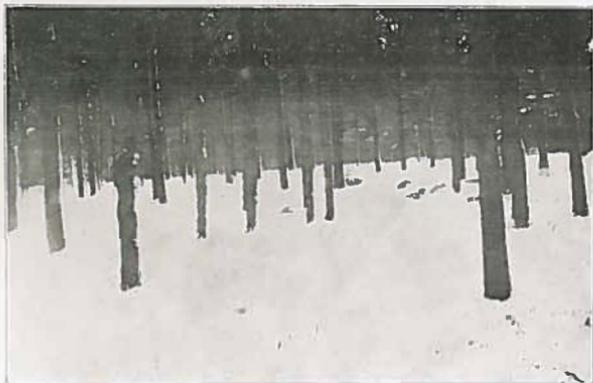
The woodland is in good condition. Trees left standing are thrifty. Pine reproduction was secured abundantly in large groups. Very little planting will be necessary when the final crop is removed.

2. S. O. HUCKINS, MOUNTAINVIEW, N. H.

Careful cuttings were begun as early as 1892. Most of the land operated is mixed pine, spruce and hardwoods of all ages in groups. The general plan followed is to remove periodically the older groups and the mature trees in the younger groups. The wood choppers are trained to take extra precau-



Before Cutting.



IMPROVEMENT CUTTINGS—GEO. B. LEIGHTON, DUBLIN.

After Cutting, Stumpage Sold for \$5 per M.



WOODLOT 8 YEARS AFTER CAREFUL CUTTING.

Brush practically gone, pine reproduction good.
S. O. Huckins, Ossipee.



SEED TREES LEFT AFTER PINE LUMBERING.

A. R. Ayers, Boscawen.

tion against damaging young pine. Brush is left on the ground partially lopped. On one lot cut in 1892 a little over 3 M board feet per acre were removed. This lot was cut again in 1906, over 6.5 M being taken.

A lot west of Moultonville gives a good idea of Mr. Huckin's method. The groups and single mature trees on 100 acres were cut in 1905, removing about 6 M per acre. In 1916 a group of 500 M, which had come to maturity in the interim will be cut. The sections cut over in 1905 will probably be ready for another cut in 10 to 15 years (20 to 25 years from the previous cutting). Thus the lot is operated roughly in blocks, the same block being cut every 20 to 25 years and 500 to 600 M being removed. This assumes an average annual increment of 50 M board feet per year for the lot, or about one-half cord per acre.

3. GEO. B. LEIGHTON, MONADNOOK, N. H.

The lots cut over comprise over 200 acres and are in Dublin near the Keene road. In 1908, before the establishment of the present forestry department, Mr. Leighton had his woodland looked over by a representative of the U. S. Forest Service. Recommendations were made and a local foreman was instructed in marking the trees to be removed. The woodland consisted of pine, spruce, hemlock, birch, maple and beech—all ages mixed by groups and single trees. The purposes of the cuttings were to remove the intermediate trees which were retarding the growth of the better ones, and to secure reproduction of pine and spruce wherever large openings were made.

The method pursued was to sell on the stump all trees marked by the local foreman. Frequent inspection of the cutting operations were made. In all 2,319,000 board feet were removed over a period of five years, or about 450 M per year. The marked trees brought \$4 to \$5 per M on the stump, making a total net profit of over \$11,000. Only about one-third of the stand was removed. At present the woodland is in a thrifty condition. The brush on the older cuttings has about disappeared.

4. A. R. AYERS, GERRISH, N. H.

Woodland located on west side of state road near state forest nursery. In 1910 inspection was made by the state forester and cutting was made the following year. On five acres a clean cutting was made, leaving a few seed trees, yielding 175

M; on 15 to 20 acres of mixed pine and hardwoods an improvement cutting was made yielding 25 M; on 15 acres of 35 to 40-year-old pine a thinning (C grade) removed 75 M; scattered trees yielded 15 M.

The 290 M board feet was sold on the logway of a portable mill for \$12 per M, or \$3,480. Cutting and hauling averaged \$3.50 per M, marking and supervision a total of \$100. Thus a profit of \$2,355, or a little over \$8 per M stumpage was secured. In thinnings about 15 per cent of the volume was removed. The present stand is in perfect growing condition except for a small windfall of 10 M, where too heavy a thinning was made on an exposed west slope.

5. RAYNE ADAMS, MOULTONBOROUGH, N. H.

Woodland located east of Moultonborough Center at Three Bridges consists of a white and red pine plantation made over 40 years ago by Isaac Adams. The trees were spaced only five feet apart and had never been thinned. Hence, they were badly crowded, many had died and those remaining were very slender. The growth had slowed down markedly during the past two decades. It should have been thinned about 15 years ago.

Mr. Rayne Adams, owner of part of the plantation, requested advice from the state forester and a careful examination was made. The trees to be removed were marked and advertised for sale. The marked trees were from 5 to 12 inches in diameter at breast height; very few were over 10 inches. In February, 1916, the merchantable marked trees were sold for \$1.75 per M on the stump, the operator agreeing to lop the tops to facilitate brush disposal. The operator used three teams, one for twitching to the wood road and two for hauling to the lake (1 to 1½ miles), where the logs were sold on the ice for \$10 per M. Operating costs amounted to about \$4.80 per M. In this way 22 acres were cut over, the small trees yielding about 4 M per acre. After logging, the small dead and unmerchantable trees were felled, the inflammable tops of all cut trees burned and the slender poles left on the ground. The remainder of the Rayne Adam's lot and an adjoining one belonging to Acquilla Adams will be cut on the same plan this coming winter.

6. O. M. PRATT, HOLDERNESS, N. H.

Over 1,000 acres of woodland is operated in connection with an orchard business. The owner began many years ago to



Planted White Pine Forest, 40-45 Years Old. Marked for Thinning.



Removing the Smaller Trees.

THINNING OPERATION—RAYNE ADAMS, MOULTONBOROUGH.

make improvement cuttings in mixed pine and hardwood growth. Two special purposes governed the cuttings—removal of hardwood competition and production of clean pine. A small slack cooperage mill is operated by the owner and hardwoods worked into barrel stock. Also considerable young hardwood is cut about three feet high and allowed to rot on the ground. The larger pine is removed and the young thrifty pines which will live through two cutting cycles are pruned close to the trunk 17 to 18 feet high. The aim of the owner is to cut the same ground over about every 15 years and to have as many trees as possible with one 16-foot log of clear lumber. Trees recently cut which were pruned during the early cuttings show that the pruning method is successful in producing clear boards.

Forestry Education at New Hampshire College.

In August, 1915, Mr. John H. Foster, who had been Professor of Forestry at New Hampshire College for several years, resigned to become State Forester of Texas. Mr. Karl W. Woodward of the U. S. Forest Service was appointed to the place and began teaching the following month. In addition to the instruction given the students who study forestry and many elective courses, Professor Woodward gives lectures throughout the state and advises woodland owners. Mr. Foster, during his term of office, published a good educational bulletin on "The Marketing of White Pine" (Extension Bulletin No. 3), and also carried on in coöperation with the Forestry Commission an investigation on forest taxation, the results of which are published on page 110 of this report.

Professor Woodward has continued with college funds the market study of white pine and given advice to a number of owners. He has begun assistance in marketing individual woodlots. The plan which he has followed is to look over the lots upon application of the owner and prepare a logging plan which the owner agrees to follow. Arrangement is then made with a mill man to do the sawing and the owner uses his own men and teams in cutting and drawing the logs. The brush is disposed of,

and where necessary, restocking of the ground is completed by planting. It is the purpose of Professor Woodward to secure a woodlot coöperator on this basis within the next few years in many localities in the state, so that demonstration of private forestry practice will be accessible for observation to a large number of other owners. In a number of states the appropriation made by Congress under the Smith-Lever law for demonstration in agriculture and allied subjects has been used to advantage for farm woodlot demonstration. It is hoped that within another year the same plan may be followed in New Hampshire.

Besides the marketing of white pine woodlots, there are many other technical problems which the Professor of Forestry at New Hampshire College might well develop to the advantage of general forestry work in the state. Particularly is this true of the investigative side of forestry. As the work of the forestry department increases, as the fire protection branch is gradually perfected, as the state and town forests are developed and made profitable, and as the public interest in reforestation waste land and giving proper care to woodland growth increases, there will arise many technical problems which will require careful investigation in competent hands. At present it appears that such work could be done advantageously by the Professor of Forestry at Durham, or by him in coöperation with the forestry department at Concord. One of the most important present needs is accurate growth studies of our native trees. We now have fairly accurate growth studies of white pine (Forestry Commission Report, 1905-06). Such information should be secured for all of our important commercial timber trees, and the equipment necessary to do such investigative work should be provided.

SPECIAL PROJECTS.

(Tree Diseases, Forest Taxation, Roadside Trees.)

The Chestnut Bark Disease.

A field investigation in 1912 carried on by the Forestry Commission, in coöperation with the U. S. Department of Agriculture, revealed the fact that the chestnut bark disease had gained a foothold in many towns near the southern border of the state. It appeared at first that the spread of this disease might be arrested, and that owners of chestnut woodland might be instructed as to means of marketing their merchantable material before it suffered heavily from the disease.

At the recommendation of the Forestry Commission, the General Court of 1913 appropriated \$500 annually for two years for the control of the disease. This was used in coöperation with a larger fund furnished by the U. S. Department of Agriculture. After the first season's field work it was found that the disease was spreading rapidly and there seemed to be no practical means of stopping it. The time of the field men was used thereafter in gathering information on local chestnut markets throughout central and southern New Hampshire and distributing this information to woodland owners. A bulletin was published in April, 1914, describing the nature of the disease and giving detailed information on the marketing of chestnut products. Upon the advice of the Forestry Commission the appropriation was discontinued after 1914.

From observations made since that time by field men employed on other work, it appears that while the chestnut bark disease is probably not spreading with such great rapidity as it did between 1910 and 1914, it is nevertheless spreading steadily. At present there does not seem to be any indication but that in time practically all the chestnut growth in the state will become infected and die.

THE WHITE PINE BLISTER RUST.

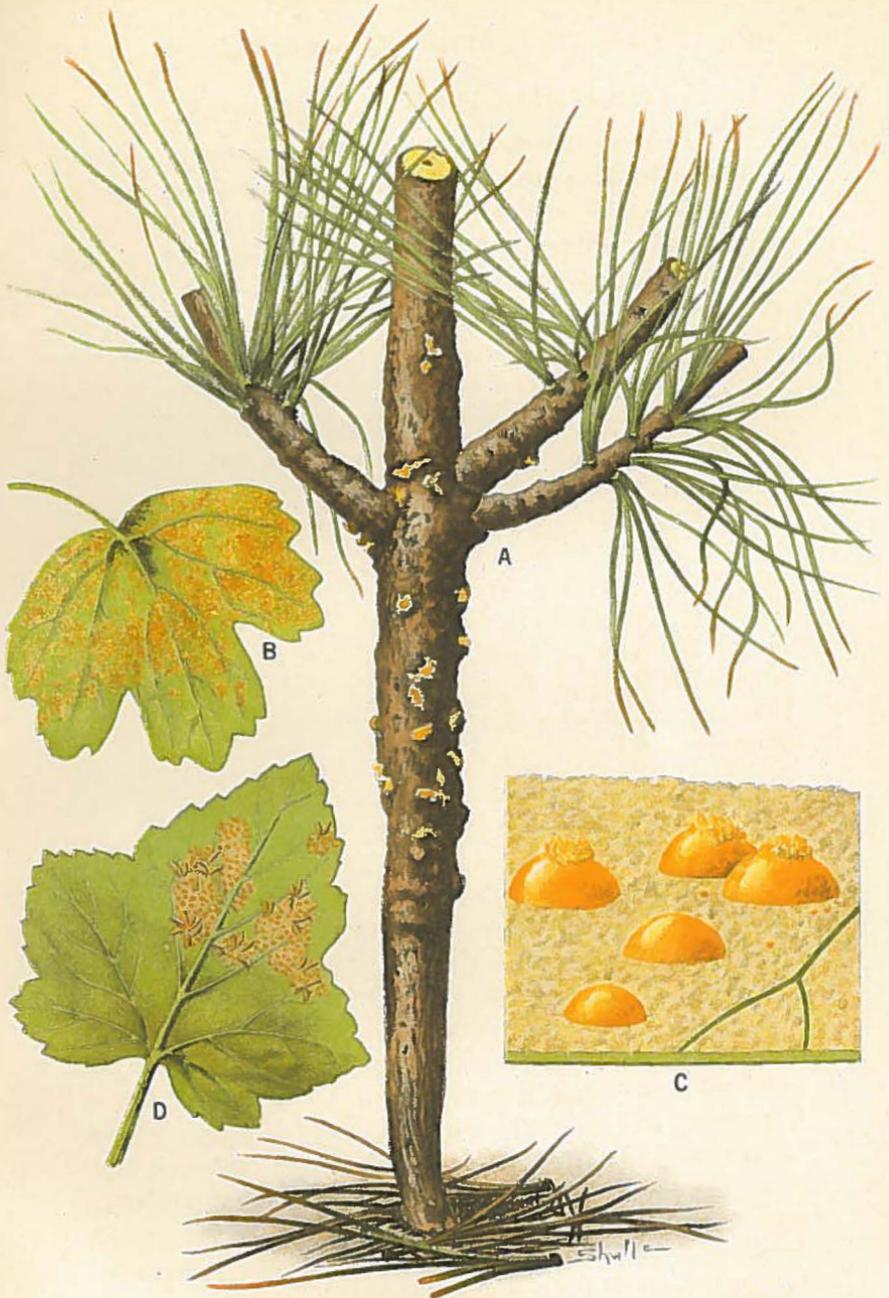
1. *A Serious Menace to Native White Pine.*

The white pine blister rust is a very destructive disease to the so-called "white pine," that is, pines which have their needles in bundles of five each. The disease spreads among pine trees through the medium of currant and gooseberry bushes and has caused so much damage to white pines in certain parts of northern Europe as to make commercial growing impracticable there. The disease was introduced into the United States on imported white pine nursery stock about 1908 or 1909. About this time large numbers of pine seedlings were purchased abroad and sold to land owners in the United States. These foreign seedlings found their way into the following states: New Hampshire, Vermont, Massachusetts, Connecticut, New York, Pennsylvania, New Jersey, Ohio and Indiana. The disease is now known to be present in all of the northeastern states above named. Probably its most serious outbreaks have been found in Massachusetts.

2. *Habits of the Disease—Identification.*

The blister rust is a fungus which spends a portion of its life on white pine, and is visible as blisters on infected trees from about the first of April until the latter part of June, while the remainder of the summer it is found on the under-surface of the leaves of currant and gooseberry bushes, returning to the pines in the early fall.

The stage on the white pine shows up in the form of abnormal swellings, generally first on the branches of large trees and the trunks of small trees. It may appear on any part of the trunk or branches. These swellings after a time break open disclosing orange-colored blisters. The blisters contain tiny spores or germs, which are blown about by the wind to the leaves of neighboring currants and gooseberries. Here the disease de-



THE WHITE-PINE BLISTER RUST.

- A, A diseased white-pine tree with the blisters broken open.
- B, early summer stage on the lower surface of a currant leaf.
- C, early summer stage much magnified.
- D, late summer and fall stage spreading the disease back to white pines.

A. HENRICH & CO. LITH. BALTIMORE

velops, spreading rapidly among currant and gooseberry bushes, and produces later in the summer another spore which is capable of re-infecting the white pine. It must be remembered that the disease cannot spread directly from pine to pine, but must go from pine to currant or gooseberries and then back to pine, and this fact makes it possible to combat the disease with some assurance of success.

3. *What Has Been Done in New Hampshire.*

When the disease was located on the currant bushes in a few places in New Hampshire and the extent of it in Massachusetts was learned, an attempt was made immediately, during the summer of 1915, to secure federal assistance in making a survey of the state to find out the extent of the disease and inaugurate eradication measures. It was found that the U. S. Department of Agriculture had no funds available for this purpose. During the winter of 1915 and 1916 a determined effort to secure federal legislation on this subject was made by an interstate committee representing the forestry departments and allied interests of 10 white pine states. The necessary legislation and appropriation was secured and during the field season of 1916 the Forestry Commission, in coöperation with the Bureau of Plant Industry of the U. S. Department of Agriculture, and the Agricultural Experiment Station at Durham, carried on an extensive investigation to determine the extent of the disease in this state. Most of the funds for this work were furnished by the U. S. Department of Agriculture. During an interim when the federal funds were not available, the Governor and Council authorized an expenditure of \$400 from their contingent fund so that the work could be carried forward.

Extensive scouting has revealed the disease throughout almost the entire white pine region of New Hamp-

shire. Very little as yet has been found on the pine trees, but it has been found extensively on the currant bushes, and in localities where the disease has been present a year or more, pine infections are found.

4. *Means of Combating the Disease.*

The situation in New Hampshire at present is so serious that the only way to insure the safety of our white pine growth against this disease is to remove all currant and gooseberry bushes from the localities where white pine culture is of importance. In October, 1916, a letter was sent out to all newspapers and to several thousand large and small white pine woodland owners advising them to destroy as soon as possible, all wild and cultivated currant and gooseberry bushes in the vicinity of their white pine growth.

Private efforts will no doubt remove a considerable number of currant and gooseberry bushes, especially on the part of land owners who have valuable young white pine growth; but unless drastic state action is taken at once there will be no assurance of saving our white pine.

The value of the white pine growth in New Hampshire runs into many millions of dollars. Its manufacture provides employment for thousands of people. A few acres of good white pine timber is worth far more than all the currant and gooseberry bushes in the state.

In combating this disease the Forestry Commission recommends that legal authority be given for declaring currant and gooseberry bushes a pest in localities where the white pine blister rust is found to exist; that owners be required to remove them and that adequate funds be provided for following up this work to see that a clean job of eradication is done in every locality where such work is necessary. It is probable that federal funds will be continued to augment whatever state funds are appropriated for this purpose, and it is certain that active co-

operation can be secured from land owners in making these funds effective.

Forest Taxation.

The taxation of woodlands in New Hampshire has become a much discussed question during the past few years. In fact it has always been an important public question in New Hampshire on account of the large per cent of forest land in the state. In 1908, the Forestry Commission, in coöperation with the U. S. Forest Service, published a report by Mr. J. H. Foster on investigations made throughout the state. This report was based on a study of several hundred woodland and timber tracts examined. It gave a detailed account of the inequality of the system then existing and made recommendations for legislation.

The Tax Commission created in 1911, exercised its authority over local assessors to raise the valuation of woodland along with that of other property. The Constitutional Convention of 1912 passed an amendment which would have enabled the legislature to separately classify forest property for taxation, but this amendment was defeated by a narrow margin at the next succeeding election. Until an amendment is made to the Constitution no change can be made in the method of taxing forests.

The sharp rise in the valuation of woodlands during the past few years has led to increased public agitation and to considerable cutting. During the fall and winter of 1914, Mr. Foster, in coöperation with the Forestry Commission and Tax Commission, extended his study made in 1908 by securing data on the rise in valuation and the condition of 126 of the lots he had studied in 1908. His report on this latter investigation is published herewith.

The Present Forest Tax Situation in New Hampshire.

BY J. H. FOSTER.

In 1908 a study of the effect of the general property tax on woodlots and timber tracts in New Hampshire was made by the writer for the U. S. Forest Service coöperating with the New Hampshire Forestry Commission. The findings and recommendations were published in the biennial report of the Forestry Commission for 1907-08. The facts upon which the conclusions were largely drawn were based upon the personal examination of some 200 individual timber lots, both large and small, widely scattered over the state. Since 1908 the writer has continued his interest in the forest taxation problem and has gathered additional information from time to time.

During the last year, in coöperation with the Forestry Commission and the Tax Commission, an effort has been made to bring up to date the information previously obtained, particularly that which related to the lots personally examined in 1908. From the Boards of Assessors in the different towns it has been possible to secure the 1914 assessments and some facts regarding the present condition of 126 of the lots previously studied.

By comparing the assessments and the timber conditions of these lots in 1908 with the assessments and conditions as they have been found to exist in 1914, some very interesting and significant results have been obtained. It is the belief that this information is of much concern to the people of New Hampshire. The writer has studied this subject with entire impartiality and presents the facts as they exist and the conclusions to be drawn from them.

These 126 distinct and widely scattered timber lots form the basis for the figures and conclusions which follow. The lots were mostly of second growth white pine, and separately listed in the assessors' books in the different towns. For the most part they were of average value and the majority of them would not have come on the market in the natural course of events for 10 to 20 years or more.

Of these 126 lots, 65 or 51.7 per cent have been entirely cut off since they were personally examined by the writer in 1908. The other 61 lots, or 48.3 per cent, may be classified as follows: Two were cut before the 1908 study; the owners of four are negotiating for the sale of their lots at this time; on several lots the owners have cut some timber from time to time; and on the balance the timber is still standing and it is not known whether sales are contemplated or not. A number of these remaining lots are owned by persons of means who have no particular desire or intention of removing the timber.

A comparison of the 1908 and 1914 assessments and the relation between assessed and actual values on the 61 lots not cut over since 1908 shows the following:

Twenty-four lots have increased up to 100 per cent in assessed value with an average of 66.5 per cent, and have an average per cent of assessed values compared to actual values of 74.6 per cent.

Thirteen lots have increased 100 per cent to 200 per cent in assessed value with an average of 145.3 per cent, and have an average per cent of assessed values compared to actual values of 76.2 per cent.

Eleven lots have increased 200 per cent to 300 per cent in assessed value with an average of 246 per cent and have an average per cent of assessed values compared to actual values of 65 per cent.

Two lots have increased 300 per cent to 400 per cent in assessed value with an average of 323 per cent increase

and an average per cent of assessed values compared to actual values of 65 per cent.

One lot has increased 500 per cent in assessed value and the assessed value is 75 per cent of the actual value.

Two lots have increased over 600 per cent in assessed value with an average of 616 per cent and have an average per cent of assessed values compared to actual values of 70 per cent.

Three lots have decreased slightly in valuation.

Two lots are assessed the same as in 1908.

Three lots do not furnish all the data necessary to make comparisons.

The average per cent of increase in assessed value of all the 53 lots which have been advanced since 1908 is 161.7 per cent.

The average per cent of assessed values compared with the actual values of all these lots is 74.6 per cent.

On the 65 lots cut off between 1908 and 1914, or 51.7 per cent of the total, the assessed values of the year preceding the cutting are not known except in 15 lots, ten of which were cut after April 1, 1914. These 15 lots therefore furnish the most complete information but should not necessarily be considered an average of all the 65 lots cut off.

The comparison of assessments in 1908 and the year before the cutting and the relative assessed and actual values on the 15 lots are shown as follows:

Eight lots increased up to 100 per cent in assessed value with an average of 33.2 per cent and have an average per cent of assessed values compared to actual values of 72.8 per cent.

Four lots increased 100 per cent to 200 per cent in assessed value with an average of 123.5 per cent and have an average per cent of assessed values compared to actual values of 53.2 per cent.

Two lots increased 200 per cent to 300 per cent in as-

essed value with an average of 278.5 per cent and have an average per cent of assessed values compared to actual values of 75 per cent.

One lot increased 542 per cent in assessed value and the assessed value was 50 per cent of the actual value.

The average per cent of increase in assessed value on the 15 lots is 123.2 per cent. The average per cent of assessed values compared with the actual values of these 15 lots is 66.4 per cent.

If it were consistent to compare the 15 lots cut off after 1908 with the 53 lots not classed as cut off, the figures would fail to show that the tendency to cut off lots is in proportion to the increase in assessment or to the per cent of the actual value assessed. Such a comparison actually shows that the lots not cut off have a somewhat higher per cent of increase in assessment and are assessed at more nearly their actual values than the lots which were cut. This comparison, however, cannot be made because the assessments on the lots not cut have continued to increase while the reverse takes place on most of the lots as soon as they are cut over.

That there is an astonishing tendency to cut off woodlots cannot be denied when it is seen that 65 out of 126 average woodlots standing in 1908 have now disappeared. Also there must be some relation between the tax assessment and the tendency to cut when it is seen that the average increase in assessment since 1908 of all lots up to the time of cutting or to the present time (where the lots are still standing) is 153.2 per cent. Furthermore, the question of how high the assessments may go without damaging results becomes of grave importance when it is realized that the average assessed value of all the lots is 72.7 per cent of the actual values.

The assessors from their personal knowledge have admitted that 9 of the 65 cut-over lots, or 13.8 per cent, were cut directly because of high assessed

values. It is probable that the per cent cut for this reason is much higher, since it is inconceivable that an owner will continue to hold a lot when the assessed value has been raised 200 per cent up to 600 per cent unless he is a person of means and is actuated by sentimental reasons.

The real conclusion is that the majority of lots are cut, not because the assessed values approach the actual values, but because the owners are unwilling to pay taxes on rapidly increased assessments when it can easily be avoided by removing the timber. It often happens that an owner is unable to pay the increase of tax without borrowing the money or selling some of the timber, which might not be possible without disposing of it all. Many of the lots unfortunately forced on the market should have been allowed to grow 10 or 15 years longer. Nevertheless, most of them are marketable and can be turned into cash at any time and the cash invested at from four to five per cent.

We cannot get away from the economic fact that white pine timber lots reach their financial maturity when 50 to 60 years of age. One does not have to study very deeply into the growth of our dense, unthinned stands of pine which are within ten years of the economic age for cutting without discovering that the value of the annual growth does not greatly over-balance the interest on the lumber value of the standing trees. If the owners could thin out their pine stands and secure some returns from time to time in order to increase the amount of annual growth and help pay the taxes, the desirability of letting the timber stand in spite of taxes, would be much greater. Between 35 and 40 years of age the yearly rate of growth in a dense unthinned pine lot drops from 10 per cent to 6.4 per cent of its volume. Between 40 and 45 years the drop is from 6.4 per cent to 4.6 per cent. At this age and under the present administration of the tax

laws the owner begins to feel the pressure of taxes. His tax bill may double or more than double in one year and whether or not he realizes that the profits from holding the timber regardless of taxes are at the same time being reduced yearly, he looks about for the best chance to sell. When the timber is sold it is found perhaps that the assessed value was not 75 per cent of the actual value. Nevertheless, the increasing tax was the one thing which put the lot on the market.

Who is the loser when the lot is sold and the timber cut off? The owner is if the cutting is done before the lot is financially mature and the taxes have not been excessive. The town is in any case, because the assessed value must be reduced after cutting. On only 13 of the 65 cut-over lots above mentioned is the present assessed value as high as the very low valuation that prevailed in 1908. The total assessed value on the 65 lots has dropped from \$212,590 in 1908, to \$104,000 in 1914. The town has therefore lost the increased revenue which it sought to gain.

In order to make it still more clear what the town loses when its timber lots are cut off, an example may be cited of the 5 out of 15 lots where the cutting was done before April 1, 1914, and on which the assessments after cutting are known. The following tabulation concerning these five lots may be of interest:

	Assessed value 1908.	Assessed value year preceding cutting.	Actual value time of cutting.	Assessed value 1914.
	\$7,500	\$10,000	\$10,000	\$3,700
	700	4,500	9,000	900
	590	1,500	5,000	414
	4,000	7,000	14,000	800
	1,200	9,000	9,000	450
Totals	\$18,990	\$26,000	\$47,000	\$6,264
Averages	\$2,798	\$5,200	\$9,400	\$1,252.80

Using the averages of these five lots for computation purposes and a tax rate of $1\frac{1}{2}$ per cent, the town obtains in taxes for a ten-year period the following:

\$5,200.00 x 1½ per cent for one year =	\$78.00
1,252.80 x 1½ per cent for nine years =	169.12

Total \$247.12

Supposing the 1908 assessment had been continued for ten years and the lots had not been cut off, the town would then have obtained in taxes \$2,798.00 x 1½ per cent for 10 years, which is \$419.70 or \$172.58 per lot more than where the increased assessment was maintained for only one year and the assessments were reduced as indicated following the cutting. It should be remembered that these are actual figures taken from tax records in New Hampshire.

Assuming that \$172.58 represents the loss to the town in 10 years on an average lot, and that one-half of the 65 cut-over lots could have been saved for another 10 years by maintaining the 1908 assessments, the towns would have gained \$5,608.85 in consideration of their leniency in assessment, without regarding what the owners themselves might have saved by increased growth.

It may be of interest to consider another lot which an owner was forced to cut 10 years before the timber was financially mature. The lot contained 35 acres of unusually thrifty growing pine. Its increase in growth in 10 years would easily have been 100 per cent. The assessed value in 1911 was \$1,200. In 1912 this was increased to \$3,000. The owner was a farmer without sufficient income to permit him to bear the increased tax burden. The timber was sold and removed before the following April. The assessed value in 1913 and each year following has been \$450. The town obtains the following in taxes on the lot for a 10-year period at 1½ per cent:

\$3,000.00 x 1½ per cent for one year =	\$45.00
450.00 x 1½ per cent for nine years =	60.75

Total \$105.75

If the assessment had remained at \$1,200 for the following 10 years, then the town would have received in taxes at $1\frac{1}{2}$ per cent the sum of \$180.00 or \$74.25 more than it actually did receive.

What does the owner lose in this instance by premature cutting? The timber sold for \$9,000. If the owner had kept this value in growing timber for 10 years the interest accumulation at 5 per cent together with the principal would amount to \$14,670. The taxes paid annually at $1\frac{1}{2}$ per cent on a valuation of \$1,200 at 5 per cent compound interest would amount to \$237.67, making a total cost of holding the timber to the end of the 10-year period of \$14,907.67. In 10 years the timber would have sold for \$18,000. The owner therefore lost \$3,092.33.

From the point of view of town finances the only justification for increasing the valuation on growing timber lots rests on the assumption that the lots will not be cut as a result. When it is shown in actual operation that over 50 per cent of the lots under observation since 1908 have been cut following increased valuation, then it appears that the town is not justified from this point of view.

From the point of view of the owner the justification for paying a tax on a valuation of over 50 per cent of actual value depends upon the character and growing condition of the timber. He may suffer a distinct loss even when the assessed value is less than 50 per cent of the actual value if the growing condition is poor. On the other hand, he may profit by holding the timber in many instances when the assessed value is as high as 75 per cent of the actual value if the timber is in good growing condition. It is inconceivable for an owner not to lose when the assessed value exceeds 75 per cent.

The most damaging effect of assessments is caused by increasing them abruptly. If they are found to be

very low, it is only fair to raise them, but the increase should not exceed 10 per cent a year. Even this may be too much. Certainly 50 or 100 per cent up to 600 per cent is not justifiable. It is short-sighted in policy because the owner can turn the timber into money at a loss perhaps to himself, but certainly to the town.

Increases in assessment should be made slowly until they reach perhaps 50 per cent to 75 per cent of the real values on lots that are growing rapidly and should go no higher. On lots that are not growing rapidly assessments of over 50 per cent of the real values should cause the owners to cut off immediately in order to avoid loss. If the owner then prefers to sell his timber, the town may feel that it has not been responsible.

To summarize, this paper shows:

1. That 51.7 per cent of the woodlots under consideration have been cut off since 1908.
2. That the average increase in assessed valuation of all the lots is 153.2 per cent.
3. That the average of present assessed values compared to actual values of all the lots is 72.7 per cent.
4. That an increase of assessed valuation in excess of 50 per cent of the actual values on poorly growing lots or in excess of 75 per cent on good growing lots will generally cause a loss to the owner unless he cuts the timber at once and will always cause a loss to the town if he does.
5. That abrupt increases should not be made. They cause the owner to cut his timber regardless of his financial advantage.

Planting and Care of Roadside Trees.

1. *The Shade Tree Laws.*

The General Court of 1915 amended the highway shade tree law (Section 7, Page 144) by providing: (1) that all brush and bushes cut from within the limits of the highway shall be disposed of within thirty days from the cutting thereof; (2) that any shade tree planted by a town or city within the limits of the highway, or any young seedling tree or sprout left there and cared for by the municipality for shade purposes shall become the property of the municipality; (3) that town or city officials may contract with any owner of land abutting a public highway to trim and improve the roadside growth, and may allow such sums of money therefor as in their judgment justly compensate the town or city for the improved condition of the roadside; (4) that along any highway damages may be assessed to the abutting owners to provide for the planting and maintenance of shade trees. The purpose of this amendment was to give the towns more authority over the highway trees than had been previously exercised.

The interest in the preservation and care of highway shade trees found expression in 1903 in an act authorizing boards of selectmen and town tree wardens to take and preserve such trees for purposes of shade and ornament. A test case of this law was made the following year, however, and the Supreme Court decided that the easement of the public over a highway did not include ownership of the trees within the highway limits for ornament and shade, but that such trees belonged to the abutting land owner. This law was amended in 1905 and again in 1913, provisions being made for the taking of such trees by the town or city by compensating the abutting owners therefor. Very little work has been done under this law since the Supreme Court decision above referred to, because the towns have hesitated to spend

the large sums of money which would be necessary to acquire ownership in the highway trees.

The amendment of 1915 was an effort to vest in the towns and cities authority over such trees as affected highway maintenance. The Supreme Court decision of 1903 was based on the principle that the public owns no actual land within the highway limits, but only the right to travel over the road and to maintain the highway in good condition for travel, including the right to remove such trees as obstruct travel and to use trees necessary for highway repairs, but not the ownership of the trees for ornament and shade. It is now clearly recognized among highway engineers that properly regulated shade is a factor in highway maintenance; and the amendment of 1915 above referred to (Section 7, Page 144) intended to give the towns and cities ownership and authority over such trees as the officials of each town planted along the roads, or preserved as young seedlings and sprouts to develop into shade trees, on the principle that such trees contributed directly to the maintenance of the highway. Since this amendment was passed there has been an increased interest in highway improvements in many of our rural towns, but there seems to be a prevailing uncertainty among town officials as to whether or not the present law would stand the test of the courts. If it were found that the principle of road maintenance gave the towns ownership in such trees as they preserved or planted for that purpose, it is certain that the present interest in this work would crystalize into a large amount of intelligent roadside improvement work and that gradually our highways could be brought into better condition. But without definite assurance on these points, the towns will naturally be very slow to authorize work. A test case of the present law would be beneficial, as it would clear the air of uncertainty and determine whether the towns can really protect their roadsides under it, or whether they must resort to actual



BUSHES CUT AND LEFT ALONG HIGHWAY—A FIRE TRAP.



A WELL CLEANED ROADSIDE.

purchase if the work is ever to be done efficiently on a large scale. If no test case is brought within the near future, it might be advisable for the General Court to request an opinion from the Supreme Court as to the constitutionality of a statute enacted to give municipal authority over highway shade trees for the purpose of highway maintenance.

2. *Coöperation of the Forestry Department with Towns and Cities.*

Until such time as a definite decision is reached by which the Forestry Commission can authoritively instruct towns and cities on roadside improvement work, the progress that is made is largely educational. On one provision of the law, however, there is no doubt, namely, the obligations of the towns to cut and dispose of brush and bushes from within the highway limits. For prosecuting this work the Forestry Commission has sent to all boards of selectmen and town fire wardens copies of the law and instructions for cutting. The old method of doing this work in most towns was to mow the bushes clean and let them lie at the roadside, constituting a fire trap. The following year a new crop of sprouts grew up through the old slash and in a year or so was mowed off clean in the same way, but each year it was necessary to cut the bushes a little higher on account of the old stumps and slash left on the ground. Thus, in a few years a thick tangle developed which was very hard to cope with, and generally was left alone, save for now and then cutting a sprout that bent over into the highway.

Under the new law requiring the clearing of the highways, the Forestry Commission has instructed the towns not to cut the bushes clean in the old way but to leave a thrifty young sprout or seedling every 10 or 15 feet to develop into a shade tree. These will soon shade the roadside and retard the understory of brush, making the brush cutting easier and less expensive each succeeding year.

Some of the towns have grasped this idea and put it into practice effectively. Where this has been done good results have been obtained and the labor has not been expensive. Only a beginning has been made in this work, and it is quite natural for the towns to object to putting it into practice extensively unless they are assured that the sprouts and seedlings left can be cared for and developed by the town. The excellent examples of this kind of work by some towns are largely in places where it was imperative that bushes be cut to open up the roadside more, and to prevent fire risk.

In addition to the thinning out of bushes and sprout growth there has been considerable interest manifested among the towns and cities in the planting of shade trees. An amendment, enacted by the General Court in 1913 and re-enacted with other amendments in 1915 (Section 7, Page 144), authorized the Forestry Commission to furnish trees to the towns and cities from the state nursery for roadside planting. There has been no additional appropriation made for this purpose, and accordingly the Forestry Commission has complied with the statute as best it could by setting aside a few trees each year from the forest planting stock and growing them into a larger size for shade trees. Many applications have been received from the towns for trees under this statute. Where the trees thus grown in the state nursery were satisfactory, they have been furnished to the towns. In case larger trees were wanted than the state could furnish, arrangements were made by the commission to purchase these trees in large quantities from commercial nurseries and distribute them to the towns at cost. In this way 100 were furnished this fall to the cities of Concord and Rochester.

3. *Tree Planting by the Highway Department.*

The State Highway Department has set an excellent example to the towns and cities of the state in the im-

provement work which it has inaugurated along the state roads and trunk lines. Instructions for the thinning out of sprout growth and the development of shade trees have been furnished by the Forestry Commission and sent to the state road patrolmen. Many of these men have done excellent work in cleaning the inflammable litter along their section of the highway and thinning out the bushes and young trees. Nursery stock has been furnished to the Highway Department by the Forestry Commission for planting along certain open stretches of highway for shade and wind breaks. This work was begun last year and 1,500 trees were planted. The planting is done by the state road patrolmen, and it is planned to continue such planting along exposed portions of the state roads. An improvement feature upon which the Highway Department is to be congratulated is the removal of unsightly signs and notices. Whatever additional authority is necessary to be vested in the Highway Commissioner to regulate the placing of signs where they will not disfigure the roadside should be given.

4. *Encourage Care of Shade Trees by Private Owners.*

While developing a policy for the protection of public trees every encouragement should be given to private owners to protect and care for their trees. Some owners have become discouraged on account of seeing the work of incompetent tree men in their localities. In order to protect owners against such men and to encourage the business of good tree experts it is recommended that a law be enacted authorizing the Forestry Commission to hold examinations for arborists, that such examination be not compulsory on the part of tree men, and that anyone passing the examination creditably be given a certificate as a "registered arborist."

APPENDIX

FOREST LAWS.

AN ACT TO IMPROVE THE STATE SYSTEM OF FOREST PROTECTION.

(Chapter 128, Laws of 1909; amended by Chapter 166, Laws of 1911; amended by Chapter 159, Laws of 1913, Sections 2 and 6; amended by Chapters 127 and 142, Laws of 1915, Sections 13 and 25.)

Forestry Commission.

SECTION 1. On the first day of May, 1909, the Governor, with the advice of the Council, shall appoint a Forestry Commission of three members, one of whom shall hold office for one year, one for two years, and one for three years, and thereafter shall appoint their successors for terms of three years each; the said commissioners to serve without compensation, but to receive for their legitimate expenses in the exercise of their duties such sums as the Governor and Council shall audit and approve, to be paid from the treasury upon warrant of the Governor.

State Forester. Direction of fire protection; scientific investigations; educational work; publications.

SECT. 2. The Forestry Commission shall appoint a state forester to serve at the will of the commission at a salary to be fixed by them, not exceeding \$2,500 a year. The state forester shall, under the supervision of the Forestry Commission, execute all matters pertaining to forestry within the jurisdiction of the state, and shall be allowed reasonable traveling field expenses and office expenses in the necessary performance of his official duties and within the limits of the appropriation, may hire such field and office assistants as in the judgment of the commission is necessary for the proper execution of his duties, and upon terms approved by the Forestry Commission, may enter into coöperation with departments of the Federal Government for the promotion of forestry work within the state. It shall be the duty of the state forester to direct, aid and coöperate with all district chiefs, forest fire wardens and other employees of the state as provided for in this act, and see that they take such action as is authorized by law to prevent and extinguish forest fires and do other work which the Forestry Commission may undertake for the protection, improvement and extension of forests. He shall, as far as his other duties may permit, carry

on an educational course of lectures within the state, and may conduct exhibits on forestry at fairs within the state. He may, under the direction of the Forestry Commission, conduct investigations within the state on forestry matters and publish for distribution literature of scientific or general interest pertaining thereto. He shall, under the direction of the Forestry Commission, prepare biennially a report to the Governor on the progress and condition of state forest work and recommend therein plans for improving the state system of forest protection, management, replacement and extension. Such report shall contain an itemized statement of all expenses incurred or authorized by the state forester or by the Forestry Commission.

Advice and co-operation with counties, towns and woodland owners.

SECT. 3. The state forester shall, upon request and whenever he deems it essential to the best interests of the people of the state, coöperate with counties, towns, corporations, and individuals in preparing plans for the protection, management, and replacement of trees, woodlots, and timber tracts, on consideration and under an agreement that the parties obtaining such assistance pay his field expenses while he is employed in preparing said plans.

Forest Fire Wardens and Deputies. Appointment; duties; may arrest violaters of law.

SECT. 4. The selectmen of all towns and the mayors of all cities shall, and other citizens may, as soon as may be after this act takes effect, recommend to the state forester the names of such persons as may in their estimation be fit to fill the offices of forest fire warden and deputy forest fire warden in their respective towns and cities. After investigation the state forester may choose and appoint from the persons recommended, as above prescribed, not more than one competent person in each town or city to be the forest fire warden for said town or city and such deputy forest fire wardens as he deems necessary. Upon the appointment of a forest fire warden by the state forester in any town or city, the term of office of the forest fire warden then or theretofore acting in said city or town shall immediately cease, and the new appointee or appointees shall thereafter serve for one year, or until a successor is appointed as hereinbefore provided. The state forester shall have the power in the exercise of his discretion to remove any forest fire

warden or deputy forest fire warden from office. Upon the termination in any manner of the term of office of any forest fire warden, or deputy forest fire warden, a successor shall be appointed in the manner hereinbefore provided for the appointment of such officers originally. Forest fire wardens and deputy forest fire wardens themselves, or some agent or agents designated by them, shall, when directed by the state forester, patrol the woods in their respective cities or towns, warning persons who traverse the woods, campers, hunters, fishermen and others, about lighting and extinguishing fires. They shall post extracts from the fire laws, and other notices sent them by the state forester, along the highways, along streams and waters frequented by tourists and others, at camp sites, and in other public places. If, in or near woodlands, any persons, other than the owner of said land or his agents acting under his direction, shall build a fire when warned not to do so by an authorized official, or shall fail to extinguish a fire when ordered to do so by an authorized official, he may be arrested by such official without a warrant.

Appointment of wardens in unincorporated places.

SECT. 5. In unincorporated places the state forester may appoint a forest fire warden and one or more deputy forest fire wardens to have the same powers and the same duties as the town forest fire wardens. When so appointed by the state forester, said forest fire wardens and deputy forest fire wardens shall succeed the present incumbent or incumbents, if any. The state forester shall have the power to remove said forest fire wardens and deputy forest fire wardens from office, at his discretion.

District Chiefs. Division of state into fire districts.

SECT. 6. The state forester shall, under the direction of the Forestry Commission, divide the state into not more than four fire districts, fixing the boundaries of such districts according to efficiency of supervision, and may appoint a district chief in each district. Said district chief shall serve at the will of the state forester and shall be allowed such wages and expenses as may be fixed by the Forestry Commission within the limits of the appropriation. It shall be the duty of the district chief to assist the state forester in directing and aiding all forest fire wardens and deputy forest fire wardens in his district in the performance of their duties, and to perform such duties as

the state forester and Forestry Commission may direct in the protection, improvement, and extension of forests.

Duty of wardens to fight forest fires; persons must respond to warden's call; compensation.

SECT. 7. It shall be the duty of the forest fire warden and deputy fire warden to extinguish all brush and forest fires occurring in his town, and either of them may call such assistance as he deems necessary to assist him in so doing, and may require the use of wagons, tools, horses, etc., for that purpose, but such authority shall not interfere with the authority of chiefs of city fire departments. If any person fails to respond to the warden's call for his assistance or the use of his property he shall be fined not exceeding ten dollars for each offense. Forest fire wardens and deputy forest fire wardens in towns and unincorporated places shall be allowed for their services such remuneration as may be fixed by the Forestry Commission and the state forester. The owners of all property required by the forest fire warden or deputy forest fire warden in the extinguishment of a forest or brush fire shall receive reasonable compensation therefor.

County Commissioners decide in case of disagreement.

SECT. 8. In case the forest fire warden or deputy forest fire warden and the persons summoned to assist him or furnish the use of property shall fail to agree upon the terms of compensation at the time or after the required service has been rendered, the dispute shall be referred to the commissioners of the county in which the city or town is located, for final settlement.

Expenses of forest fires shared by town and state; town pays bill; state reimburses town.

SECT. 9. The expenses of fighting forest and brush fires in towns and cities and other expenses lawfully incurred by forest fire wardens and deputy forest fire wardens of said towns and cities in preventing forest fires, shall be borne equally by the town or city and by the state. The forest fire wardens shall render to the selectmen or the mayor, as the case may be, a statement of said expenses within one month of the date they are incurred, which said bill shall show in detail the amount and character of the services performed, the exact duration thereof, and all disbursements made by said wardens, and must

bear the approval of the forest fire warden, and the approval also of the deputy forest fire warden, if said expenses were incurred by the authority of said deputy forest fire warden; said bill shall be audited, and if approved by the selectmen of the town or mayor of the city wherein such services were incurred, shall be paid on the order of the selectmen by the town or city treasurer. A duplicate bill, showing that the same has been audited and paid by the town, shall be filed by the selectmen or the mayor with the state forester, who shall draw his order on the state treasurer in favor of said town or city for the portion of said bill for which the state is liable in accordance with the provisions of this section.

Payment of fire bills in unincorporated places.

SECT. 10. The forest fire wardens and the deputy forest fire wardens in unincorporated places shall render to the state forester a statement of such expenses as they have lawfully incurred under this act in fighting or preventing fires in woodlands within one month of the date upon which such expenses are incurred. The aforesaid statement shall show in detail the amount and character of the services performed, the exact duration thereof, and all disbursements so made by the forest fire warden, and the deputy forest fire warden, if said expenses were incurred by the authority of said deputy forest fire warden. The aforesaid statement shall be audited by the state forester and if by him approved he shall draw an order upon the state treasurer for the same. The expenses incurred in fighting forest and brush fires and other expenses lawfully incurred by a forest fire warden or a deputy forest fire warden in preventing forest fires in an unincorporated place shall be borne equally by the state and said unincorporated place; but the total expense shall be paid in the first instance from the state treasury, and one half thereof shall be added to the tax assessed the following year against said place in the same manner as is provided by chapter 62 of the Public Statutes for the assessment of taxes in unincorporated places generally.

Wardens to report fires; securing evidence of law violation.

SECT. 11. Forest fire wardens and deputy forest fire wardens shall make reports to the district chief of the district in which they are located or to the state forester at such time and in such form as the state forester may require. If a warden has

any reason to believe that any forest or brush fire in his city or town was caused in violation of statute he shall report to the state forester all the facts coming within his knowledge. The state forester may then bring the facts before the attorney-general of the state, who, if the facts as reported seem to him sufficient, shall take action to recover the penalty fixed by statute for such violation.

Permits required for kindling fires.

SECT. 12. No person shall kindle a fire upon public land without permission first had from the Forestry Commission, the state forester, district chief, forest fire warden, deputy forest fire warden, or from the official caretaker of such public land. No person shall kindle a fire upon the land of another without permission first had from the owner thereof or from the owner's agent.

Permits required for burning brush.

SECT. 13. No person shall kindle a fire or burn brush in or near woodland, except when the ground is covered with snow, without the written permission of the forest fire warden, or the presence of the forest fire warden or person appointed to represent him.

Penalties for violation.

SECT. 14. Fires kindled by throwing down a lighted match, cigar, or other burning substance, shall be deemed within the provisions of sections 12 and 13, and every person violating any provisions of said sections shall be fined not more than two hundred dollars, or imprisoned not more than sixty days, or both.

Power of arrest without a warrant.

SECT. 15. The state forester, or the forest fire warden or the deputy forest fire warden, may arrest, without a warrant, any person or persons taken by him in the act of violating any of the laws for the protection of forest lands, and bring such person or persons forthwith before a justice of the peace or other justice having jurisdiction, who shall proceed without delay to dispose of the matter as justice may require.

Payment of fire damages.

SECT. 16. Every person who shall set fire on any land that

shall run upon the land of any other person shall pay to the owner all damages done by such fire.

Penalty for wilful neglect of duty by warden.

SECT. 17. If any forest fire warden or deputy forest fire warden provided for in this act shall wilfully neglect or refuse to perform the duties prescribed for him he shall forfeit not less than \$100 nor more than \$500, to be recovered in an action for debt, upon complaint of the Forestry Commission, and all forfeitures so recovered shall be paid into the state treasury.

Person discovering fire must extinguish it, or report to nearest warden; penalty.

SECT. 18. It shall be the duty of any person who discovers a forest or brush fire not under control or supervision of some person, to extinguish it or report it immediately to the forest fire warden or deputy forest fire warden or official in charge of forest protection, and failure so to do shall be punished by a forfeiture not exceeding ten dollars, to be recovered upon the complaint of the warden.

Fines used for fire protection.

SECT. 19. All moneys received from fines imposed under and by virtue of the provisions of this act shall be paid to the state treasurer and kept by him as a separate fund, to be paid out by him upon the requisition of the state forester, for use in connection with the prevention and suppression of forest fires.

State Forests. Acquisition by gift or purchase; management by Forestry Commission; revenue goes to state treasury.

SECT. 20. Whenever any person or persons shall supply the necessary funds therefor, so that no cost or expense shall accrue to the state, the Forestry Commission is hereby authorized to buy any tract of land and devote the same to the purposes of a public reservation. If they cannot agree with the owners thereof as to the price, they may condemn the same under the powers of eminent domain, and the value shall be determined as in the case of lands taken for highways, with the same rights of appeal and jury trial. On the payment of the value as finally determined, the land so taken shall be vested in the state, and forever held for the purposes of a public reservation. The persons furnishing the money to buy said land shall be

at liberty to lay out roads and paths on the land, and otherwise improve the same under the direction of the Forestry Commission, and the tract shall at all times be open to the use of the public. The Forestry Commission may take means for the protection of such reservation from forest fire, and, as far as compatible with the wishes of the donor, may plant and remove trees and otherwise improve the forest conditions.

The commission is empowered to receive in the name of the state free gifts of land for the purpose of forestry, in such manner that no cost of purchase shall accrue to the state, and may arrange for the registration of necessary papers, map and survey the land, protect it from fire, plant, cut and otherwise improve the forests as it is advisable within the limits of the appropriation.

The commission is empowered to purchase, with the consent of the Governor and Council, suitable tracts of land for use in demonstrating the principles of forestry, and make provisions for the management of the same, as is advisable within the limits of the appropriation.

All revenue derived from the sale of forest products from state land shall revert to the state treasury, except the revenue derived from the state nursery, which shall be reinvested in the state nursery by the Forestry Commission.

State Forest Nursery. Sale of young trees to land owners.

SECT. 23. The state forester, under the supervision of the Forestry Commission, is hereby empowered to acquire in the name of the state suitable land and maintain the same as a state forest nursery. He shall raise seedling trees of useful varieties for planting and shall, on terms approved by the commission, sell said seedling trees to persons who desire to plant them within the state. He may, under the supervision of the commission, enter into agreement with persons or institutions to grow seedling trees to be disposed of as above prescribed if the commission deems it expedient so to do.

Fire Lookout Stations. Establishment and maintenance; acquisition of observatory sites.

SECT. 24. The state forester, with the consent of the Forestry Commission, is empowered to purchase in the name of the state the equipment of the present mountain lookout stations and to maintain such stations thereafter, and to establish and maintain additional mountain lookout stations, connected by tele-

phone lines, to be used for the discovery and control of forest fires, and shall have the right to receive and hold in the name of the state gifts of land for observatory sites and rights of way for paths and telephone lines. If observatory sites or rights of way necessary for the maintenance and effective operation of lookout stations cannot be acquired by gift or purchase, the Forestry Commission shall have the right to acquire the same under the power of eminent domain, and the value thereof shall be determined as in the case of land taken for highways, with the same rights of appeal and jury trial.

The state forester may cooperate with the forestry departments of the states of Maine, Massachusetts, and Vermont in the establishment and maintenance jointly of lookout stations serving New Hampshire and any of the other said states.

Fire Warden Conferences.

SECT. 25. The state forester, under the direction of the Forestry Commission, may call conferences of the forest fire wardens, deputy forest fire wardens, and other employees of the forestry department in different sections of the state for the purpose of improving the service. Those summoned by the state forester shall be allowed their traveling expenses in attending such conferences. He may, with the consent of the Forestry Commission, secure the attendance at such conferences of expert foresters from without the state, the said experts to be paid their necessary traveling expenses.

Special work in preventing fires.

SECT. 26. For the purpose of prevention of fire, the state forester may establish at advantageous points throughout the state supply stations for tools and apparatus used in fire fighting and provisions necessary to men employed; make proper maps for the use of district chiefs and forest fire wardens, build fire trails and fire lines; employ paid patrols at suitable points and at necessary times, and use other means as seem advisable to the commission within the limits of the appropriations.

AN ACT TO PROVIDE FOR THE USE OF SPARK ARRESTERS ON PORTABLE STEAM SAWMILLS.

(Chapter 95. Laws of 1911.)

Portable steam sawmills required to use proper spark arresters.

SECTION 1. No person, except when the ground is covered with snow, shall operate any portable steam mill unless the same is provided with a suitable spark arrester, approved by the state forester. Such approval shall be in writing, signed by the forester, and said approval may be revoked by the state forester in the same manner.

Examination of mills.

SECT. 2. It shall be the duty of the state forester to examine all portable steam mills or cause them to be examined, whenever he deems it necessary, to determine whether they are provided with suitable spark arresters, and whether the same are kept in constant use, as provided for in section 1 of this act. It shall be the duty of the town forest fire warden to examine portable steam mills, when requested to do so by the state forester, and make reports on the same in such form as the state forester may require.

Penalty for violation of law.

SECT. 3. Any person operating a portable steam mill when the ground is not covered with snow, without a suitable spark arrester and the approval of the state forester, as herein provided, and any owner or part owner of said mill knowingly permitting its operation, shall be fined not less than fifty dollars and not more than one hundred dollars.

SECT. 4. All acts and parts of acts inconsistent with this act are hereby repealed, and this act shall take effect upon its passage.

AN ACT CONFERRING SPECIAL AUTHORITY UPON THE GOVERNOR AND COUNCIL TO CLOSE THE OPEN SHOOTING SEASON DURING PERIODS OF PROTRACTED DROUGHT.

(Chapter 59, Laws of 1909.)

Governor and Council may proclaim a time of drought, suspending the open season.

SECTION 1. The Governor and Council when, in their opinion, the discharge of firearms might endanger property by starting fires in the woodlands during a period of excessive dryness, may suspend by official proclamation, posted and promulgated through the newspapers of the state, the open season, so called, for such time as they may designate.

Penalty for violation.

SECT. 2. For the period which such proclamation shall cover, all provisions of the law relating to the closed season shall be construed to be in force, and if, during the continuance of such period, any person shall shoot an animal or bird for which there is no close season otherwise provided by law, he shall be punished by a fine of fifty dollars and costs.

SECT. 3. This act shall take effect upon its passage.

AN ACT TO REVISE AND AMEND THE FISH AND GAME LAWS.

(Chapter 133, Laws of 1915.)

Fish and game wardens to extinguish or report forest fires.

SECT. 69. . . . "It shall be the duty of all such wardens while in and about the forests, to caution persons of the danger from fires in the forests, and to extinguish a fire left burning if in their power. It shall be their duty to give notice to all parties interested when possible, and to the forest fire warden of the town interested in particular, of fires threatening to extend beyond control. Pending the arrival of such fire warden, they shall assume all the powers of such wardens as provided by statute."

**AN ACT FOR THE PROTECTION OF FOREST PROPERTY
FROM FIRE ORIGINATING ALONG RAILROADS AND
HIGHWAYS.**

(Chapter 155, Laws of 1913; amended by Chapter 100, Laws of 1915.)

**Railroad companies required to use proper spark arresters and
ash pans.**

Section 1. Every railroad company or corporation operating locomotives within the state shall, subject to the approval of the Public Service Commission, equip and maintain in good condition a spark arrester and a suitable ash pan on every engine, except such engines as are operated by oil or electricity; and shall require its employees operating such engines to exercise due care to keep such devices in good order and to prevent the escape of live coals or sparks which may cause fires along the right of way; and shall, subject to the approval of the Public Service Commission, make and enforce regulations for the giving of fire signals and notifications of the existence and location of fires along the right of way to its employees. In carrying out this section, the Public Service Commission may serve orders and enforce compliance with such orders as provided in Chapter 164, Laws of 1911, and amendments thereto.

**Section foremen may be appointed deputy fire wardens; town
wardens and deputies to co-operate in putting out railroad
fires; expenses paid by railroad.**

SECT. 2. The state forester is hereby authorized to appoint as deputy forest fire wardens the section foremen or such other railroad employees as the authorized officials of the railroad may recommend. Such deputies when so appointed shall be vested with the powers and duties of deputy forest fire wardens as provided in Chapter 128, Laws of 1909, and amendments thereto, except as such powers and duties are limited or extended by this act. Railroad deputies thus appointed shall extinguish and supervise the fighting of forest and brush fires originating along the railroad right of way, but shall not be required to supervise the fighting of fires which do not originate along the right of way. The Forestry Commission shall instruct all wardens and other employees of the Forestry Department to cooperate with the railroad deputies in the prevention and extinguishment of railroad fires, to immediately notify the nearest station agent or railroad deputy upon the discovery of a fire

along the right of way, and to combat such fire until the railroad deputy or other railroad official shall assume charge. A railroad deputy who receives notice of the existence of a fire adjacent to the right of way shall proceed forthwith to extinguish it. All just and proper expenses incurred in extinguishing forest or brush fires caused by the railroad company or its employees shall be paid by such railroad company; but the fact that such payment has been made shall not be admissible as evidence that such fire was so caused.

Railroad companies shall instruct employees in fire prevention; shall patrol dangerous places during drought.

SECT. 3. Railroad companies shall promulgate among their employees instructions for the prevention and extinguishment of fires along the right of way; and shall, through the railroad deputies or other officials, organize and maintain a system of patrol during dry weather along the sections of its right of way where there is danger of fire. The fact that a section of the right of way was not patrolled shall not be admissible as evidence of negligence to debar such railroad from insurance on property, as provided in Chapter 159 of the Public Statutes.

Railroad companies may clear inflammable ground litter in woodlands abutting right of way.

SECT. 4. Railroad companies shall have the right, subject to the provisions of this section, to enter upon forest or brush land adjacent to the right of way, without liability for trespass, for the purpose of clearing brush, grass and inflammable material from such land, for a distance of twenty-five feet from the railroad right of way, but shall not remove valuable timber growth without recompense to the owner. Prior to making such a clearing, the railroad company shall give the owner thereof notice of its intention by letter deposited in the United States mail to his last known address, and thereafter by publishing said notice at least once in two papers of general circulation in the county. Said notice shall quote section 4 of this act. If the owner shall not file an objection to such clearing with the Public Service Commission within fifteen days from the date of such publication, he shall be deemed to have given consent. Upon the filing of such an objection by an owner, the Public Service Commission shall notify the owner the time and place when he may appear to show cause why such clearing should not be done. After a hearing, the Public Service Commission

may sustain the objection or permit the clearing to be done and may prescribe the extent and methods of any and all such clearings. The Public Service Commission may require the assistance of the Forestry Commission and the state forester in furnishing information pertinent to the carrying out of this section.

Forestry Commission may investigate carrying out of law.

SECT. 5. The Forestry Commission or its authorized agents shall have the right to enter upon railroad or other property to ascertain facts in regard to the carrying out of this act, and from time to time shall report such facts to the Public Service Commission.

Lumber slash must be cleared back 40 feet from railroad right of way; and 20 feet from trolley right of way or public highway.

SECT. 6. On and after July 1, 1915, any person, firm or corporation cutting wood or lumber on property adjacent to the right of way of any steam or electric railroad or public highway shall dispose of the slash caused by such cutting in such a manner that the inflammable material shall not remain on the ground within forty (40) feet of the right of way of any steam railroad, or within twenty (20) feet of the right of way of any electric railroad or the traveled part of any public highway. Any operator of wood or timber on such land, or any owner of such land where cutting is done, may be fined not more than ten dollars for each acre of such land or fraction thereof from which the inflammable material is not properly disposed of within sixty days from the cutting of the trees thereon; *provided*, that any owner or operator who cuts wood or timber during the winter, after November 1, shall have until May 1 in Grafton, Carroll and Coös counties, and until April 1 in other counties, to remove the slash in accordance with the provisions of this section. If such slash is destroyed by burning, such burning shall be done with the permission of the town forest fire warden. The Forestry Commission is hereby charged with the execution of this section. All owners or operators shall be required to use due care in clearing such land, and shall not be relieved of liability for damage imposed by Chapter 128, Laws of 1909, and amendments thereto; but no owner of such land shall be liable for damages resulting from fires not set by himself or his agents.

Railroads liable for fire damage; may insure and have an insurable interest in abutting property.

(Chapter 159, Public Statutes.)

SECT. 29. The proprietors of every railroad shall be liable for all damages to any person or property by fire or steam from any locomotive or engine upon their road.

SECT. 30. Such proprietors shall have an insurable interest in all property situate upon the line of their road, which is exposed to such damage, and they may effect insurance thereon for their own benefit.

SECT. 31. Such proprietors shall be entitled to the benefit of any insurance effected upon such property by the owner thereof, less the cost of premium and expense of recovery. The insurance shall be deducted from the damages if recovered before the damages are assessed, or, if not, the policy shall be assigned to the proprietors, who may maintain an action thereon.

**AN ACT IN AMENDMENT OF CHAPTER 85, LAWS OF 1895,
RELATING TO THE PROTECTION AND PRESERVATION
OF ORNAMENTAL AND SHADE TREES IN THE HIGH-
WAYS.**

(Chapter 98, Laws of 1901; amended by Chapter 119, Laws of 1905; amended by Chapter 138, Laws of 1915.)

Towns and cities shall appoint tree wardens.

SECTION 1. Mayors of cities and selectmen of towns shall, immediately upon the passage of this act, and annually thereafter, appoint one or more tree wardens, who shall be discreet persons, resident of the city or town where appointed, interested in planting, pruning and preservation of shade and ornamental trees in public ways and grounds, whose business it shall be to perform the duties hereinafter specified, and shall be allowed such compensation for their services and expenses as the mayor or selectmen may deem reasonable.

Towns and cities to have control of roadside and street trees marked by tree wardens.

SECT. 2. Towns and cities shall have control of all shade and ornamental trees situated in any public way or ground within their limits, which the tree warden deems reasonably necessary

for the purpose of shade and ornamentation; and it shall be the duty of the tree wardens, as soon as possible after their appointments, to carefully examine the trees, situated as aforesaid, and to plainly mark such trees as they think should be controlled by their municipality, for the purposes aforesaid. Galvanized iron disks shall be furnished by the secretary of the Forestry Commission to said officers as may be required by them for the purposes of this act at a cost not to exceed five hundred dollars a year. Said disks shall be painted red and have stamped on them the letters "N. H.," not less than an inch in height, and to be pierced in the center for the admission of a spike. The disks shall be inserted in each tree at a point not less than three feet nor more than six feet from the ground on the side toward the highway, by driving a spike through the disk into the tree within two inches of the spike's head, so that the disk may slide with the growth of the tree. If any of the spikes or disks shall be destroyed or defaced it shall be the duty of the warden to renew them as soon as possible after he is informed or discovers that they have been removed. They shall also have the power to designate from time to time, in the same manner as hereinbefore directed, such other trees within the limits of the public ways and grounds as in his (their) judgment should be preserved for ornament or shade.

Acquisition of roadside trees by municipality.

SECT. 3. If any of the trees designated as aforesaid should prove to be private property, and the owners thereof refuse to release or convey their interest therein to the municipality, the tree warden shall acquire them for the use of the city or town by purchase if it can be done at a fair price. Failing in this, he may take said trees for the use of the city or town by appraising the fair value of the same and by causing to be served upon the owner thereof a notice of such taking, which notice shall state the number of each variety of tree so taken, the location of the same as near as practicable, and the value thereof as fixed by him; and also by filing a copy of such notice as attested by him with the city or town clerk. If the owner shall be satisfied with the value stated in such notice, the tree warden shall cause the same to be paid to him forthwith. If the owner shall be dissatisfied with the action of said tree warden in valuing the trees so taken, he may, within thirty days after said notice has been served upon him, but not afterwards, apply to the selectmen to assess his damages. Such

proceedings shall thereupon be had, including the right of appeal, as are provided in the case of assessment of damages in laying out highways by the selectmen; and thereupon such damages, if any, may be awarded as shall be legally and justly due to the landowner. Cities and towns are hereby authorized to raise and appropriate money to carry into effect the provisions of this act.

Towns and cities may appropriate money for care of trees; Forestry Commission to furnish trees to towns for roadside planting; Highway Department to plant and care for trees along state roads.

SECT. 4. Towns and cities may annually appropriate money, not exceeding in the aggregate fifty cents for each of their ratable polls in the preceding year, to be used by the tree warden in planting, pruning, protecting, and, whenever necessary, acquiring shade and ornamental trees within the limits of their public ways and grounds; and the Forestry Commission is hereby authorized to grow shade trees for roadside planting and to distribute said trees free of charge at the point where grown to towns for planting along roadsides, such trees to be planted under the supervision of the State Highway Department or the town tree warden. The State Highway Department may provide for the planting of such trees along any of the so-called trunk lines and pay the cost thereof from the maintenance funds available to the department under the motor vehicle law, and may plant such trees along any state roads and pay the costs of same from any appropriation available for such roads.

Removal of marked shade tree by hearing, or approval of tree warden.

SECT. 5. Whoever desires the cutting and removal in whole, or in part, of any public shade or ornamental tree, may apply to the tree warden, who shall give a public hearing upon the application at some suitable time and place, after duly publishing and posting notices of the hearing in two or more public places in town, and also upon the tree or trees which it is desired to cut and remove; *provided, however*, that the tree warden may, if he deem it expedient, grant permission for such cutting or removal without a hearing if the tree or trees in question is on a public way outside of the residential part of the town limits, such residential part to be determined by the

tree warden. No tree within such residential limit shall be cut by the tree warden, except to trim it, or removed by him, without a hearing as aforesaid. The decision of the tree warden shall be final.

Unlawful to injure or deface a public shade tree.

SECT. 6. It shall be unlawful to cut, destroy, injure, deface, or break any public shade or ornamental tree, or to affix to any such tree a playbill, picture, announcement, notice, advertisement, or other device or thing, whether in writing or otherwise, or to paint or mark such tree, except for the purpose of protecting it, and under a written permit from the tree warden, or to negligently or carelessly suffer any horse or other beast, driven or being lawfully in a public way or place, to break down, injure, or destroy a shade or ornamental tree within the limits of said public way or place; or to negligently or wilfully, by any other means, break down or injure any such tree.

Clearing Brush along Highways. Duty of selectmen to cut and remove brush and bushes, leaving young trees for shade and ornament.

SECT. 7. Mayors of cities, selectmen of towns, and county commissioners for unincorporated places, shall annually, during the months of August or September, and at other times when advisable, cause to be cut and disposed of from within the limits of the highway, all trees and bushes that cause damage to the highway, traveling public, or that are objectionable from the material or artistic standpoint. Shade and fruit trees that have been set out or marked by the abutting land-owners or by the town tree warden, and young trees standing at a proper distance from the highway and from each other, shall be preserved, as well as banks and hedges of bushes that serve as a protection of the highway, or that add to the beauty of the roadside; and it shall be unlawful for anyone to deposit rubbish within the limits of the highways.

Town or city may acquire roadside trees by planting, and by leaving young trees when bushes are cut.

Any young shade or ornamental tree planted within the limits of a public highway by the tree warden, or by any other person or persons, with the approval of the selectmen or the mayor,

shall forthwith become the property of the town or city. Any young seedling tree or sprout left within the limits of the highway as specified in this section and designated by the tree warden to be preserved for its future value as a shade tree shall become the property of the municipality; *provided* that the abutting land-owner, having been notified of the intention of the town to take and preserve such young tree or trees, shall have made no written objection to the tree warden within thirty days from the date of such notification.

Town or city may contract with abutting owners to cut bushes and improve roadside growth.

The selectmen of a town or the highway department of a city may contract with any owner of land abutting a public highway to cut, trim and improve the roadside growth along said owner's property, and for all such work properly done in carrying out the provisions of this section and approved by the tree warden, may allow and cause to be paid to said owner such sums of moneys as in their judgment, with the advice of the tree warden, justly compensate the town or city in the improved condition of the roadside.

State Highway Department has charge of brush cutting along state road; brush cut along all roads must be disposed of within 30 days; burning to be done with permission of forest fire warden.

On all state roads and trunk-line highways the plan of carrying out the provisions of this act shall be under the supervision of the State Highway Department. Said department shall make such rules and regulations for the purpose of carrying out the provisions of this act as shall in its judgment, seem for the best interests of the state. Whenever any trees or brush cut along the highway are disposed of by burning, the cut trees or brush shall be removed a safe distance from any adjoining woodland or from any tree or hedge designated or desirable for preservation, and such burning shall be done with the permission of the forest fire warden. All trees or brush thus cut from within the limits of the highway shall be disposed of within 30 days from the cutting thereof.

Damages may be assessed to abutting owners for roadside growth on new highways and existing highways.

When any highway shall be laid out, damages may be assessed to the abutting owners to provide for the maintenance or planting, from time to time, within the limits of such highway, of such shade and ornamental trees as may be necessary for the preservation and improvement of such highway. Damages may be assessed to abutting owners on any existing highway upon petition therefor, and such proceedings had as in the lay-out of highways to provide for the maintenance and planting, from time to time, of such trees within the limits of such highways as may be necessary for the preservation and improvements of the same. When such damage shall be assessed and paid there shall be, in addition to the right of travel over such highway, a public easement to protect, preserve and renew the growth thereon for the purposes aforesaid.

Penalty for injuring a shade tree.

SECT. 8. Persons violating any of the provisions or this act shall forfeit not less than five nor more than one hundred dollars, to be recovered in an action of debt by the tree warden or any other persons for the benefit of the town or city in which the tree is situated, or be fined not less than five nor more than one hundred dollars.

SECT. 9. All acts and parts of acts inconsistent with this act are hereby repealed, and this act shall take effect upon its passage.

AN ACT REGULATING CONSTRUCTION OF TELEPHONE LINES.

(Chapter 81, Public Statutes.)

Telephone companies may not cut trees along roads without owners' consent, except by applying to selectmen.

SECT. 5. No person or corporation shall have a right to cut, mutilate or injure any shade or ornamental tree for the purpose of erecting or maintaining their line without consent of the owner of the land on which it grows; or, if his consent cannot be obtained, unless the selectmen, upon petition, after notice to and hearing the parties, decide that the cutting or mutilation is necessary, and assess the damages that will be occasioned to the owners thereby, nor until the damages are paid or tendered.

AN ACT FOR THE REFORESTATION OF WASTE AND CUT-OVER LAND.

(Chapter 163, Laws of 1915.)

Forestry Commission may accept deeds of waste land; shall reforest and care for such land; donor may, within ten years, secure title to the planted land by paying cost of improvement and four per cent interest.

SECTION 1. For the purpose of reforesting waste and cut-over land, the Forestry Commission is hereby instructed and authorized to promulgate throughout the state the offers made by section 2 of this act.

SECT. 2. Whenever any person or persons shall deed to the state any tract of land adapted for forest growth, so that no cost of purchase shall accrue to the state, the Forestry Commission is authorized to accept and hold such tracts in the name of the state, and to reforest, protect, and manage them subject to the limitations of this section. The donors of such land, or their heirs and assigns, shall have the right, within ten years from the date of conveyance, to purchase it from the state at the cost of improvements with interest at four per cent per annum, and the secretary of state shall, upon the recommendation of the Forestry Commission, convey such land to said donor or donors. If the donor, or his heirs or assigns, shall not acquire the land within ten years from the date of conveyance, such land may be sold, or the wood and timber thereon may be sold, by the Forestry Commission, with the approval of the Governor and Council; provided, that such sale shall be advertised and awarded to the highest bidder, and the state may reject any such bids. The state shall not be required to reforest more than twenty-five acres of any tract acquired under this act in any one year. Any forest fire on such tracts shall be extinguished as provided in Chapter 128, Laws of 1909, and amendments thereto. All revenue from the sale of such tracts, or of the wood and timber thereon, shall revert to the state treasury. Not more than twenty-five acres of land shall be reforested by the state for any one person, firm, or corporation, nor shall the state accept a deed from any person, firm, or corporation that is, on the date of such proposed conveyance, the owner of any lands which shall have been reforested by the state.

State Forester may make planting plans and furnish trees free of charge to counties, cities, towns and public institutions.

SECT. 3. The state forester, under the direction of the commission, may execute free of charge to counties, municipalities, and public institutions owning land suitable for reforestation, a planting plan for the reforestation of such land, and may furnish trees free of charge, arrange for and supervise the planting of such land and any other land suitable for reforestation owned or acquired by the state; provided, that in the case of land owned by counties or municipalities, the said counties or municipalities shall pay the cost of planting the trees furnished by the state, shall protect and care for them as recommended by the state forester, and, when required, shall furnish the state forester with information as to the condition and growth of the trees.

Appropriation for planting work.

SECT. 4. The sum of twenty-five hundred dollars each year is hereby appropriated for carrying into effect the purposes of this act for the years ending August 31, 1916, and August 31, 1917.

AN ACT TO ENCOURAGE THE PLANTING AND PERPETUATION OF FORESTS.

(Chapter 124, Laws of 1903.)

Land owners may secure tax abatement on land planted to trees.

SECTION 1. In consideration of the public benefit to be derived from the planting and cultivation of timber or forest trees, the owners of any and all land which shall be planted with timber or forest trees, not less than twelve hundred to the acre, shall be entitled, from and after the first day of April, 1903, to a rebate of the taxes assessed upon said land, as follows: For the first ten years after the land has been so planted, a rebate of ninety per cent of all the taxes assessed upon said land; for the second period of ten years after such planting, a rebate of eighty per cent of all taxes, and for the third and final period of rebate after such planting, a rebate of fifty per cent of all said taxes; said rebate to be allowed only on condition that said planted trees are kept in a sound condition. A

return of such planting shall be made to the selectmen when taking the annual inventory, which return shall be verified by the selectmen and made the basis of such tax exemption. After said trees have been planted ten years it shall be lawful for the owners to thin out the same, so that not less than six hundred trees shall be left to the acre; but no portion of said planted land shall be absolutely cleared of trees during the period for which said rebate may be allowed.

**AN ACT AUTHORIZING TOWNS TO PURCHASE AND MAN-
AGE LANDS FOR FORESTRY PURPOSES.**

(Chapter 27, Laws of 1913.)

Towns and cities may vote money to buy and manage forest land; such land to be managed by the state forester; net proceeds shall go to town treasury.

SECTION 1. Towns and cities may at any legal meeting grant and vote such sums of money as they shall judge necessary to purchase, manage and improve lands for the purpose of growing wood and timber.

SECT. 2. Any lands so purchased shall be managed under the direction of the state forester.

SECT. 3. The net proceeds, after deducting necessary expenses, from the sale of wood and timber from such lands shall be turned into the town treasury.

SECT. 4. This act shall take effect upon its passage.

LIST OF FIRE WARDENS AND DEPUTIES.

An Asterisk (*) means forest fire warden; others are deputies;
R., route; R. D., route delivery.

BELKNAP COUNTY.

Name	P. O. Address.	Telephone.
Alton.		
Oscar Duncan*	Alton	3-21
Arthur D. Rollins.....	West Alton	572-25 Laconia
John W. Proctor.....	Alton	3-24 North Barnstead
Frank Carpenter	Alton	34-4 Wolfeboro Ex.
Philip L. Drew.....	Alton	
Barnstead.		
Charles E. Thyng*.....	R. 4, Pittsfield.....	7-3 North Barnstead
E. B. Drake.....	Barnstead	
H. C. French.....	South Barnstead	8009-11 Pittsfield
F. J. Holmes.....	R. D., Ctr. Barnstead	2-13 North Barnstead
Belmont.		
C. O. Judkins*.....	Belmont	6-12
Edwin W. Blaisdell....	R. D., Laconia.....	337-31 Citizens
John Bryant	Belmont	19-1/2
R. H. Hoadley.....	R. 3, Laconia.....	523-21
Luke H. Rickert.....	R. 1, Laconia.....	247-4 Citizens
W. S. Wallace.....	R. 2, Laconia.....	331-12 Citizens
Center Harbor.		
James R. Lovett*.....	Meredith	
Guy Cram	R. 1, Center Harbor..	14-3
Orville P. Smith.....	R. D., Ashland.....	102-5 White Mts.
Gilford.		
Charles H. Gove*.....	R. 4, Laconia.....	574-2 Winnepesaukee
Frank Grant	R. 6, Lakeport.....	562-3 [Tel. Co.
Fred J. Potter.....	R. 4, Laconia.....	573-14
Gilmanton.		
Wm. S. P. Sanderson*	Gilmanton	24-21 Belmont
C. A. Price.....	Gilmanton Iron Works	16-4
John H. Beck.....	Gilmanton Iron Works	
Charles J. Kelley.....	R. 4, Pittsfield	
Laconia.		
Arthur W. Spring*.....	Laconia	347-1 1/2 Citizens
Caleb J. Avery.....	The Weirs	123-4 Citizens
W. H. Rand.....	78 Oak St., Laconia	
Meredith.		
Charles N. Roberts*.....	Meredith	43 Meredith
F. A. Mead.....	Meredith	16-14
Lewis A. Higgins.....	R. D., Laconia	
Frank P. Corliss.....	R. 2, B. 68, Meredith..	325-2 Citizens

Name.	P. O. Address.	Telephone.
New Hampton.		
F. M. Morrill*.....	New Hampton	12 Bristol
Thomas J. Hayes.....	Winona	12-2 Citizens
Victor L. Huckins.....	R. D., Ashland.....	111-11 Citizens
F. A. Emerson.....	Bristol	
Sanbornton.		
F. H. Hunkins*.....	R. 1, Laconia.....	233-2½
Edwin W. Lane.....	Hill	78-2 Citizens
Charles H. Odell.....	R. 1, Laconia.....	234-3½ Citizens
F. J. Thomas.....	R. D., Tilton.....	130-21 Citizens
J. M. Hunt.....	Tilton	120-13 Citizens
Tilton.		
Joseph F. Leary*.....	Box 1, Tilton.....	21-2
John M. Hunt.....	Tilton	120-13 Citizens
H. C. Wyatt.....	R. 1, Tilton	
E. L. Sanderson.....	Tilton	110-2½
CARROLL COUNTY.		
Albany.		
Ichabod Hammond*	Pequaket	4-8 Madison Ex.
A. P. Irish.....	North Conway	
Bartlett.		
George S. Chesley*.....	Bartlett	18-12 North Conway
Albert E. Howard.....	Intervale	
Henry Kittridge	Glen	13 Glen Tel. Line
Brookfield.		
Wallace F. Lang*.....	R. 1, Sanbornville.....	6-14 Sanbornville
F. J. Woodus.....	Sanbornville	
Chatham.		
Harry C. Chandler*.....	North Chatham	12-21
Preston Chandler	North Chatham	Fryeburg, Maine
Conway.		
Fred T. Hale*.....	Conway	11-2
Chester Potter	Conway Center	
M. A. Heath.....	Greenhill	11-23 Fin's Ldg.
J. H. Woodward.....	Fryeburg, Me.	
John H. Smith.....	North Conway	3-11 North Conway
Harry Thompson.....	North Conway	
Ivory S. Mason.....	Conway	
Eaton.		
John H. Bryant*.....	Snowville	91-12 Conway
George M. Perkins.....	B. 113, Eaton Center..	9021-4 Conway
Effingham.		
Richard Dearborn*	Effingham	31 Pine River Line
John L. Marston.....	R. 1, Mountainview....	Pine River Line
Eugene Tewksbury	Effingham Falls	
Freedom.		
John E. Perkins*.....	Freedom	16-31 Ossipee Val.
L. G. Burnham.....	Freedom	16
G. F. Huckins.....	Freedom	
Jesse I. Drew.....	R. D., Freedom.....	32 Town Line

Name.	P. O. Address.	Telephone.
Hart's Location.		
C. H. Morey*.....	Bemis	9602-4 North Conway
H. T. Hartshorn.....	Bemis	
George Howland	Crawford's	9017-2
Jackson.		
D. W. Davis*.....	Intervale	
Jonathan Meserve	Box 43, Jackson.....	14-5 Jackson
Madison.		
O. R. Kennett*.....	Silver Lake	3-11 Madison
Victor Staples	Madison	
H. E. Chick.....	Madison	3-14 Madison
Walter Kennett	Silver Lake	3-11 Madison
Moultonborough.		
Ernest Davis*	Moultonborough	8-31
George A. Blanchard..	Moultonborough	4-4 Center Sandwich
Lynde E. Davis.....	Center Harbor	15-12
Ossipee.		
F. E. Palmer*.....	Moultonville	Mountainview Ex.
W. H. Lord.....	Mountainview	Mountainview Ex.
Albert O. Huckins.....	Mountainview	18-11 Mountainview
J. E. Hodgdon.....	Ossipee	
Isaac Buswell	R. D., Ossipee	
M. H. Winkley.....	Ossipee	19-34 Mountainview
Sandwich.		
Daniel S. Watson*.....	Whiteface	11-22 Sandwich
J. A. Hansan.....	Whiteface	11-13 Sandwich
Walter H. Avery.....	R. D., Ctr. Sandwich..	13-14
Tamworth.		
Samuel A. Hidden*.....	Tamworth	12-5
Thomas Boyd	South Tamworth	
John F. Sanborn.....	Chocorua	
S. Harold Hidden.....	Tamworth	12-5
M. W. Chamberlain....	Chocorua	
Tuftsboro.		
Edwin B. Edgerly*....	Mirror Lake	157-24 Wolfeboro
Ernest M. Hunter.....	Melvin Village	
Wakefield.		
Nathan O. Weeks*.....	East Wakefield	1-3 Wakefield
I. L. Lord.....	Union	6-21 Milton Mills
R. B. Buzzell.....	Horns Mills	7-25 Milton Mills
E. K. Freeman.....	Sanbornville	
Wolfeboro.		
John D. McHugh*.....	Wolfeboro	64-4 Wolfeboro
Frank J. Lucas.....	South Wolfeboro	
Charles H. Nute.....	East Wolfeboro	142-11 Wolfeboro

Name.	P. O. Address.	Telephone.
Keene.		
Louis A. Nims*.....	Keene	139
George H. Matthews....	Keene, R. D. 2.....	345-M
Herbert A. Davis.....	Keene	343-11
Robert E. Faulkner....	Keene	158-W
Aden H. Hall.....	Keene	
Walter L. Moore.....	Keene	351-22
Henry W. Nims.....	Keene	351-11
Horace Robbins	Keene	
Herbert Blauchon	Keene	
Marlboro.		
Cyrus H. Kinsman*....	Marlboro	6-14
A. A. Wallace.....	Marlboro	6-13
Norman N. Collins....	Marlboro	4-4
Lewis A. Higgins.....	Marlboro	
Marlow.		
W. W. Howe*.....	Marlow	5944-12 Keene
Karl F. Huntley.....	Marlow	
Henry C. Mosher.....	Marlow	
Nelson.		
Clarence Guillow*	Munsonville	8007-11 East Sullivan
W. P. Tolman.....	Cheesham	8-23 Harrisville
Albert Cram	Munsonville	
Richmond.		
S. A. Bullock*.....	R. 4, Winchester.....	2-14 Richmond
Albert B. Conway.....	R. 3, Winchester	
Silas O. Martin.....	R. 3, Winchester.....	21-14 Fitzwilliam
Rindge.		
Albert L. Hale*.....	East Rindge	9-22
George C. Todd.....	Rindge Center	2-13
William S. Cleaves....	West Rindge	
Roxbury.		
Lorenzo W. Davis*....	R. 2, Keene.....	343-6 Keene
Charles A. N. Nye....	Marlboro	
Stoddard.		
C. B. McClure*.....	Munsonville	H. R. Green's store
John T. McCoy.....	South Stoddard	28-3 Hancock
Henry E. Spaulding....	Stoddard	28-11 Hancock
Sullivan.		
T. A. Hastings*.....	East Sullivan	8010 or 6-2
Frank L. Fifield.....	East Sullivan	
E. F. Nims.....	Sullivan Center	1-11 Sullivan
Surry		
A. E. Salley*.....	Surry	342-21 Keene
S. H. Clement.....	Keene	344-13 Keene
Frank E. Ellis.....	R. 1, Keene.....	352-12 Keene
Leon A. Hodgkins....	Surry	

Name.	P. O. Address.	Telephone.
Swansey.		
Walter F. Oakman*.....	West Swansey	
Leonard A. Newell.....	East Swansey	
Amasa A. Marsh.....	Westport	
Troy.		
Asa C. Dort*.....	Troy	1-4 Keene
Frank Despres	Troy	
Oliver P. Whitcomb....	Troy	561-2
Walpole.		
W. D. Knowlton*.....	Walpole	10-12
John Dufficy	14 West St., N. Walpole	
Westmoreland.		
George A. Johnston*...	East Westmoreland	
A. S. Chickering.....	Westmoreland Depot...	76-4 Brattleboro, Vt.
Edward C. Greene.....	Westmoreland	
William E. Lawrence...	Westmoreland Depot...	Pay Station,
A. Harley Rodgers.....	Westmoreland Depot...	East Westmoreland
George A. Capron.....	Westmoreland	641-14 Westmoreland
Winchester.		
Orvel B. Peirce*.....	Winchester	62-14 or 15-2 Winchester
Alexander Pierce	Winchester	37-3 Winchester
Paul Tacy	Box 105, Ashuelot	
A. S. Willard	Winchester	47-2
A. P. Read.....	Winchester, R. D...	785-12
R. W. Johnson.....	Winchester	54-4
Frank H. Lombard.....	Winchester	8-5 Winchester
Guy C. Hawkins.....	Winchester	89-3
<hr/> COOS COUNTY. <hr/>		
Berlin.		
Wilfred Hodgdon*	Berlin	227-2
Joseph Durant	Berlin	
Harry L. Marston.....	Berlin	163-3
R. H. Nicholson.....	Maynesboro Stock Farm, Berlin	57-3 M. Stock Farm
W. D. Goodwin.....	Cascades	129-5 Berlin
Carroll.		
John Paige*	Twin Mountain	51-5 Whitefield
Manson G. Hunt.....	Whitefield	
George Howland	Crawford's	9017-2
Clarksville.		
W. W. Young*.....	Beecher's Falls, Vt....	64-5
Roy J. Young.....	Clarksville	55-11
Fred Hall	Pittsburg	59-5 West Stewartstown
Colebrook.		
L. M. Lombard*.....	Colebrook	15-4 Colebrook
Columbia.		
John Gray*	Colebrook	22-21 Colebrook
Eugene Jordan	R. 2, Box 58, North Stratford	

Name.	P. O. Address.	Telephone.
Dalton.		
W. B. Aldrich*.....	R. 2, Lancaster.....	55-2 Whitefield
F. B. Tillotson.....	Whitefield	54-4 Whitefield
J. M. Atkins.....	Whitefield	54-2 Whitefield
Frank G. Carpenter....	Littleton	115-5 Littleton
Dummer.		
W. G. Wentworth*.....	Milan	
H. S. Lockhart.....	West Milan	16-24 Groveton
Errol.		
F. B. Brooks*.....	Errol	Umbagog House
Dwight C. Thurston....	Errol	20 Farmers
James Bunnell	Errol	
Gorham.		
W. J. Perkins*.....	Gorham, Box 230.....	36-23
Eugene Beaudette	Gorham	10-2 Gorham
W. D. Goodwin.....	Cascades	129-5 Berlin
Jefferson.		
W. B. Paschal*.....	Bennett's Landing	9-13 Jefferson
Levi C. King.....	R. 1, Whitefield	
Lancaster.		
O. E. Wentworth*.....	Lancaster	112-12
J. E. McIntire.....	Lancaster	77-3 Lancaster
Fred Williams	Lancaster	
N. P. Coe.....	Lancaster, 33 Main St.	
Milan.		
D. A. Stevens*.....	Milan	
L. A. Bickford.....	Milan	10-12 Milan
H. S. Lockhart.....	West Milan	16-24 Groveton
Northumberland.		
D. O. Ellingwood*.....	Groveton	
H. P. Locke.....	Northumberland	10-22 Groveton Ex.
George Cummings	R. D., Lancaster	
Pittsburg.		
W. N. Judd*.....	Pittsburg	59-21
Allen Farnham	Pittsburg	57-12 W. Stewartstown
Horace Wright	Pittsburg	52-15 W. Stewartstown
Thomas Schedule	Care S. S. Lockyer,	
Joseph Robinson	Berlin Mills Co.,	
Sam Couture	Berlin, N. H.	
George A. Anderson....	Care Berlin Mills Co.,	
	Berlin	
W. S. Stowell.....	Wilson's Mills, Me.	
Randolph.		
F. C. Wood*.....	Randolph	R. R. Sta., Randolph
T. S. Lowe.....	Randolph	16-2 Gorham
Shelburne.		
James Simpson*	Shelburne	49-14 Gorham
Seymour C. McAllister.	Shelburne	49-11 Gorham
C. D. Peabody.....	Shelburne	48-2 Gorham
H. C. McKeen.....	Shelburne	49-14 Gorham
Neil McLean	Shelburne	49-13 Gorham

Name.	P. O. Address.	Telephone.
Stark.		
J. W. Emery*.....	Stark	32-3
Albert M. Emery.....	Groveton, Box 56.....	16-43 Groveton
L. A. Jackson.....	Crystal	
Stewartstown.		
George H. Carr*.....	R. 3, Colebrook	16-12
William Hall	R. 4, Colebrook.....	54-5
H. S. Little.....	Colebrook	37-221
Israel Dearth	Beecher Falls, Vt.....	64-12
Urban S. Tyrrell.....	Beecher Falls, Vt.	
Claude D. Knights.....	Colebrook	19-3
Stratford.		
W. H. Kimball*.....	Stratford	Stratford Hollow
William Hapgood	North Stratford	24-11 North Stratford
Wentworth's Location.		
J. R. Turner*.....	Wentworth's Location.	9011-15
Whitefield.		
C. N. Canton*.....	Whitefield	28-3 Whitefield
Vernon E. Samson.....	Whitefield	59-6 Whitefield
B. C. Goodwin.....	Whitefield	58-5 Whitefield
UNINCORPORATED PLACES.		
COOS COUNTY.		
Bean's Purchase.		
W. H. Morrison*.....	Gorham	Gorham
E. C. Frost.....	Glen House, Gorham...	47-4 Gorham
Cambridge.		
Ira C. Beecher*.....	Errol	Errol 9011-12
Crawford's Purchase.		
P. J. Martin*.....	Bretton Woods	
George Miglierini	Bretton Woods	
Dartmouth College Grant.		
D. T. Wentworth*.....	Gorham	27
James Cilley	Wentworth's Location.	
Dixville.		
W. H. Noyes*.....	Dixville Notch	
Hadley's Purchase.		
F. P. Allard*.....	North Conway	
George S. Chesley.....	Bartlett	18-12 North Conway
Kilkenny.		
George A. Webster*....	Lancaster	73-5 Lancaster
Millsfield.		
A. L. Bowker*.....	Errol	5-41 Colebrook Ex.

Name.	P. O. Address.	Telephone.
	Odell.	
M. J. Hayes*.....	Groveton	
	Success.	
O. S. Bean*.....	89 Church St., Berlin..	92-3 Berlin
Joseph Durant	Berlin	

GRAFTON COUNTY.

Alexandria.

H. L. Phillips*.....	R. D., Bristol.....	11-11
John H. Austin.....	R. D., Bristol	
Alvah E. McMurphy..	R. 1, Bristol.....	79-21

Ashland.

L. G. Fifield*.....	Ashland	133-2 Ashland
William F. Timlin.....	Ashland	20-4 Ashland

Bath.

Henry S. Lang*.....	Bath	112-4 Woodsville
Stephen J. Burton.....	Woodsville	112-24 Woodsville

Benton.

L. H. Parker*.....	R. 2, Woodsville.....	4-6 Wildwood Line
F. M. Tyler.....	Benton	
E. A. Marden.....	Benton	
George Fillian	East Haverhill	7-13 Pike
W. W. Eastman.....	Benton	16-4 Pike

Bethlehem.

William A. Green*.....	Bethlehem	14-4 Bethlehem
W. S. Phillips.....	R. D., Littleton.....	16-2 Bethlehem

Bridgewater.

David T. Atwood*.....	Plymouth	30-4 Ashland
W. W. Gilpatric.....	Plymouth	

Bristol.

Clarence N. Merrill*....	Bristol	6-11 Bristol
Clarence A. Smith.....	Bristol	3-4 Work, 15-22 Res.

Campton.

Lewis F. Avery*.....	West Campton	
Fred E. Pulsifer.....	Plymouth	9-23 Plymouth
L. W. Palmer.....	Plymouth	139-14 Plymouth

Canaan.

A. W. Hutchinson*.....	Canaan	29-3
Ralph Dodge	Canaan	
Wallace G. Fogg.....	West Canaan	
Allie Green	Canaan	24-14 Canaan
Eugene A. Shepard....	Canaan Center	
Ira B. Stevens.....	Canaan	16-11

Name.	P. O. Address.	Telephone.
Dorchester.		
George W. Rowen*.....	Cheever	
Henry M. Merrill.....	Dorchester	
Herbert H. Ashley.....	Cheever	
George N. Burnham....	North Dorchester	
Easton.		
C. A. Young*.....	Easton	12-22 Franconia
Albert P. Lane.....	Easton	
Ellsworth.		
Asa Batchelder*	Ellsworth	10-21 Campton
Enfield.		
Joseph Pillsbury*	Enfield	17-11 Enfield
I. D. Fogg.....	Mascoma	54-4
A. B. Gordon.....	Enfield	11-11 Enfield
Franconia.		
E. B. Parker*.....	Franconia	28-4 Franconia
W. P. Wakefield.....	Profile House	Profile House
A. Raymond Bowles....	Franconia	125-4 Franconia
Grafton.		
Fred Gage*	Grafton	8057-13 Canaan
George S. Barney.....	R. 2, Canaan	
Frank Sargent	Canaan	32-31 Canaan
Henry Otis	R. 1, Grafton	
Groton.		
Charles A. Davis*.....	North Groton	22-11 Rumney
Hanover.		
H. W. Barnes*.....	East Lyme	
H. B. Fullington.....	Hanover	38-Y. N. E.
A. D. Storrs.....	Hanover	
Haverhill.		
George A. Wells*.....	Haverhill	108-22 Pike
Clarence L. Willis.....	North Haverhill	111-3 Woodsville
Frank Keith	R. 2, Pike.....	15-2 Pike
Hebron.		
Harry S. Morgan*.....	Hebron	
Walter R. Merrill.....	East Hebron	
Oscar Roby	Hebron	
Holderness.		
Charles A. Haskell*....	Holderness	13-11 Ashland
O. M. Pratt.....	R. 4, Plymouth.....	53-21 Plymouth
John H. Evans.....	R. 4, Plymouth.....	54-4 Plymouth
Frank L. Piper.....	R. D., Ashland.....	150-11 Ashland
Landaff.		
C. M. Gale*.....	R. 2, Lisbon.....	42-3 Lisbon
Burt J. Carleton.....	Lisbon	49-2 Lisbon
Austin J. Hall.....	R. 2, Woodsville	

Name.	P. O. Address.	Telephone.
Lebanon.		
Eugene B. Gerrish*....	Lebanon	10-21 Lebanon
Israel D. Fogg.....	Mascoma	54-4
Thomas J. McNamara..	West Lebanon	65-3
H. J. Taylor.....	Lebanon	11-18
Lincoln.		
E. S. Atwood*.....	Lincoln	16-2 North Woodstock
Lisbon.		
D. C. Dexter*.....	Sugar Hill	116-3 Lisbon
Fred R. Ash.....	Littleton	45-14 Lisbon
Walter Jesseman.....	Lisbon	49-5 Lisbon
Harry H. Young.....	Franconia	15-4 Franconia
Littleton.		
Fred A. Dodge*.....	Littleton	110
Joseph Morse	East Littleton	114-13
G. O. Carpenter.....	North Littleton	168-13 Littleton
Frank Weller	Littleton	161-3
H. H. Samson	230 Main St., Littleton	177-2 Littleton
James Hartwell	Littleton	125-13
F. A. Williams.....	Littleton, R. F. D.....	101-2
Livermore.		
James C. Donahue*....	Livermore	2 Livermore
Lyman.		
Ai F. Parker*.....	R. D., Lisbon.....	41-41 Lisbon
C. E. Mason.....	R. 1, Lisbon	
Lyme.		
George A. Pushee*....	Lyme Center	5-5 Fairlee, Vt.
Arthur E. Derby.....	Lyme Center	
Henry S. Pushee.....	Lyme	73-10 Lyme
Monroe.		
Oscar Frazer*	Monroe	36-11 Barnet, Vt.
Hugh Nelson	Monroe	7-12 Barnet, Vt.
Orange.		
Charles H. Ford*.....	R. 2, Canaan.....	8-13
John Peterson	Grafton	
Orford.		
C. L. Cushman*.....	Orfordville	18-4 Fairlee, Vt.
Warren Chase	R. 1, Pike	
John Stickney	Piermont	4-4 Piermont
Charles E. Brock.....	Orford	13-210 Fairlee, Vt.
Piermont.		
George L. Webster*...:	Piermont	15-2 Piermont
Fay S. Emery.....	Piermont	4-110 Piermont
Gedeon Lamontague....	Piermont	4-310 Piermont
George Maker	Pike	17-2
Plymouth.		
L. D. Fogg*.....	Plymouth	209-12 Plymouth

Name.	P. O. Address.	Telephone.
Rumney.		
W. W. Downing*.....	Rumney	29-21 Rumney
George C. Silsby.....	Rumney	28-2 Rumney
Arthur G. Wright.....	Quincy	5-14 Rumney
Thornton.		
Frank L. Houston*.....	R. D., Campton.....	5-24 Campton
L. W. Bradley.....	Woodstock	32-22 North Woodstock
William Lyford.....	Campton	23-4 Campton
Warren.		
Frank B. Little*.....	Warren	
Harry A. Fifield.....	Warren	
Edmund N. Morrill....	Warren	5-11 Warren
Waterville.		
Joseph L. Tuttle*.....	Waterville	22-2 Campton
Wentworth.		
Freeman B. Ellsworth*.	Wentworth	Davis' Store
Lester C. Hutchins....	West Rumney	18-12 Rumney
Woodstock.		
E. E. Woodbury*.....	Woodstock	14-2 North Woodstock
George F. Gordon.....	North Woodstock	8-22 North Woodstock
J. A. Kendall.....	West Thornton	24-11 Campton

HILLSBOROUGH COUNTY.

Amherst.		
W. W. Sloan*.....	Amherst	51-3 Milford
Antrim.		
Charles D. White*.....	Antrim	12-13
Morris Burnham	Antrim	3-3 Antrim
Bedford.		
Arthur N. Hodgman*...	Bedford	4-4 Bedford
Ira Barr	Bedford	
John Sargent	R. 2, Manchester.....	4-6 Bedford
Bennington.		
Henry W. Wilson*.....	Bennington	16-13 Antrim
J. H. Balch.....	Antrim	17-11 Antrim
Herbert A. Curtis.....	R. 2, Antrim	
Henry A. George.....	Box 47, Bennington	
T. B. Griswold.....	Bennington	
Brookline.		
Harry Marshall*	Brookline	
O. D. Fessenden.....	Brookline	35-2 Townsend, Mass.
Deering.		
Harry D. Locke*.....	Main St., Deering....	42-2 Hillsboro
Edward W. Colburn...	West Deering	
Arthur O. Ellsworth...	Deering Center	
John F. Leverin.....	North Weare	

Name.	P. O. Address.	Telephone.
Francestown.		
George R. Smith*.....	Francestown	
Fred H. Epps.....	Francestown	16-6 New Boston
Fred A. Pettee.....	Francestown	29-14 Francestown
Fred W. Perham.....	Francestown	29-22 Francestown
Leon E. Hoyt.....	Francestown	
Goffstown.		
George L. Eaton*.....	Grasmere	14-25
Greenfield.		
Fred J. Aiken*.....	Greenfield	13-3 Greenfield
George Blanchard	R. D., Lyndeboro	
Daniel O. Flynn.....	Greenfield	
Page A. Lowe.....	South Lyndeboro	
Ed. Trufaut	Greenfield	5-15 Greenfield
Greenville.		
Victor L. Parker*.....	Greenville	20 Greenville
Luman E. Metcalf.....	Box 183, Greenville...	41-2 Greenville
William H. Doonan....	Greenville	35-11
Hancock.		
E. L. Adams*.....	Hancock	
Charles A. Sheldon....	R. D., Hancock.....	9-2
Alvah M. Wood.....	Hancock	16-4
Hillsboro.		
Dana R. Bruce*.....	Hillsboro, L. Village..	4-31 Hillsboro U. Vil.
Fred B. Monroe.....	Hillsboro	47-13
Albert J. Burnham....	Hillsboro, U. Village..	5-12
Thomas Devoy	Hillsboro	
Hollis.		
Lester J. Hayden*.....	R. D., Brookline.....	4-23
R. W. Leslie.....	East Pepperell, Mass..	7-2 Hollis
George F. Hills.....	Hollis	11-12
W. N. Hayden.....	R. D., Nashua.....	557-21 Nashua
Hudson.		
James E. Merrill*.....	Hudson	333-W Nashua
Philip J. Connell.....	Hudson	1575-X Nashua
Litchfield		
I. N. Center*.....	R. D., Hudson.....	12-3 Merrimack
Walter A. Crowell.....	R. 3, Manchester	12-2 Merrimack
Fred McQuesten	R. 1, Hudson	551-24 Nashua
Robert L. Barnes.....	R. 1, Hudson	
John A. Reid.....	R. 5, Manchester	22-3 Merrimack
Herbert C. Leach.....	R. 1, Hudson	12-21 Merrimack
Lyndeboro.		
E. K. Warren*.....	Lyndeboro	16-2 Wilton
Charles L. Perham....	R. D., So. Lyndeboro.	18-3 Wilton
Manchester.		
Carl B. Thurber*.....	Keystone Press, Cor. Manchester & Chest- nut Sts., Manchester	2220 office, or Hose Co. No. 5 house

Name.	P. O. Address.	Telephone.
John A. Connelly.....	225 Grove St., Manchester	8051-4
John W. Gott.....	95 Douglas St., West Manchester	1481
John H. Hamer.....	Vol. Fire Co., Amoskeag	838-W
Harvey Stowe.....	Auburn	2150
Albert L. Worthen.....	1005 Cilley Rd., Manchester	373
Charles E. Longa.....	10 North Adams St., Manchester	2684-J
Mason.		
John T. Smith*.....	Mason	25-7 Greenville
James O. Reed.....	Mason	24-5 Greenville
Clarence H. Reynolds..	Mason	25-8 Greenville
George C. Arnold.....	Greenville	11-14 Greenville
Stanley A. Flagg.....	Mason	13-31 Greenville
Merrimack.		
Arthur G. Gordon*.....	Reed's Ferry	Mill 16-2, Home 8-14
Charles H. Fields.....	Reed's Ferry	13-31 Merrimack
George W. Carroll.....	Reed's Ferry	8-2 Merrimack
Osgood F. Upham.....	Merrimack	25 Merrimack
Charles F. Young.....	R. D., Reed's Ferry..	552-4 Nashua
Alden Wright	Kaolin Farm Co., R. F. D., Nashua.....	338-Y Nashua or 3-5 Merrimack
Milford.		
W. L. Winslow*.....	Milford	152-2
Fred A. Conrey.....	Milford	32-11
Fred Jones	Milford	35-24 Milford
Harry H. Thorp.....	Milford	52-4 Milford
Mont Vernon.		
Charles H. Raymond*..	R. D., Milford.....	113-4 Nashua
W. L. Robinson.....	Mont Vernon	37-21 Milford
Joseph H. Blood.....	Mont Vernon	156-5 Milford
Nashua.		
Charles H. Whitney*..	Nashua	112-5
Luther Robbins.....	Hollis Depot	55-7 Nashua
New Boston		
A. P. Smith*.....	New Boston	21-2 New Boston
Perley A. Todd.....	New Boston	33-3
Fred C. Brown.....	New Boston	
Arthur C. Wilson.....	New Boston	21-12
Perley D. Morris.....	New Boston	14-3
New Ipswich.		
A. E. Chase*.....	New Ipswich	
J. M. Burton.....	Temple	
Fred L. Mansfield.....	New Ipswich	18-24
Pelham.		
F. M. Woodbury*.....	Pelham	
Peterborough.		
T. E. Driscoll*.....	Peterborough	101-2
Fred S. Gilchrist.....	Peterborough	122-13
H. O. Lane.....	Peterborough	115-3
Edward P. Vose.....	Peterborough	125-3

Name.	P. O. Address.	Telephone.
	Sharon.	
Alpha Wilson*	Peterborough	
	Temple.	
George H. Fish*	Temple	19-25 Greenville
George Wheeler	R. 2, Wilton	129-12 Peterboro
William Davidson	Temple	21-4 Greenville
	Weare.	
F. E. Cutting*	East Weare	20-31
Edwin Barnard	Riverdale	4-21 Weare
Orrin D. Dow	North Weare	12-5 Weare
C. F. Eastman	South Weare	5-31
Edwin M. Smith	East Weare	20-32 or 10-11
S. W. George	Weare	20-13
	Wilton.	
Frank L. Proctor*	Wilton	12-6 Wilton
Frank N. Gray	Wilton	10-12
W. A. Burton	Wilton	9-10
Stanley H. Abbott	Wilton	2-2
George W. Perham	Wilton	7-15 Wilton
George S. Proctor	Wilton	3-3 Wilton
Orville H. Frye	Wilton	1-16 Wilton
	Windsor.	
J. R. Nelson*	Hillsboro U. Village... 9-24 H. U. V.	

MERRIMACK CO.

Allenstown.

A. W. Gilbert*	Suncook	63-12
George Dowst	Suncook	9-13 Chichester
Henry W. Billings	Suncook	33-21 Suncook

Andover.

Dennis E. Fenton*	Andover	19-3
Ara M. Lovering	East Andover	
Eli D. Messer	Potter Place	

Boscawen.

Samuel N. Allen*	Boscawen	10-5 Salisbury Ex.
Walter Eastman	R. 13, Penacook	
Frank B. Folsom	Boscawen	
E. A. Griffin	Boscawen	12-11 Salisbury Ex.
N. M. Flagg	Penacook	18-13 Salisbury Ex.

Bow.

Frank D. Clough*	R. 3, Concord	785-2 Concord
Harry Clough	R. 3, Concord	8-15 Dunbarton
Frank E. Woodbury	R. 4, Manchester	

Bradford.

F. H. Gillingham*	Bradford	
George W. Cofran	Bradford	
Moody Gillingham	Bradford	6-4
Fred Smith	Bradford	

Name.	P. O. Address.	Telephone.
Canterbury.		
Lowell T. Mason*.....	Canterbury	5-3 Canterbury & Bos.
Alvah H. Blake.....	Penacook	
Charles E. Morrill.....	Canterbury	4-2 Citizens
William H. Muzzey....	Canterbury	
Leroy A. Glines.....	Canterbury	16-21 Canterbury
Chichester.		
W. S. Langmaid*.....	North Chichester	16-4
Abraham L. West.....	R. 7, Concord.....	18-11 Chichester
Frank L. Winslow.....	Chichester	15-6 Chichester
Concord.		
William C. Green*.....	Warren St., Concord..	145 Cent. Fire Sta.
Levin J. Chase.....	Concord	407-W
Fred N. Dodge.....	Penacook	
Elbridge Emery	East Concord	687-5
William M. Emerson..	Concord	694-7
William H. Gay.....	Concord	
George A. Hill.....	R. 2, Concord.....	76-M
Eli Langlois, Jr.....	5 Perry Ave., Concord	1012-M
Danbury.		
E. A. Farnum*.....	Danbury	
Warren A. Powers.....	South Danbury	
W. W. Walker.....	Danbury	
Dunbarton.		
A. L. Burnham*.....	Goffstown	5-23 Dunbarton
Walter C. Walker.....	R. 2, Concord	3-14 Dunbarton
J. Charles Weatherbee.	R. 2, Concord	
P. H. Burnham.....	Dunbarton	5-15
Epsom.		
George H. Yeaton*.....	Epsom	12-3 Chichester
Albert Sherbourne	Epsom	
Harold S. Bickford....	Gossville	
Clarence O. Wells.....	Short Falls	9-31 Chichester
Franklin.		
James W. Huntoon*....	Franklin	269
Harry E. Colby.....	Franklin	373-22
John E. Cunningham..	Franklin	
Henniker.		
H. A. Tucker*.....	Henniker	8001
J. E. Marshall.....	Henniker	
W. C. Goss.....	Henniker	
H. A. Cummings.....	Henniker	7-2 Henniker
Hill.		
Clyde A. Blake*.....	Hill	341-4 Franklin
Frank R. Woodward...	Hill	345-6
Walter C. Dickinson...	Danbury	
Alson F. Foster.....	Hill	76-2 Citizens, 341-5 N.E.
Hooksett.		
Edwin A. Tyrrell*.....	Hooksett	32-3 Suncook
Orin J. Cate.....	Hooksett	
Lucius B. Morrill.....	R. 1, Manchester	

Name.	P. O. Address.	Telephone.
Hopkinton.		
W. H. Milton*.....	Contoocook	9-31
James G. Rice.....	Contoocook	7-21 Contoocook
Marl D. Chase.....	R. 1, Concord.....	689-25
George E. Patch.....	R. 1, Concord.....	691-24 Concord
Arthur J. Boutwell....	R. D., Concord.....	688-2 Concord
Loudon.		
Arthur K. Marston*...	Loudon	12-5 Citizens
Edward H. Sleeper....	Loudon	18-5 Belmont
E. P. Jenkins.....	R. 6, Concord.....	17-1½ Canterbury
Newbury.		
Mark W. Muzzey*.....	Newbury	
Chester A. Gove.....	Mount Sunapee.....	9-14 Sunapee
Moody Gillingham	Bradford	6-4 Bradford
George J. Messer.....	Blodgett's Landing....	15-3 Sunapee
Archie O. Gove.....	Mt. Sunapee	9-12 Sunapee
New London.		
Ira S. Littlefield*.....	New London	4-23
Roy E. Emery.....	Elkins	8-5
William M. Kidder.....	New London	6-3
H. C. Hoyt.....	New London	10-4
Northfield.		
Joseph F. Leary*.....	Box 1, Tilton.....	21-2
Byron Shaw	Franklin	16-2
Walter B. Hill.....	Tilton	
Everett L. Sanderson..	Tilton	
Pembroke.		
Fred M. Pettingill*....	Suncook	34-12 Suncook
Edward A. Strand.....	Pembroke	31-13 Suncook
Pittsfield.		
John H. Jenness*.....	Pittsfield	
Roy Watson	Pittsfield	
Salisbury.		
Burton F. Sanborn*....	R. 1, Andover.....	13-15
John Shaw	Salisbury	2-5
Herbert E. Webster....	Salisbury	
Sutton.		
H. L. Pillsbury*.....	North Sutton	7-2 Sutton
F. B. Johnson.....	South Sutton	1-6 Sutton
Fred A. Sawyer.....	Warner	18-4 Warner
Warner.		
Jesse M. Downes*.....	Warner	
Webster.		
J. L. Colby*.....	Webster	4-13 Salisbury
F. T. Colby.....	Webster	
A. E. French.....	Webster	20-3 Salisbury
M. J. Walker.....	Webster	

Name.	P. O. Address.	Telephone.
Wilmot.		
F. E. Goodhue*.....	Wilmot	9101-3 Franklin
J. C. Howlett.....	Wilmot Flat	
C. T. Atwood.....	South Danbury	

ROCKINGHAM CO.

Atkinson.

John H. Smith*.....	Atkinson	596-W Haverhill
Elmer E. Conley.....	Westville	41-3 Salem
C. P. Stowell.....	Westville	5-14 Plaistow

Auburn.

Fred H. Hall*.....	Auburn	10-21 Candia
George A. Palmer.....	Auburn	11-11 Candia
Harvey Stowe	Massabesic, Manchester	

Brentwood.

John E. Tuck*.....	Brentwood	21-3 Epping
Fred Rand	R. 1, Epping	
James L. Stevens.....	Exeter	

Candia.

Charles P. Robie*.....	R. 1, Manchester	
John D. Underhill.....	Candia	14-3 Candia
George V. Gage.....	East Candia	

Chester.

Farish G. Lewis*.....	Chester	6-7 Chester
James W. Towle.....	Chester	2-8
William B. Underhill..	Chester	8004-8
Walter P. Tenney.....	Chester	3-30
William T. Owen.....	Chester	
James E. McCannon...	Chester	

Danville.

Dana Lessard*	North Danville	
Lewis H. George.....	Danville	

Deerfield.

Howard P. King*.....	R. D., Raymond.....	3-13 Deerfield
Chester E. Maynard....	R. 1, Raymond.....	26-14
Otis A. Meloon.....	South Deerfield	8005-3

Derry.

John D. Blake*.....	R. 2, Derry.....	33-3
Arthur G. Low.....	Derry Village	63-3
Arthur C. Sargent.....	R. 3, Derry	
Herbert H. Kimball....	R. 3, Derry Village	
John F. Coyne.....	43 South Ave., Derry	
William Bennett	Box 134, Derry.....	42-3

East Kingston.

D. M. Evans*.....	East Kingston	
Leslie Webster	East Kingston	5-2

Epping.

James D. Whittemore*	Epping	14-4
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Name.	P. O. Address.	Telephone.
Exeter.		
George H. Carter*.....	Exeter	2-8 Exeter
G. F. Adams	34 Auburn St., Exeter	
William Peters	Exeter	500
Fremont.		
Eli N. Marcotte*.....	Fremont	5-4 Raymond
Walter H. Lyford.....	Epping	29-12
Alden F. Sanborn.....	Fremont	
Greenland.		
R. S. Moody*.....	Greenland	1078-J Portsmouth
Thornton N. Weeks....	Greenland	1079-X
Hampstead.		
John S. Corson*.....	Hampstead	1-2
Albert H. Little.....	Westville	3-13
Hampton.		
Howell M. Lamprey*...	Hampton	73-11
William S. Brown.....	Hampton	63-11
Hampton Falls.		
F. Henry Fogg*.....	Hampton Falls	
S. C. Hawes.....	R. 1, Hampton Falls..	61-4 Exeter
William A. Janvrin.....	Hampton Falls	
Kensington.		
George A. Prescott*...	Kensington	62-5
Ralph B. Fish.....	East Kingston	135-5
Bertrand Palmer	R. D., East Kingston..	139-7 Amesbury, Mass.
Kingston.		
James A. Lyford*.....	Kingston	
Albion W. Nason.....	Kingston	
Edward Kimball	Kingston	
Daniel W. Swett.....	Kingston	8-4 Kingston
Freeman L. Nason.....	R. 1. Newton.	
Frank Cavaric	Kingston	
William Carleton	Newton Jct., Box 62	
Londonderry.		
J. E. Ray*.....	Londonderry	39-5 Derry
Frank E. Avery.....	Londonderry	332-5 Nashua
Nathan P. Watts.....	Londonderry	36-24
Newcastle.		
J. O. White*.....	Newcastle	
Newfields.		
Perley R. Bean*.....	Newfields	54-22 Exeter
Harry G. Atwood.....	Newfields	54-15
William Pease	Newfields	
Newington.		
Louis C. Bean*.....	Newington	
Fred H. Winn.....	Newington	303-32

Name.	P. O. Address.	Telephone.
Newmarket.		
Matthew T. Kennedy*..	Newmarket	36-4 Newmarket
Fred A. Langley.....	Newmarket	32-12
Newton.		
George W. Rowe*.....	Newton	
Lewis E. Bailey.....	R. 1, Newton.....	10-31 Plaistow
North Hampton.		
Otis S. Brown*.....	Little Boar's Head...	35-3 Rye Beach
J. Russell Dow.....	North Hampton	8021-2 Rye Beach
Frank A. Marston.....	North Hampton	8021-2 Rye Beach
Northwood.		
Charles C. Holmes*....	Northwood	5-21 Northwood
George B. Small.....	Northwood Center	5-21 Northwood Ctr.
George M. Bartlett....	Northwood Narrows...	2-2 Northwood Ctr.
Nottingham.		
P. B. Batchelder*.....	South Lee	
A. H. Cooper.....	East Northwood	
F. L. Gove.....	R. D., Raymond	
A. W. McDaniel.....	R. D., Barrington	
T. M. Rollins.....	R. D., Raymond.....	House 7003-3, Sta. 8008-2
Plaistow.		
Fred P. Hill*.....	Plaistow	206-J
Elden C. Smart.....	R. D., Haverhill, Mass.	
Theodore Fecteau.....	Westville	5-13
Portsmouth.		
William F. Woods*....	Portsmouth	230 house, 122 work
W. P. Gray.....	52 Wibird St., Ports'th	
M. J. Lynch.....	Hanover St., Portsam'th	
Raymond.		
George E. McClure*....	Box 99, Raymond.....	34-14
Rye.		
C. D. Locke*.....	Rye	
Ernest Tucker	Portsmouth	
Salem.		
F. N. Emerson*.....	Salem Center	35-6
Charles J. Palmer, Jr..	North Salem	41-15
D. S. Bailey.....	Salem Depot	15-5 Salem
Sandown.		
James F. Sargent*.....	R. 3, Chester	2-31
G. W. Dimmock.....	R. 3, Chester	
Clarence I. Drowne....	R. 3, Chester	2-32
Seabrook.		
Frank W. Chase*.....	Seabrook	
Robert McQuillin	R. 9, Hampton Falls	
Emery M. Eaton.....	Seabrook	
South Hampton.		
C. M. Evans*.....	South Hampton	139-3
Edgar W. Wyman.....	R. 1. Amesbury, Mass.	138-6 Amesbury, Mass.

Name.	P. O. Address.	Telephone.
Stratham.		
John F. Emery*.....	Stratham	59-14
Windham.		
J. W. M. Worledge*....	Windham Center	178-31 Derry
Charles O. Parker.....	Windham Depot	
Albert W. Farmer.....	West Windham	992-23 Nashua
STRAFFORD CO.		
Barrington.		
Walter Buzzell*.....	Barrington	12-4
William H. Felker.....	R. 1, Rochester.....	2-5
L. B. Haley.....	East Barrington	11-2 Barrington
Dover.		
James Smith*	Dover	186-R
Ernest B. Folsom.....	R. 3, Dover.....	251-4
John H. Wesley.....	Dover	
L. I. Jenness.....	R. 3, Dover.....	251-22
Irving F. Wentworth..	Dover	576-W
Charles W. Rollins....	Dover	551-M
Durham.		
Karl W. Woodward*...	Durham	58-14 Newmarket
C. W. Stone.....	Durham	
Fred Langley	Durham	59-13 Newmarket
Farmington.		
C. S. Pinkham*.....	Farmington	
Arthur G. Scruton.....	R. 2, Rochester	
William V. Ware.....	Farmington	179-13 Rochester
James W. Foss.....	Rochester	223-12 Rochester
Lee.		
Benton E. Layne*.....	Dover	273-16 Dover
Ben Lang	Lee	
Madbury.		
William H. Knox*.....	Middle St., Dover.....	259-14 Dover
Arthur W. Simpson...	R. 6, Dover.....	253-12
Middleton.		
Fred L. Leighton*.....	Union	6-3 Milton Mills
Charles Knowles	Union	6-2
George S. Davis.....	Box 732, Farmington.	44-4
Sam A. Lawrence.....	Union	
Milton.		
Fred P. Jones*.....	Union	41-15
Fred B. Roberts.....	Milton	23-2
H. R. Jewett.....	Sanbornville	9-4 Milton Mills
Isaac L. Lord.....	Union	6-21 Milton Mills
F. Leroy Tripp.....	Farmington	42-15
New Durham.		
George D. Lambertson*.	New Durham	13-24 North Barnstead
F. J. Lucas.....	South Wolfeboro	
George W. Bennette...	New Durham	13-42

Name.	P. O. Address.	Telephone.
Rochester.		
John F. Nute*.....	Rochester	251-11 Residence
W. E. Horne.....	47 Chestnut St., Roches- ter	52-12 Fire Dept.
Peter McShane	20 Common St., Roches- ter	
John A. Allen.....	Rochester	159-12
C. S. Clark.....	Rochester	
Rollinsford.		
Charles E. Lord*.....	Salmon Falls	693-M
Charles Plumer	R. 2, Dover.....	252-25
Lorenzo E. Baer.....	Dover	697-M
Somersworth.		
E. H. Farley*.....	Somersworth	
Strafford.		
George P. Foss*.....	Strafford Center.....	13-14 Barrington
Martin S. Brock.....	Rochester	3-13
J. H. Perkins.....	Center Strafford	8-7
Albert M. Leighton....	Strafford	15-6 Barrington

SULLIVAN CO.

Acworth.

Weston O. Kemp*.....	East Acworth	3-11 Lempster
Guy S. Neal.....	Acworth	26-3 Alstead
B. P. Chapman.....	South Acworth	26-11

Charlestown.

G. L. Richardson*.....	Charlestown	15-3 Charlestown
H. A. Fowler.....	Charlestown	33-2 Charlestown

Claremont.

P. J. Sheridan*.....	77 Central St., Clarem't	367-W
Martin Pederson	Claremont Junction ..	76-5
Alfred Pierce	Claremont	271-Y
Arthur L. Fitch.....	Claremont	87-M

Cornish.

James B. Chadbourne*..	R. 4, Windsor, Vt.....	76-11 Windsor, Vt.
Elwin W. Quimby.....	R. 3, Windsor, Vt.....	37-11 Windsor, Vt.
Fenno B. Comings.....	R. 4, Windsor, Vt.....	45-12 Windsor, Vt.
George C. Huggins.....	Cornish Flat	274-24 Claremont
C. S. Lear.....	Cornish	231-13 Claremont
E. J. Hurley.....	Croydon Flat	16-5 Newport

Croydon.

F. W. Putnam*.....	Croydon	9-21 Croydon
E. J. Hurley.....	Croydon Flat	16-5 Newport

Goshen.

George F. Crane*.....	Goshen	2-11 Goshen
Archie O. Gove.....	Mt. Sunapee	9-12 Sunapee

Grantham.

Perley Walker*	Grantham	9-5 Croydon
E. J. Hurley.....	Croydon Flat	16-5 Newport
J. J. Gault.....	Grantham	3-21

Name.	P. O. Address.	Telephone.
Langdon.		
George H. Royce*.....	Charlestown	23-5 Alstead
Emery W. Henry.....	R. 1, Alstead.....	28-24
M. F. Bragg.....	Alstead	26-3
William Roberts	Langdon	
Lempster.		
F. A. Barton*.....	Lempster	1-2 Lempster
E. E. Hurd.....	Lempster	5-4 Lempster
A. K. Hodgman.....	East Lempster	5-2 Lempster
Newport.		
George E. Lewis*.....	Newport	203 Newport
Plainfield.		
Louis E. Shipman*.....	Cornish	156-11 Windsor, Vt.
E. J. Hurley.....	Croydon Flat	16-5 Newport
R. K. Jordan.....	Plainfield	47-21 Windsor, Vt.
Herbert Williams	Meriden	6-5 Meriden
Griswold S. Hayward..	Windsor, Vt.	129 Windsor, Vt.
Fred Smith	W. Lebanon, R. 1.....	37-11 White River Jct.
Springfield.		
Charles H. Brooks*.....	R. D., Canaan.....	12-23 Sunapee
H. C. Hoyt.....	New London	10-4 New London
Henry Patten	West Springfield	8-3
Sunapee.		
F. M. Sargent*.....	Sunapee	22-14 Sunapee
John W. Rowell.....	Sunapee	18-13
Austin W. Russell.....	George's Mills	9021-12 Sunapee
Unity.		
Orin J. Bailey*.....	Quaker City	61-12 Claremont
H. F. Wright.....	East Unity	0-23
A. Harry Anderson.....	Unity Center	72-31 Unity
Washington.		
J. W. Wood*.....	Box 54, Washington... ..	9-22 Hillsboro
W. E. Farnsworth.....	Washington	1-12 Hillsboro

LOOKOUT STATIONS AND WATCHMEN.

Name.	P. O. Address.	Telephone.
Agassiz	W. S. Phillips, R. 2, Littleton	16-2 Bethlehem
Belknap	Leon Merrill, R. D., Laconia.....	578-22 Laconia
Black (No. Dist.) Cambridge	Ralph W. Knox, R. D., Milan.....	7-3 Milan
Black (West Dist.) Benton	J. B. Hooper, R. 2, Pike	103-25 Pike
Blue Job	John M. Felker, R. 1, Box 55, Rochester....	9531-11 Rochester
Cabot	Frank Leavitt, R. D., Lancaster.....	112-14 Lancaster
Carrigain	David Murray, Livermore	31 Livermore Mills
Carter Dome	Leslie Wight, Glen House, Gorham..	47-12 Gorham
Chocorus	E. W. Lippitt, Conway	6-11 Ossipee Val.
Crotched	J. J. Sawyer, Bennington	26-2 Antrim
Croydon	George S. O'Rourke, c/o E. J. Hurley, Croydon Flat	138-13 Newport
Deer	E. C. Nash, Pittsburg.	W. Stewartstown Ex.
Israel	Clarence R. Brown, North Sandwich	14-15 Sandwich Ctr.
Kearsarge (North)....	W. H. Seavey, Kearsarge	12-31 North Conway
Kearsarge (South)	Otto W. Davis, Wilmot Flat	3-41 New London
Magalloway	Herbert Higgins, Pittsburg	52-6 W. Stewartstown
Monadnock	Ernest J. Harling, Jaffrey	8046-2 East Jaffrey
Osceola	Charles O. Brewster, Waterville	22-5 Campton
Pawtuckaway	True M. Rollins, Box 118, Raymond....	On Mt. 8008-2 Deerfield, Watchman Hse 7008-3 Deerfield
Pine	John Sanborn, Gorham	16-41 Gorham
Pitcher	Fred R. Jennings, Stoddard	8028-13 Hancock
Rosebrook	T. E. Moran, Fabyan..	Bretton Woods Ex.
Signal	F. G. Jipson, Errol...	5-7 Colebrook
Smart's	E. B. Tewksbury, Lyme Center	5-12 Lyme
Stinson	Fred R. Ford, Rumney	7-2 Rumney
Sugar Loaf	John Ryan, c/o Odell Mfg. Co., Groveton	Odell Office, Groveton
Uncanoonuc	George E. Flanders, Goffstown	4-3 Goffstown

STATEMENT OF EXPENDITURES.

(From September 1, 1914, to August 31, 1916.)

I. Year Ending August 31, 1915.

The appropriation from September 1, 1914, to August 31, 1915, was divided into fifteen accounts:

1. State forester, salary.....	\$2,500.00
Unexpended balance	0.00
Total appropriation	<u>\$2,500.00</u>
2. Field assistance, salaries	\$1,500.00
Unexpended balance	0.00
Total appropriation	<u>\$1,500.00</u>
3. Clerks, salaries	\$1,799.95
Unexpended balance .....	.05
Total appropriation	<u>\$1,800.00</u>
4. State forester and assistants, travelling ex- penses	\$999.96
Unexpended balance .....	.04
Total appropriation	<u>\$1,000.00</u>
5. Salary and expenses of four district chiefs, employed six months	\$3,729.24
Unexpended balance	170.76
Total appropriation	<u>\$3,900.00</u>
6. Incidentals	\$1,490.64
Unexpended balance	11.36
Deposit—sale of pamphlet cases	\$1,502.00
	2.00
Total appropriation	<u>\$1,500.00</u>
7. Printing blanks	\$698.30
Unexpended balance	101.70
Total appropriation	<u>\$800.00</u>

8. Printing biennial report	\$417.48
Unexpended balance	82.52
	<hr/>
Total appropriation	\$500.00
	<hr/> <hr/>
9. Reimbursing towns for fighting forest fires ...	\$7,500.00
Unexpended balance	0.00
	<hr/>
Total appropriation	\$7,500.00
	<hr/> <hr/>
10. State forest nursery:	
Expense of operation	\$2,200.86
Sale of nursery stock	1,700.86
	<hr/>
Total appropriation	\$500.00
	<hr/> <hr/>
11. Mountain lookout stations	\$5,000.00
Unexpended balance	0.00
	<hr/>
Total appropriation	\$5,000.00
	<hr/> <hr/>
12. Forest fire warden conferences	\$725.64
Unexpended balance	274.36
	<hr/>
Total appropriation	\$1,000.00
	<hr/> <hr/>
13. Forest fire prevention	\$2,500.00
Unexpended balance	0.00
	<hr/>
Total appropriation	\$2,500.00
	<hr/> <hr/>
14. Acquisition and care of state land	\$3,113.63
Unexpended balance	1,886.37
	<hr/>
Total appropriation	\$5,000.00
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15. Suppression of chestnut bark disease	\$498.20
Unexpended balance	1.80
	<hr/>
Total appropriation	\$500.00
	<hr/> <hr/>

II. Year Ending August 31, 1916.

The appropriation from September 1, 1915, to August 31, 1916, was divided into fourteen accounts:

1. State forester, salary	\$2,500.00
Unexpended balance	0.00
Total appropriation	<u>\$2,500.00</u>
2. Field assistance, salaries	\$1,799.53
Unexpended balance .....	.47
Total appropriation	<u>\$1,800.00</u>
3. Clerks, salaries	\$1,799.98
Unexpended balance .....	.02
Total appropriation	<u>\$1,800.00</u>
4. State forester and assistants, travelling expenses	\$1,000.00
Unexpended balance	0.00
Total appropriation	<u>\$1,000.00</u>
5. Salaries and expenses of four district chiefs, employed six months	\$3,899.51
Unexpended balance .....	.49
Total appropriation	<u>\$3,900.00</u>
6. Incidentals	\$1,499.78
Unexpended balance .....	.22
Total appropriation	<u>\$1,500.00</u>
7. Printing blanks	\$798.31
Unexpended balance	1.69
Total appropriation	<u>\$800.00</u>
8. Reimbursing towns for fighting forest fires....	\$2,928.60
Unexpended balance	4,571.40
Total appropriation	<u>\$7,500.00</u>

9. State forest nursery :	
Expense of operation	\$2,412.30
Sale of nursery stock	1,412.30
	<hr/>
Total appropriation	\$1,000.00
	<hr/> <hr/>
10. Mountain lookout stations	\$6,000.00
Unexpended balance	0.00
	<hr/>
Total appropriation	\$6,000.00
	<hr/> <hr/>
11. Forest fire warden conferences	\$510.61
Unexpended balance	489.39
	<hr/>
Total appropriation	\$1,000.00
	<hr/> <hr/>
12. Forest fire prevention	\$2,500.00
Unexpended balance	0.00
	<hr/>
Total appropriation	\$2,500.00
	<hr/> <hr/>
13. Acquisition and care of state land.....	\$5,000.00
Unexpended balance	0.00
	<hr/>
Total appropriation	\$5,000.00
	<hr/> <hr/>
14. Reforestation	\$2,500.00
Unexpended balance	0.00
	<hr/>
Total appropriation	\$2,500.00
	<hr/> <hr/>
III. Special Funds.	
1. Reimbursing towns for balance due on account of fighting forest fires for year ending August 31, 1913	\$9,686.53
Unexpended balance	313.47
	<hr/>
Total appropriation	\$10,000.00
	<hr/> <hr/>
2. Suppression of white pine blister rust.....	\$196.91
Unexpended balance	203.09
	<hr/>
Total allotment from contingent fund of Governor and Council	\$400.00
	<hr/> <hr/>