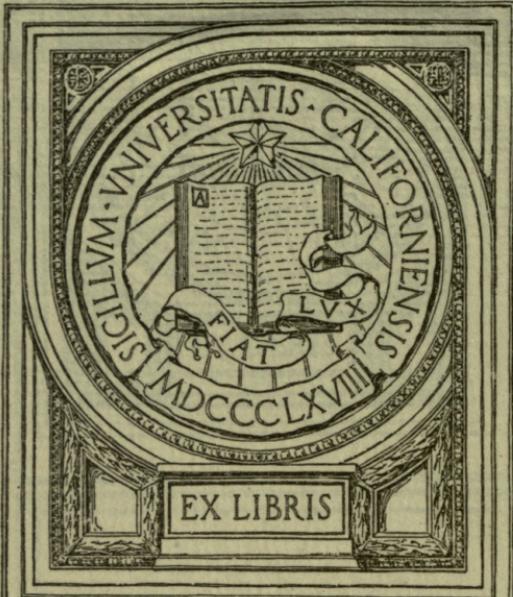
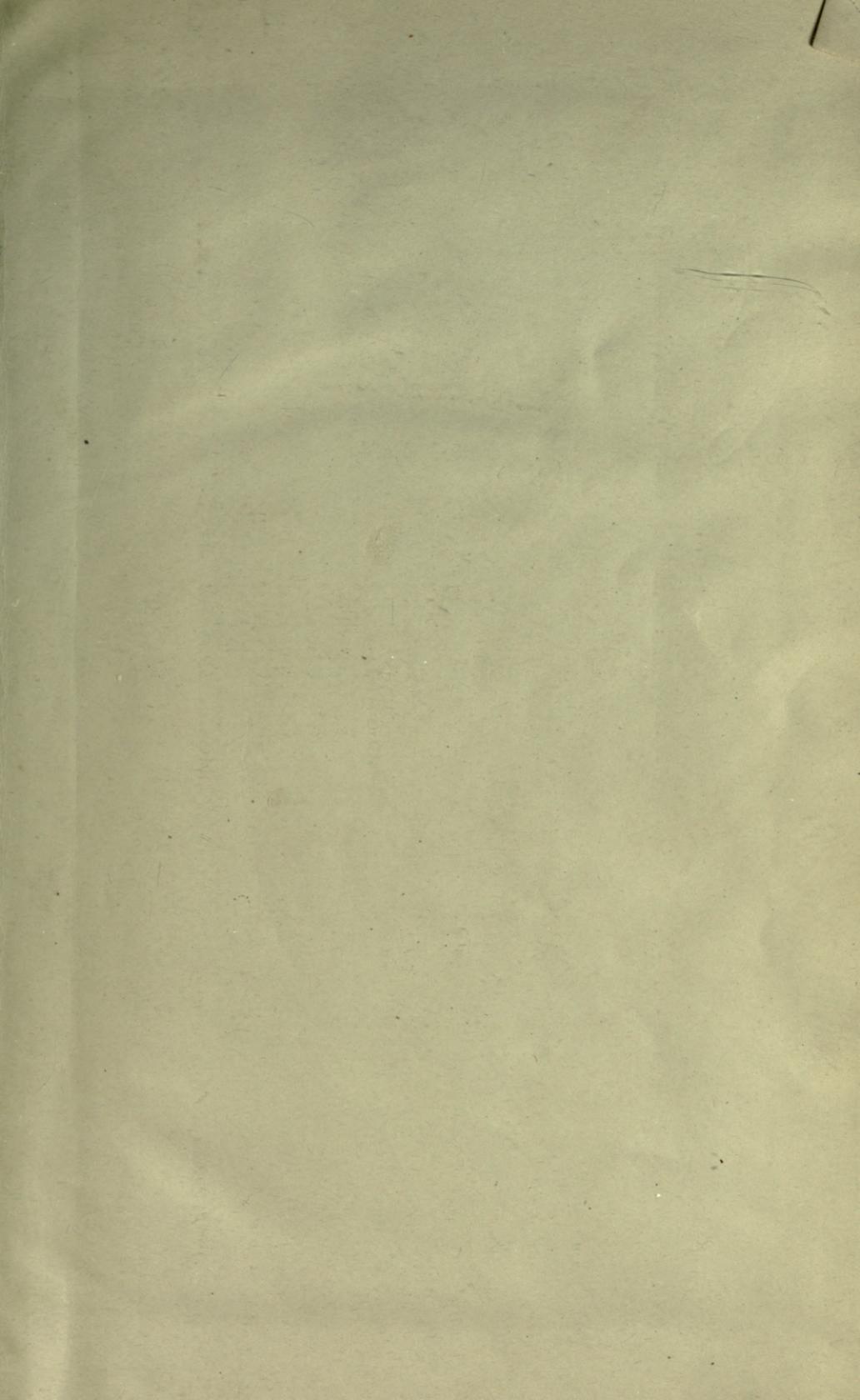


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PENNSYLVANIA FORESTRY PAMPHLETS

VOL. II

- Forest Fires. Experience with Evergreens in Pennsylvania. Bulletin No. 23, Pennsylvania State College Agri. Experiment Station.
- nc*
- Reports of the Secretary of Agriculture, Economic Zoologist, Commissioner of Forestry, Dairy and Food Commissioner and State Veterinarian Department of Agriculture, Bulletin No. 20.
- nc*
- Preliminary Report of the Commissioner of Forestry for 1896. By J. T. Rothrock. *nc*
- Gov. 12-1871*
- Division of Forestry, 1900.
- Pennsylvania Laws relating to the Department of Forestry, Forestry Reservations, Timber Lands, *nc* Roadside Trees, etc. 1901.
- Propagation of Forest Trees having Commercial Value and Adapted to Pennsylvania. By George H. Wirt. 1902
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- Some Aspects of the Forestry Problem. From the Report of the Secretary of the Board of Agriculture. By Dr. J. T. Rothrock. *nc*
- Proceedings of the First Convention of Pennsylvania Foresters. Department of Forestry.
- nc*
- Wood-Using Industries of Pennsylvania. Bulletin No. 9, Department of Forestry.

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Forest Trees. Experience with Evergreens in Pennsylvania. Bulletin No. 28. Pennsylvania State College Agri. Experiment Station.

Reports of the Secretary of Agriculture, Economic Zoologist, Commissioner of Forestry, Dairy and Food Commissioner and State Veterinarian Department of Agriculture, Bulletin No. 29.

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Division of Forestry, 1900
Pennsylvania laws relating to the Department of Forestry, Forestry Reservations, Timber Land Reservations, etc. 1901.

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Pa. Dept. of Agri., Bul. 34, 1898

~~DIVISION OF ECONOMIC ZOOLOGY.~~

Walter Mulford

See next page

The fire which destroyed the State Capitol was disastrous for this division of the Department of Agriculture, and its chief, Dr. B. H. Warren, lost a portion of his private library, note books and statistics which had been collected with considerable labor during the preceding year.

Dr. Warren reports that during the past year he received 357 specimens (embracing 39 species), of insects, which were sent by farmers and others for identification; in addition to these, his report states that 78 specimens of birds, of 45 different species, were sent in and identified by the division.

Considerable attention has been paid to the collection of data and information relative to wild animals destroyed by forest fires, and to the loss by the destruction of birds and their nests by the same agency.

The attention of Dr. Warren having been called to the increase in the amount of bounties paid by different counties in the State, he has collected, and will embrace in his annual report, a large amount of statistics relating to this economic question so little understood, and to the too often foolish payment of money in the form of bounties for animals and birds which in reality are the friends of the farmer, and which should be preserved in order to retain that balance of power which nature has established between the crops and their insect enemies, and which is so often disturbed, to the great loss of the agriculturist, by the destruction of insect-eating birds.

In the line of special investigations the force of the division has been directed to the following topics:

1. Field mice and best methods for their destruction.
2. Grasshoppers, and how to get rid of them.
3. Lice and other insects which annoy cattle.
4. The English sparrow and its relation to agricultural interests.
5. Currant, grape and gooseberry destroying insects.
6. The wheat weevil and wheat midge.

In the investigation into the habits of the English sparrow and its effects upon agricultural interests, a large number of circular letters of inquiry have been sent out and replies received from farmers and others interested. The Zoologist and his assistants have made a number of examinations of the stomachs and other organs of this sparrow, and have, in this manner, been furnished with evidence as to the character of its food and the effect which it, either directly or indirectly, exercises upon the agricultural interests of the State.

FORESTRY DIVISION.

The Forestry Division, under the energetic leadership of Dr. Rothrock, has, within but little more than two years, taken a position well towards the front of all states which have by legislative action shown an interest in matters relating to forestry, and, if the balance sheet is to be made up from laws actually upon the statute books, it is a question whether Pennsylvania does not occupy the foremost position in all questions which relate to the preservation of her forests and the reforestation of her cleared lands.

When this division was created, it had entirely new ground to operate upon, as the citizens of our State had not had the subject of forestry brought before them except in a spasmodic manner, by which but little real good was accomplished. Many had the idea that any move in the interest of the preservation of our forests or for the reforestation of denuded areas must necessarily conflict with the pecuniary interests of the owners of these areas, and that the systematic preservation of our forests meant the prohibition of the cutting of timber by their rightful owners.

Commencing thus upon really negative ground, Dr. Rothrock has changed this view not only among the owners of timber lands, but also among members of our Legislature until it is generally understood that the interests of the State as to forests need not in any manner conflict with the interests of the owners. It is a conspicuous fact that thus far, in the already large collection of laws relating, directly or indirectly, to the interests of forestry, there is not a single provision to be found which is not in the interest of the forest owners as well as the State. It is true that at first glance it may seem that some of the provisions of laws enacted by the last Legislature appear to react against the interests of the owner, but a careful examination and the results of the future, will clearly show that this is not the case.

Recognizing the fact that the greatest enemy to reforestation has been the forest fire, the Department has used its best efforts to educate the people up to a true understanding of the question, and to show them that the theory that railroads are the main causes of these losses is not correct, but that careless hunters, boys and similar preventable causes, create more loss than do locomotives and all other causes combined.

Two acts bearing directly upon this phase of the question were made laws during the session of 1897. One makes it the duty of constables to act as fire-wardens, and the other increases the responsibility of county commissioners, in the same direction, and it is believed that, coupled with a healthy and correct public sentiment, that both of these measures will decrease our annual losses from forest fires.

Another step in the same direction was secured by the passage of the act which authorizes all peace officers to arrest, without warrant, such persons as may be guilty, either through carelessness or design, of causing fires in forest areas. It is true that by some, this step is regarded as dangerous and possibly not warranted by custom or precedent, yet it is believed that it will, when supplemented by other legislation, effect much good.

An act was drafted by this division providing that all unseated lands and lands sold for taxes should become the property of the State for the formation of forest reservations, which shall assist in the protection of the headwaters of our streams and water courses, the theory being that as now situated they are totally unproductive and that, under the provisions of the act, they will not only in time become productive, but will also materially assist in the restoration of the balance required by physical laws which have too long been violated.

The Forestry Division, assisted by the Department and its other sub-divisions, has also secured the enactment of a law which partially relieves forest lands from taxation and which, in a similar manner, encourages the intelligent care of cleared lands by which the growth of valuable timber is encouraged and rendered possible.

The passage of the act of May 25, 1897, probably constitutes the greatest achievement of the Department in the direction of forest protection and water supplies. It was at first met with strong opposition because its merits and intentions were misunderstood, but after it had been thoroughly explained to our people through the medium of farmers' institutes and to the Legislature through its proper committees, nearly all opposition was removed, and it is safe to state that appropriations and investments made by the State, under the provisions of this act, will prove to the citizens of the future the most profitable investment that could have possibly been made, and, as its operations are founded upon one of the most solid of all theories relating to the interests under the care of the Forestry Division, it is not too much to say that, if properly supported by subsequent legislation, our State will soon take the foremost position with her forest reservations and the protection of her water supplies; and it is, indeed, fortunate that the location of the head waters of our main streams is such that three reservations, if of sufficient size, will effect the same results that would require many smaller ones in other states.

In bringing the subjects under his care to the attention of the public and especially to that portion most deeply interested in agriculture, the Commissioner of Forestry has had a powerful aid in the extensive series of farmers' institutes which have been held in every county of the State during the past three years, and he has made use of this potential influence for good by delivering more than fifty illustrated lec-

tures in various portions of the States, and others in surrounding states where his services have been asked, and it is needless to add that these lectures have had much to do with forming public opinion into such a condition that has rendered the legislation above alluded to not only possible, but also popular.

The destruction of the special report of this division by the burning of the State Capitol was a misfortune, but the almost unanimous passage of an act of the Legislature for reprinting it, furnished but another proof of the fact that an unusual and lasting interest has been awakened in our State on this subject.

The special report of Dr. Rothrock shows that the division has over 1,500 practical correspondents, and that a large number of blanks have been sent out asking for information relative to the amount of timber which has been cut during the year, the condition and value of that left standing and for information upon other topics relating to the forest interests of our State, and the replies already received to these circulars of inquiry clearly prove that Dr. Rothrock will be able to lay before our next Legislature information of such a practical character as will relieve the division from any mistaken criticism and show the wisdom of the legislation secured last winter.

Arrangements have been made to secure special reports from experts in relation to the relations of our forests to water powers which, owing to the rapid introduction of electricity as a power, are annually becoming more valuable and more worthy of protection. The study of the various fungi which causes more or less loss to our forests, shade and fruit trees has also had the attention of the division, and it has been the pleasure of the Department to heartily co-operate with Dr. Rothrock in this special direction.

At several times during the past year, the attention of the Department has been directed to the loss of shade, fruit, forest and ornamental trees from the exhalations of mines and certain manufacturing industries; this subject has been referred to Dr. Rothrock and his assistants, and his forthcoming report will, I am sure, deal with the problem in a manner which will prove satisfactory to all concerned, and will enable the Legislature, if action is necessary, to act intelligently in relation to the subjects involved.

The following quotation from a friend of the forestry cause in our State is so appropriate that I transfer it to my report as conveying my own sentiments:

"The division is young. It deals with problems hitherto new and unsolved in our Commonwealth. It is safe to assume, however, that the magnitude and importance of its operations will become more and more apparent with each successive year, and that henceforth it must be considered as an essential factor of our State Government."

Department, of the results of various plans proposed to prevent these losses.

One of not the least important duties of this Division is to furnish farmers and others with a place at which they may obtain, without cost, information relating to any and all insect pests, and at which they may obtain the most reliable and recent plans for preventing present or future losses, and it has been found by the experience of the past year that this information may be kept at the office in the form of circulars and thus convey to the inquirer just the information he wants and at a time when it is most needed, and when it will prove to be most beneficial.

Pa. Dept. of Agri., Bul. 41, 1899

Walter Mulford

FORESTRY DIVISION.

In addition to the duties devolving upon it by reason of former legislation, this Division has, during the past year, had its work greatly increased by duties resulting from carrying into effect the acts of March 30, 1897, and May 25, 1897. The former act provides for a Forestry Commission of which "the Commissioner of Forestry, Chairman of the State Board of Health, the Deputy Secretary of Internal Affairs and two other persons, one of whom shall be a lawyer or conveyancer of at least ten years professional experience, and the other a practical surveyor, to be appointed by the Governor."

By the provisions of this act, the commissioners are authorized to locate Forestry Reservations, as follows:

1. One of not less than 40,000 acres upon waters which drain mainly into the Delaware river.
2. One of not less than 40,000 acres upon waters which drain mainly into the Susquehanna river.
3. One of not less than 40,000 acres upon waters which drain into the Ohio river.

The act provides that these reservations shall constitute "one continuous area as far as the same is practicable," and the Commission is empowered by the act to "have recourse to a jury to assess damages for any property to be taken."

The act of March 30, 1897, gives the Forestry Commissioner the power to purchase land at tax sales and makes it the duty of the proper county officers to notify the Secretary of Agriculture and Com-

missioner of Forestry of all sales of land for unpaid taxes; they are also required to advertise such sales, under certain restrictions, in the county papers of the districts in which the lands are located.

The Commissioner of Forestry is limited in the price to be paid by a proviso in the law to the effect that "the price paid for said lands, shall in no case exceed the amount of the taxes for the non-payment of which the same are being sold, and the costs."

Acting under the provisions of this act, the Forestry Commissioner has purchased at tax sales 55,681 acres and 90 perches of land, of which 3,482 acres and 51 perches were bought at commissioners' sales, and, therefore, not subject to redemption by defaulting taxpayers. The remaining 52,199 acres and 39 perches were purchased at treasurer's sales, and are subject to redemption by the defaulting taxpayers at any time within two years from the date of the sale. Some of this latter class of land, the Commissioner reports, will no doubt be redeemed, but in such cases the State will not lose anything, as the former owner must, before he can redeem the land, pay all back taxes and expenses, and, in such instances, the money will be paid into the county treasury and the county treasurer will reimburse the State Treasurer for any outlay which may have been made from State funds.

The Forestry Commissioner advises that, in section 1 of this act, the time for advertising should be changed from "six weeks" as at present, to four weeks, as the longer time involves quite an expense, and especially in thinly settled counties in which the cost of advertising is quite a burden.

The purchases which have already been made under this act are located in the counties of Clearfield, Clinton, Lycoming, Monroe, Pike and Elk. There are large areas in other counties and other areas in the same counties which may eventually become available, but the desire of the Commissioner to have the reservations as nearly in one block as possible has caused delay in making purchases, it being thought best to go slowly at first and only purchase such areas as actual examinations show to be sufficiently closely located to answer the requirements and purposes of the act.

The Commission contemplated by the act of May 25, 1897, not having been all named, no work has been done under the act, but the Commissioner of Forestry, anticipating the appointment of the two remaining members of the Commission, has examined numerous areas in the State which are believed to be suitable to the requirements of the act, and, as soon as the Commission shall have been appointed and organized, the work may be commenced and rapidly carried to completion.

It is believed that the results of these two acts, working in unison, will give our State a series of forestry reservations which will ac-

comply with the object sought for, and will, in due time, place Pennsylvania in the front rank of forestry work.

The act of May 25, 1897, "for the preservation of forests and partially relieving forest land from taxation," promises, to quote from the Commissioner's report, "to be one of the most important enactments of the last session of the Legislature." It is not only based upon one of the most profound principles of political economy that "the forests are actually of more use to the State than they are to the individual," but it came to the relief of the farmer and land-owner just at a period when they most needed relief from the burden of excessive taxation under which they labored. The fact has for years been beyond dispute that taxation of timber which so long as it stood was yielding no revenue, swallowed up the profits of the farmer and drove the lumberman, in self-defence, to sacrifice lands which in the future might have yielded him a fair compensation. The taxation not only robbed the owner, but, to an even greater extent, the State."

This law provides that "in consideration of the public benefit to be derived from the retention of forest or timber trees, the owner or owners of land in this Commonwealth, having on it forest or timber trees of not less than fifty trees to the acre, and each of said trees to measure at least eight inches in diameter at a height of six feet from the ground, with no portion of the said land absolutely cleared of trees, shall, upon making due proof thereof, be entitled to receive annually from the Commissioners of their respective counties during the period that said trees are maintained in sound condition upon the said land, or so much of the said eighty per centum as shall not exceed the sum of forty-five cents per acre. Provided, however, That no one property owner shall be entitled to receive said sum on more than fifty acres."

The act of March 30, 1897, enabled the Forestry Commissioner to take a very important step in a comparatively new direction, viz., in the enforcement of the laws relating to forest fires. This act makes the constables of the townships ex-officio fire wardens, and the Commissioner reports to me that "the present method by means of constables and their posses has given satisfactory results. There has, in some counties, been a little friction growing out of the method and time adopted by the Commonwealth in paying its half of the expenses incurred in fighting the fire, and in one county the friction caused, was, on the other hand, on the doubt as to the right of the county to pay its half. There is no doubt, however, as to the efficiency of the law, and as to its force and constitutionality, and the friction is not more than is to be expected from the new application of an old principle involved in the State and county sharing the expense."

The Commissioner also reports that the act of June 2, 1870, was

supplemented by an amendment which removes much of the difficulty which existed under the unamended act, and the act is now found to be operative; in fact, in several counties convictions have been secured, and in Huntingdon county, the Judge (Bailey), has promptly made an example of offenders. This cannot but result in decreasing the number of forest fires which are the result of intent or carelessness, and will in time do much towards the preservation of our timber lands.

Attention has been given to the provision of the act of June 2, 1891, (which permits the recovery of damages for the destruction of trees along public highways by telegraph, telephone and electric light companies), and the convictions which have already been secured have had an excellent effect in affording greater protection to this class of property from wanton destruction and injury.

In his report the Forestry Commissioner will suggest the benefit which would accrue to the State, its citizens and its timber if the minor principles of the forestry problem were introduced to a greater or less extent among the children of our public schools, and he suggests that proper kinds of seeds should be furnished to such schools as will take proper care of them, and that the Spring Arbor Day would be an excellent opportunity for inculcating the knowledge alluded to.

In this connection I may also call attention to several suggestions of the Forestry Commissioner which are well worthy of the greater attention of the citizens of our Commonwealth, and especially of those interested in the growth of our timber and forest lands.

In North Carolina, New York, Minnesota, and in some other states, legal provision is made for posting the State forestry laws at prominent places in which they will most likely be seen by those who, in any form, may have to do with forests and forest lands; the expense need not be large and the results, through gradual education, may be very valuable, and, in time, add much to the value of our forest lands.

For a number of years past the Board of Agriculture, and more recently the Department of Agriculture, has had their attention called to the great injury done to forest trees and especially to fruit and shade trees, in the immediate neighborhood of coke ovens, smelting furnaces and other industrial plants, the refuse gases of which are all more or less injurious to the growth of trees. Several attempts have been made to obtain the aid of the State, through its Department of Agriculture, in efforts to abate nuisances of this kind, but in the absence of all reliable knowledge as to the effects of such refuse matter, the Department has not felt it proper to take part in such actions, but I would earnestly recommend that the Forestry Commissioner, assisted by the other force of the Department, should

be authorized to make practical examinations into the difficulty complained of, and, if possible, suggest means by which the loss may be prevented or decreased.

Another important integer in connection with the disturbed water flow, caused by forest denudation, it is interesting to note, is the effect of a few accidental cases of the introduction of the common willow as a soil retainer in exposed positions along the lines of the Juniata and other rapid streams of the State. A study of the effect of such planting, the expense of which need not be great, would be of great value, if the retaining of some of the lands of farms along the Juniata which are now annually being deprived of some of the best land by the yearly floods which wash the soil towards the ocean, were taken into consideration.

The Forestry Commissioner also calls attention to the probable future demands of the wood pulp industry, which will in the near future undoubtedly assume great proportions in our State. At present we know very little of the comparative values of the different trees and woods for this purpose. Trees planted quickly assume a value for this purpose, and the State would undoubtedly make a wise investment by a small appropriation to enable the Commissioner of Forestry to obtain and publish practical and reliable information in relation to the comparative value of the different native woods of our State, and especially of those which grow along the large rivers and streams, and publish the information in such a form as would be accessible to those directly interested. It takes no longer to plant, protect and grow a crop of timber which will give the best pulp, than it does to grow the more worthless kinds, and we at present have no practical knowledge as to what the proper and best kinds are, but the question could readily be answered by a careful examination made by the Forestry Commissioner.

In relation to the wood pulp industry, the Commissioner writes as follows:

“There are many thousands of acres in Pennsylvania which are now yielding no return whatever, and which might under proper care be made to produce promptly the wood needed to perpetuate this most important industry. Upon this question the people need and are asking for information, especially as to the kinds of wood which will be most suitable for the purpose, and which will at the same time come into the market most speedily.”

DAIRY AND FOOD DIVISION.

The work of this Division probably reaches the general taxpayer and citizen more directly and universally than that of any of the five divisions of the Department; the other four, important as they are, only reach a portion of our citizens; the Institute Division appeals directly to the interests of the agricultural class by furnishing them with such information as they most need; the Forestry Division appeals directly to the interests of the lumberman and student of climatology and only reaches the average citizen at the point at which its work bears upon the rainfall and climate of our State; the Entomological Division works along the line which more directly appeals to the interests of the fruit and vegetable grower, and the Veterinary Division appeals almost exclusively to the interests of the stock owner and stock raiser and only reaches the general taxpayer at non-essential points, but in the work of the Dairy and Food Division we have interests which reach every citizen of our Commonwealth, for none are so high or so low that the character and condition of their food supplies is not a matter of dollars and cents to them, and to whom the work of this division appeals at every point.

When the Division was organized three and one-half years ago an opinion prevailed that by ruling out adulterated food products, its work would cause an increase in the prices of many classes of products of common use and thus affect the commodities of every day life, and that in this direction, it would work to the advantage of the wealthy purchaser and against the interests of the laboring man; but three and one-half years of practical work have clearly shown that this work has not increased the cost of any commodity; that low grade goods, if they are properly marked, can still be purchased under a system which ensures to every purchaser the opportunity to protect himself from fraud and imposition.

This work, while it has educated the manufacturers to a higher plane, has also educated the consumer to the fact that the higher grades of most of the commodities which he purchases are the most economical, although they cost more per pound per package than those marked "Compound" and that they furnish more of what he wants for a given amount than can be obtained from "compounds": "mixtures."

A careful resume of the work will convince anyone that a change for the better has forced itself into the grocery and food stores of

Pa. Dept. of Agri., Bul. 34, 1898
Walter Mulford

REPORT OF THE COMMISSIONER OF FORESTRY.

HARRISBURG, PA., January 1, 1898.

HON. THOS. J. EDGE, SECRETARY OF AGRICULTURE :

Dear Sir: For a division which has been in existence but two years, operating in a field practically new to our people, with our plans to formulate, and our methods of work to develop, we feel that a most gratifying start has been made.

It was something to convince a people, who had grown up in sight of forests supposed to be inexhaustible, that they would do well to consider the economical methods of lumbering which are practiced in regions where timber is scarce, and to provide by wise legal enactments for a restoration of the forest wealth upon which so much of our past prosperity has depended. We can hardly yet realize the full import of the change in public sentiment which has come about so swiftly but so quietly in this State. It is fair to add the strength of the forestry movement in Pennsylvania is a surprise to those in other states who are working with the same object in view.

The whole work here has been done along educational lines. That so much has been accomplished is simply evidence that our people, through their representatives, may be trusted to act wisely upon any question which has been fully stated and fairly placed before them.

Some of the work contemplated by the creation of this division has involved changes in legislation which a few years ago would have been considered as radical, yet the public has already placed the seal of its approval upon them. For example, it has been an established policy of the State, from the earliest period of its history, to dispose of its land cheaply enough to induce settlers to occupy it all as speedily as possible. There was wisdom in this in former years. But we have clearly outgrown the conditions then existing, and the necessity for a change in policy has become apparent. It is now a cause of regret that the need for a change was not discovered before the State had disposed of practically all of its lands. It is now recognized that the good of the largest number requires that a certain portion of the soil should remain as public property, to be managed for the public, in order that the natural laws upon which the prosperous perpetuity of the State depends be not violated, and the very surface of the soil, out of which so much of the wealth and all of the food comes, may be preserved in productive condition.

It was once considered the very essence of equity that all private real property should bear its proportion of taxation, and upon this idea those who prepared the last Constitution of the Commonwealth acted. It now appears that we were leading many of our best citizens by the too rigid application of a sound general principle, to despoil the State, in self-protection. It was the result of a better insight into the relations of the forests to the public that brought a rebate of taxes upon the growing farm timber, which returns to the community at large a benefit for every day that it is allowed to stand. This comes as a direct relief to the depressed agricultural industries of the State.

Just here another principle may claim brief attention. The care which a savage extends to the sick of his own immediate band, civilization has developed into a right on the part of an afflicted citizen to demand care when he is unable to "do for himself." The outgrowth of this idea is seen in every hospital for which the Commonwealth provides. But even this will fail to meet calls which the near future may press upon us. Just as the most rational medical practice is preventive, rather than curative of disease, so the broadest statesmanship will diminish the cost of curing disease, by preventing it, whenever a legitimate function of government can be brought to bear upon the case. Instead of so many hospitals we may have some sanitariums located among the birch and balsam forests. This is neither sentiment nor fancy. It is an event of the next few years. It will be entered upon because of the cold business fact that it is the cheapest thing to do, and because it will destroy a large proportion of invalidism by preventing it, and will give a self-supporting capacity to those who otherwise would have become perpetual charges upon the community. The forest reservations which have been authorized by act of the Legislature will have a large share in the natural development of this idea. The bill creating them was introduced at the request of the Pennsylvania Forestry Association. It should be stated here that the Forestry Division of the Department of Agriculture rendered all proper assistance in making its passage possible.

Then, too, we should call attention here to the change in public sentiment in regard to land sold for taxes. It is but a few years since the idea was broached that the State should become the possessor of them. The favor it met with was but scant. During the past session of the Legislature a bill providing for this was introduced as one of the measures suggested by the Division of Forestry, endorsed by the Department of Agriculture and desired by His Excellency, Governor Hastings. It passed by a practically unanimous vote. No law enacted during the session has been more heartily and universally commended over the State.

This bill, however, marks another stage in our passage to a more rational estimate of the relations of the forests to the community at

large. Becoming State property, such land would no longer be subject to taxation. In reality this is but little hardship to the counties in which it lies because as a matter of fact it now yields little or no revenue from taxes. Under the old law it must have continued to yield less with each successive year, while at the same time it would have become constantly poorer, and have led to a serious derangement of the water flow and water utilization, which would have wrought vast injury to the farm lands below, by freshets on the one hand, and a deficient water supply in dry seasons on the other.

Averting these disasters will be a public benefit which will not be confined to the counties themselves but will extend to the manufacturing and agricultural interests of the regions adjacent along the lower courses of the streams. *The increase of the forest areas, which it is safe to expect under State control, will also tend to lessen the rapidity of evaporation from the cultivated areas, and thus to a certain extent will protect the maturing crops in the season when moisture is most required. With a reasonable prospect of such advantage to the community at large, we may anticipate that any loss to the counties will be more than made good, and that means will be discovered of an equitable relief to the counties for any hardship which might be brought upon them.

There are counties in this State which have hitherto placed so high a tax upon some of their most valuable timber lands, and at the same time afforded so little protection to them against fire, that the owners have been driven to cut the timber, and thus to render the lands so valueless that they were surrendered (by failure to pay taxes) to the counties. Thus, by one act, these counties deprived themselves of both timber and taxes. It is hardly necessary to point out that this led to a direct loss to the county in which it was done. It was a wrong to the land owner and to the community, and especially to those who are to follow.

Under conditions hitherto existing, forest restoration, on any large scale, was out of the question. The annual fires, with a merciless punctuality, swept over the lands which had been cleared by lumbering operations, until both the young growth and, often, the soil itself were destroyed. In many cases extensive bodies of mature, valuable timber were killed. We had tolerated this until we ceased to consider it a crime to burn a forest, and had come to regard it as inevitable. We had lost sight of the fact that very often such conflagrations were deliberately started by vagrant, irresponsible persons, on ground to which they had no claim, for no other reasons than to increase the yield of berries in subsequent years. Sometimes it was done from malice, or at other times the fires arose from carelessness on

* See page 152 of Paper by Mr. Geo. S. Rafter, C. E., published in Vol. XII, Proceedings of the American Forestry Association.

the part of hunters. It should be stated here that the opening of the hunting season is usually marked by an increase in the number of these fires. In some regions they occur most frequently on Sunday, when persons who are worse than thoughtless are abroad in the woods. Comment on such a condition of affairs is unnecessary. It is enough to say that it was not only a disgrace to our civilization, but that it indicated a neglect on the part of the State to accord to the owner of such lands the protection for which taxes were paid.

It is in vain to assert that to have paid for the suppression of these fires would have led to their creation by evil disposed people who desired employment. The obvious duty of a government is to ferret out and punish such offenders, and to protect the law abiding citizen at all hazards. It is for this that the government exists, and failing to do this it neglects its first duty.

The earliest distinct, practical step toward suppression of such crimes was taken when the old act of June 2, 1870, was amended and a penalty clause attached which will compel county commissioners to make an effort to bring such offenders to justice, the State in consideration of the general benefits to be derived bearing a portion of the expenses.

The next practical measure, also originated and sanctioned by the Department of Agriculture, was placing the duty of suppressing forest fires upon constables within whose districts they occurred. It also provides a penalty for failure to perform this duty. Having the right to summon a posse to their aid, there can be no excuse for failure to greatly reduce the losses which the State has hitherto suffered from these annual fires. It should be added and emphasized that no man is required by this act to work without reasonable compensation, and that the Commonwealth assumes a fair share of the pecuniary responsibility.

It is not supposed that there will be no forest fires in the future. Some will inevitably arise. We may, however, look for a decrease in their number and for a more prompt suppression of them when they do occur. Neither do we anticipate that the best effects of this law will follow its earliest operation. It is true, and unfortunate that it is true, that a certain number of convictions must follow before the ignorant or malicious can be brought to recognize the existence of any law. This law will be salutary just in proportion as it is rigidly enforced. An act essentially similar has been in operation in the State of New York. It is worth while to quote for a second time from the report of that Commonwealth that "ten years' experience in the matter has demonstrated that the present law relating to the protection of our woodlands from fire is a practical one. We have reason to believe that the widespread and disastrous fires which threatened the existence of our forests at one time will not recur."

An additional safeguard now exists by the passage of the act which authorizes peace officers to make summary arrest "on view," without a warrant having been previously obtained, of those who may be reasonably suspected of violating the laws for the protection of forest property. This was rendered necessary by the fact that in the woodland counties where such offenses are more frequent and most serious, that the formality of obtaining a warrant usually allowed the escape of the offender. Such a law has been in operation in Canada and it is believed with good results.

In certain of our counties it is still the custom to burn over ground which has been recently cleared to put it in condition to obtain a crop of grass. This "burning of the fallows," as it is called, has often been done without proper, or indeed any, precaution being taken to prevent its spread. Some of our most disastrous forest fires have been so created. One can readily see that this condition of affairs is a survival from earlier days, when each settler who opened up a home in the heart of the woods was a "law unto himself." As population increases, and as neighbors approach him, the good of all parties requires certain restraints. In conversation with those who have been accustomed to burn their fallows, it was stated in so many words that it was each man's "business to look out for himself." It was not considered the fault of the man who created the fire if it invaded the property of another, but was regarded as neglect in the second party if he allowed it to do so.

One may readily see that the prevalence of such an idea may work untold harm. It compels any citizen to live in what, at best, might be termed an "armed neutrality" with his neighbor. It opens an avenue for malice to wreak itself upon others and is in every way unsuited to the age in which we live. Some states have legislated against it by requiring such work to be done under official supervision, or at least only at proper times and with official permission. It is supposed by many of our citizens that there is no law to prevent one from creating a fire upon his own property when he sees fit, at any risk to that of his neighbor. If brought into court it would probably be discovered that this is an error, and that the legal responsibility can be placed where it belongs. The pleasantest aspect of this special problem is that it is fast working its own solution, and that we may hope accidents from this cause will constantly become rarer.

In connection with forest fires another question may any day be started. For example, "back firing" has long been resorted to as a most efficient method of heading off a previously existing forest fire. That it is open to grave abuse no one can doubt. To illustrate: A fire exists on the land of A. The land of B lies between that of A and C. In order to protect himself C may start a fire along the boundary between B and himself. A change in the wind may occur, and the

fire started designedly by C may burn over the whole property of B. The point is that we have hitherto been using a good remedy recklessly, and legal complications may at any time grow out of it. I am not at present prepared to suggest a remedy.

One reason why the abuses alluded to have been allowed to go so long unchecked is because their serious character was not recognized as fully as now. It was supposed to concern only the land owner. It is clear that there has been a marked change in public sentiment. It is equally clear that there has been a cause for this change. It is probable that the educational influences of your Department, have had some influence in effecting it.

But these laws have a far-reaching, secondary influence which has not yet been alluded to. It is more than probable when prompt, systematic suppression of forest fires comes to be the rule, and the citizens are called upon to do the work, that attention will be directed to the enormity of the crime in a way which has never yet been done, and the men who cause them will come to be regarded as public enemies and culprits. Once public sentiment settles down to this conviction, we may confidently hope for a reformation.

This is the proper place to call attention to a hitherto unconsidered relation of some of the counties to the lands which they now hold because of failure on the part of the owners to pay the taxes upon them. Thus far, they have simply been allowed to go without care or attention. It was a natural consequence that such areas should constantly deteriorate. They were swept over by fires, and browsed upon by cattle, until all of the natural tendency to a fresh growth of timber was practically destroyed. Belonging to the county they were everyone's in the largest sense of the word, and they suffered accordingly. Any squatter or timber thief could do his worst with them almost without "let or hindrance." The time must soon come when the question will arise whether they should not be cared for by the county, in the hopes of a remunerative return.

There are towns in Germany which have for years been practically exempt from taxation because of revenue received from forest lands so managed. It is at least fair to assume when these lands come finally into the hands of the county, that timber thieves, browsing cattle and destructive fires will be kept off. After a few wholesome convictions of law breakers it is more than likely that what timber remains and what comes as sprouts from stumps would, in a few years, show such a marked increase in value as to justify the small cost of such protection.

It is proper in this connection to correct an error which is common over the State. It is generally supposed that forestry begins in tree planting. This is not the case. Forestry begins with properly conducted lumbering operations. Planting is, of all methods of forest

restoration, the most expensive, and is not likely to be resorted to extensively in this country for years to come. Indeed, there is small reason why it should be. With us the first step toward forest restoration, after suppression of fires, is to see that in lumbering, enough of seed trees are allowed to remain to restock the ground. It is not true entirely, or even to any great extent, that the soil refuses to reproduce a crop of the same kind of trees as those which have been cut off. The fact is, it seldom gets the chance to do so, because seed trees are not often left. There is no more reason to expect a perpetual succession of white pine on the same soil, without seed, than there is to look for a perpetual succession of corn on the same field without seed.

There may be a slight advantage given to some fresh kind of tree because of the long previous growth of another kind, but this advantage is hardly marked enough to interfere with the desired crop if an abundant supply of seed is furnished. There are numberless instances over the State in which the abundant second growth of the same species of tree can now be seen. Of course this statement needs the modification which follows. When the physical conditions which once existed, and favored a given species of tree, have been changed by its removal, then some other species may have an advantage. For example, young hemlocks and white pines are extremely sensitive to an intense heat of the sun, and often wilt down under it and die. In the absence of shade a chestnut growth might succeed where the pines or hemlocks would die. But it must be remembered that when our forests are cleared a fire promptly runs through the "slashings," and destroys the undergrowth and the moisture-retaining bed of leaves, which otherwise would have protected these young pines and hemlocks. Our own lack of foresight has given an unnatural advantage to the chestnuts, oaks, etc. On the other hand I can now show northern, shady exposures where the spontaneous growth of white pine and hemlock is surprising. These are all questions for "up to date" county officials to consider.

It may be well to give some facts showing that forests can be made a source of revenue. These quoted are from the official reports of Germany, and may be wholly relied upon. From the Dukedom of Oldenburg we have, for the financial years from 1886-7 to 1895-6, as follows:

Year.	Total income.	Total expenses.	Annual net profit.
1886-7,	\$41,234	\$26,450	\$14,784
1887-8,	39,875	27,661	12,214
1888-9,	40,913	26,724	14,189
1889-90,	43,578	26,120	17,458
1890-1,	45,148	27,485	17,663
1891-2,	44,433	27,814	16,619
1892-3,	42,817	27,410	15,407
1893-4,	66,976	31,254	35,722
1894-5,	44,116	30,670	13,446
1895-6,	44,838	30,743	14,095

Or, in other words, the total income from 1886 to 1896 was \$453,928; total expenses, \$282,331; total net profit was \$171,597.00.

The domain forests of the Dukedom of Saxony-Gotha, in the financial year from July 1, 1895, to July 1, 1896, gave the following result:

Total income,	\$328,115 00
Total cost of maintenance and administration,	94,469 00
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Net annual profit,	\$233,646 00
Net annual profit per acre,	3 25
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The domain forests of the grand dukedom of Saxony for the financial year 1894 yielded as follows:

Total income,	\$224,608 00
Total cost,	165,907 00
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Net profit,	\$58,701 00
Net profit for the year, per acre, ..	2 03
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A summary of the forest operations of the dukedom of Saxony-Meiningen for the year 1895 shows that 107,085 acres yielded as follows:

Total income,	\$445,585 00
Total cost of maintenance and administration,	176,572 00
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Total net revenue,	\$269,013 00
Total net annual revenue per acre,	2 50
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The forest estate of the grand dukedom of Mecklenburg Schwerin contains 268,784 acres. The statement of its operations for the financial year of 1894-5 was as follows:

Total income,	\$1,075,119 00
Total cost of maintenance and administration,	314,893 00
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Total net profit,	\$760,226 00
Total net annual profit per acre, . .	3 10
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In the royal Saxon state forests there are 421,164 acres. The year 1894 shows the following statement:

Total income,	\$2,360,489 00
Total cost of maintenance and administration,	856,132 00
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Total net profit,	\$1,504,357 00
Total net annual profit per acre, .	3 57
	<hr/> <hr/>

In so far as these statistics bear upon our forests and their possible production, the natural answer to them would be, that under existing conditions we can hope for no such returns. This is entirely true if we consider immediate returns only. But the reply would require very considerable modification if we consider future possibilities. The facts are that we are nearer a shortage of timber at this moment than we suppose and that it will require years before we have changed our extravagant habits in the use of lumber. Low prices now prevailing are due to two causes—i. e., cheap “cut-rate,” transportation on the one hand, and the glut of hemlock caused by cutting these trees to obtain bark on the other.

This condition cannot endure, and when the change comes, as come it will, we may expect much higher prices to rule the lumber market. Then, too, no one can predict the size of the possible demand for pulp wood. Its increase in the last few years has been fabulous. It is an open secret that the pulp manufacturers are at this moment concerned over the source of their future supply.

A PLAIN STATEMENT OF AN IMPORTANT PROBLEM.

The following item comes from the Pittsburg Post, of October 15, 1897:

“Extreme quietness still prevails along the wharves. Up-river packets are enjoying a fair trade, but there is little or nothing done

among the tow boats. The river has not been so low in many years, and the outlook for a rise this month is not promising. Two days' steady rain would be necessary to bring a good boating stage, and pilots do not expect this before November. A few of the prophets, however, cling to the prediction that tows will be taken out before Hallowe'en. The stage of the water at Davis' Island dam last night was 1.3 feet; river stationary."

As a matter of exact record the lowest stage of water at Pittsburg during September, 1895, was 5.3 feet. In September, 1897, the lowest stage there was 5.2 feet.

This statement is both startling and suggestive, especially when taken in connection with the following information, kindly given by the National Weather Bureau, through Mr. E. R. Demain, the observer at Harrisburg:

"Deficiency of rainfall at Pittsburg from January 1, 1895, to October 15, 1895, was 9.47 inches.

"Deficiency of rainfall at Pittsburg from January 1, 1897, to October 15, 1897, was 3.55 inches."

It would seem from the above that in 1897 the water was lower at Pittsburg than in 1895, though the deficiency of rainfall was in 1897 less than one-half (exactly 37 per cent.) what it was in 1895.

Facts of similar import reach us from other stations. Thus, at Philadelphia, the deficiency of rainfall from January 1, 1895, to October 15, 1895, was 7.42 inches. From January 1, 1897, to October 15, 1897, it was 0.61 inches.

From Erie, Pa., we have these figures, thus: deficiency of rainfall from January 1, 1895, to October 15, 1895, was 8.20 inches. Deficiency from January 1, 1897, to October 15, 1897, was 5.16 inches.

At Harrisburg, Pa., the deficiency of rainfall from January 1, 1895, to October 15, 1895, was 18.95 inches. From January 1, 1897, to October 15, 1897, it was 11.31 inches.

This is one of the problems to be accounted for and remedied if possible. It is evident that there are too many elements of state and national prosperity involved here to permit of any shortage of water power if it can be avoided.

Of course it will be noted that these rainfall data were taken in Pennsylvania, though the origin of a portion of the water supply of Pittsburg is quite beyond our borders. There can, however, be no doubt but that over a large portion of the Allegheny and Monongahela basins the rainfall was greater than in 1895, yet these streams seem to have been lower. There can be no doubt as to the essential fact—that in our periods of annual minimum waterflow, our rivers are delivering less water in each successive year. Thus, the most reliable

estimates at hand now (from Mr. Henry Birkinbine) give the following for the Schuylkill river in its periods of least annual flow at Philadelphia:

1816,	there were sent down	500,000,000	gallons daily.
1825,	there were sent down	440,000,000	gallons daily.
1874,	there were sent down	245,000,000	gallons daily.
1875,	there were sent down	245,000,000	gallons daily.
1878,	there were sent down	220,000,000	gallons daily.
1881,	there were sent down	215,000,000	gallons daily.
1895,	there were sent down	195,000,000	gallons daily.

If these figures are correct, as they probably are, it would seem that in 1895 there was available at Philadelphia only 39 per cent. of the water there was in 1816. Or, in other words, that in eighty years 61 per cent. of the water that should have been available during autumn in the Schuylkill, at Philadelphia, had disappeared—that is, if we assume the reported flow of 500,000,000 gallons as a fair average minimum flow for earlier years.

There is a striking fact in connection with the table just given. It is the progressive decrease, and as if to reinforce the belief in the general accuracy, it will be noted that in 1874 and 1875 the flow is stated roundly at 245,000,000 gallons. It is hardly probable that there will be any dispute over the general statement that we are having less flowing water available at the critical season of the year than formerly. How it is to be accounted for is quite another question. Three explanations might be, or are, offered:

1st. That we are passing through a period of less rainfall than formerly.

2d. That the disastrous change is due to disturbing the former balance of natural conditions by removal of the forests.

3d. That much of this missing water has been used before it reaches the point or points at which the estimates were made.

Taking the last of these explanations first, it may be briefly stated that it does not seem possible, or even probable, that the deficiency of flow can be caused by use of water, because, in the first place, the diminished flow is often as marked at the head of the streams, and above any point of use, as it is below. In the second place, very much of what is used is not carried out of the country by the users, and must again find its way into the soil, or stream, at, or near, the point of use. In the third place, for that which is carried off by locomotives, either as water or as vapor, almost as large a portion is returned in the one form or the other to the region from some other points. It would be very interesting to learn the exact quantity of water consumed by our railroads.

Of the two remaining explanations that which seems least applicable to existing conditions of water flow is the one which assumes a

diminished rainfall, because sufficient data are not yet available to settle the question as to whether or not there can be fairly said to be any decrease in the quantity of water delivered from the sky—even in recent years. In fact there are places in which we know that during twenty years past the later decade has yielded as much rainfall as the earlier one. Or, if we include in our estimate a term of years measured by centuries and raise the question as to whether or not we are undergoing a cyclic period of drought as compared with earlier periods, then we are simply invoking an hypothesis which itself requires defence.

It, of course, would explain the present diminished flow if we could prove a diminished fall extending through a long term of years, but in seeking and offering such an explanation we are assuming as true that which requires to be proved. The term "cyclic change" is euphonious and seductive, but as a matter of fact we know as little about cyclic changes as we do about almost any terrestrial condition. In reasoning with them for a basis we argue not upon what we know, but upon what we do not know.

Apropos of this we may quote from Bulletin D, United States Department of Agriculture, page 18, "Rainfall of the United States," by Alfred J. Henry, Chief of Division: "It is true that suggestions of a faint periodicity have been found in some regions of the globe, but it is still the general belief that the vicissitudes of rainfall, if not wholly fortuitous, are so intermingled with the variations of pressure, temperature, etc., that no satisfactory solution of the problem will be reached until the greater problem of the general circulation of the atmosphere has been solved."

In the Monthly Weather Review for September, 1897, page 395, Prof. H. A. Hazen has gathered together the scattered data which seems to prove more clearly than ever before that the removal of our forests has not appreciably diminished our rainfall—I. c. p. 397, he says: "Observations of this nature, condensation in or over a forest, however, can not ordinarily be checked by instrumental means, but show in a general way that the forest tends to conserve vapor and moisture, which, in the case of the open field, would be diffused into the atmosphere."

There would remain then, the assumption that this diminished flow comes from some change, or changes, made in the hitherto established balance of nature. Of such possible changes the one most frequently invoked is the removal of the forests. These are some of the facts which appear to bear upon the case:

1st. It seems to be proven that there is a diminution in the volume carried in our streams during the dry season, and that this is marked over wide areas.

2d. It is certain that our woodland areas in which water is hoarded are decreasing, and that in the same measure our areas of rapid evapo-

ration, and from which the water flows with greater rapidity after the ground is saturated, are being increased. This period of eighty years, from 1816 to 1895, during which the autumn flow of the Schuylkil seems to have been gradually diminishing, is too long a reach to be explained by any cyclic change of which we have any exact instrumental record—and certainly the cyclic explanation must be open to question. The decrease in water flow becomes all the more striking when it is noted that the deficiency of water occurs just at the time when we should expect the effects of the summer evaporation over cleared areas to be most marked.

3d. Any excess of water which flows out of the country in a freshet leaves so much less in the country to maintain the even, average flow of springs and streams.

4th. Competent engineers inform us that as between two similarly situated and conditioned regions, the one, however, being treeless, and the other being timber clad, the latter will absorb of the water which falls, and of the snow which melts, about three-fifths more than the former.

5th. Many of our smaller streams, which once flowed the year through, are now, for a portion of each summer season, either absolutely dry, or nearly so. This is ordinarily supposed to mean merely so much water cut off from the larger streams by previous stages of high water. But as a matter of fact it means also a dry atmosphere over a large portion of our cleared areas, which dry air evaporates, by so much, the water from the larger streams. We cannot here give the exact ratio of evaporation, but it probably aggregates an immense volume of water.*

6th. It is now frequently seen that the "green woods" burn in our forest fires, and that formerly they very seldom did so. This means that the normal condition of a saturated atmosphere which once existed has changed, and that, instead, we have an air from which much of the moisture has been evaporated, because the forest areas of slow evaporation have been changed into cleared areas of rapid evaporation, and that the latter areas tend to a constant equalization of the quantity of moisture in the air by drawing upon and drying out even the green woods.

7th. While our river gauges have thus far not clearly indicated periods of higher water, the fact remains that our county commissioners are continually raising the height of our bridges above the stream to keep them out of the way of the flood.

It would thus appear that in the loss of water retaining power in the cleared ground and in the increase in the rate of evaporation over the remaining water surfaces there is good reason to associate, at

* Mr. Rafter (op. cit. p. 157) writes, "I reach the conclusion that the deforestation of a drainage area will, in the state of New York, probably decrease the annual water yield of that area from four to six inches."

least in part, the unusually low water during our summers with the removal of our forests.

Of course no one desires to see any suspension of legitimate lumbering interests. The whole object of the forestry agitation is to perpetuate the lumbering interests, and in protecting them also to insure for the State an abundant water power for the future. We may well weigh the statements in the "Manufacturers' Gazette," for October 30th, page 12, where, under head of the gratuitous power furnished by nature, the following occurs:

"Districts long neglected must become populated. Consider what the Falls of Montmorenci might do for Quebec; what the Falls of Ohio might do for Louisville. How Maine will grow when the Penobscot and Kennebec shall have been properly harnessed! Think of the transformation that must go on in our Susquehanna Valley when the water's energy shall have been turned to full account. No state in the Union is more suited to this sort of evolution than Pennsylvania, with her uncounted copious streams in fertile valleys and her great natural wealth. Some such transformation seems bound to come; and it would be no greater than has twice been wrought in this century, first for hand labor, and then by the general introduction of steam. The use of steam is an artifice. The nearer we get to nature, and the free use of her gifts, the less we depend upon the artificial."

Under existing conditions, where is the loss of water power to end? This raises one of the most important questions before our thinkers, workers and legislators to-day.

For a thoroughly exact and reliable solution of the relations of the forests to the water flow of the State, we should require much more information than we now possess. While this is true, it is also equally true that there are certain well-founded principles upon which reasonably exact and safe conclusions may be based, and that in order to formulate information for the public benefit we are justified in using the knowledge we already have.

For example: No one who will weigh a mass of dry leaves and weigh that same mass after it has been exposed to the rain will doubt that leaves possess the power of retaining water. Furthermore, he would recognize that while the water from above readily permeated the mass of leaves, as they lay upon the soil, and entered into the earth, that at the same time these very leaves, being themselves saturated with moisture, would act most efficiently in retarding the evaporation of the surface water in the soil. These facts are so plain that no one can avoid recognizing the water retaining capacity of the leaves which lie upon the forest floor. If we change the point of observation from the forest to the field and study the constitution of the densest sward we cannot fail to recognize that above the surface of the earth no such water-retaining layer exists, or if it is there, it will be less thick and less densely matted. Evaporation will go on much more rapidly in it

than in the forest. Then, too, another point in favor of the forest is the fact that in it the soil itself is more efficiently shaded than in the field. From these observations alone one must conclude that when the land is changed from a forest to a field condition there will follow a large loss of water by evaporation.

It is just as obvious, when one stops to examine, that during a heavy rain the conditions existing in the forest are such as to retain a larger portion of the water than is held by the field. In other words, much of the water, which soaks into the ground in the forest, flows off as surface water from the field and is almost at once carried out of the country.

Let us make this statement as exact as our present information will allow. On pages 17 and 18 of the report of Major C. W. Raymond, United States Engineer, upon Flood Protection of the City of Williamsport, we find the following statement: "Colonel Torrelli affirmed as the result of careful observation that four-fifths of the precipitation in forests is absorbed by the soil or detained by the surface of the ground to be gradually given up in springs and gentle rills. And only one-fifth of the precipitation is delivered to the rivers rapidly enough to create floods. Upon the same slopes and surfaces, denuded of their forests, the proportions are reversed."

That is to say, in the forests four-fifths soak into the ground and in the fields but one-fifth succeeds in doing so—hence then there is a saving by the woods of three-fifths of the water-fall over that of the fields.

It will be interesting to note just what this means. From data collected by this office it appears that in the year 1896, in the counties of Clarion, Forest, Indiana, Jefferson and Warren, in the State of Pennsylvania, the areas cleared of timber aggregated about thirty-two square miles. These counties drain almost wholly into the Allegheny river. It is not possible as yet to obtain the exact annual rain fall for the region. It is safe, however, to place it at thirty-eight inches. The quantity of water falling upon thirty-two square miles would be 4,881,619,353,600 gallons. In an United States gallon there are 231 cubic inches. Dividing the number of cubic inches of rainfall by the number of cubic inches in a gallon, we would ascertain that the rainfall aggregated 21,132,551,314 2-7 gallons annually over the thirty-two square miles cleared. If this rain fall were converted into a stream one foot deep, one hundred and twenty-five yards wide, and which flowed at a speed of four miles an hour, it would require fourteen days, twenty hours, forty-one minutes and thirty-five seconds to pass a given point. If it were converted into a solid cube it would form a mass of water 471.21 yards in length, width and depth.

If the statement of Colonel Torrelli is to be depended upon, the removal of timber from those thirty-two square miles would mean that

four-fifths of this vast volume of water, instead of soaking into the ground to slowly percolate into the streams of the Allegheny Valley and to aid in maintaining an even flow of water, was allowed to run hastily from the surface, into the streams and out of the country. If it did not create a freshet it was, at least in great part, wasted. It was, in other words, so much power rendered unproductive and carried beyond our reach.

It may be that the estimate of Colonel Torrelli is too large. Any authority quoted approvingly by Major Raymond is, however, likely to be as nearly correct as the science of his time allows. We are content to state the case, and without insisting upon these figures, to stand positively upon the principle which they indicate.

The real, practical point for those interested in the future of that region is to determine for themselves where this progressive loss of power is to end.

Is there any probable benefit to be expected in the way of preservation of this water, with the power it implies, by restoration of forests on land, otherwise barren, at the heads of the streams?

If so, is it not supreme folly to delay such restoration an hour longer than necessary?

If forests are not restored to this barren ground, to what other use will it be put?

Can any State afford to have any portion of its areas unproductive?

Do not barren areas reduce the income of a State by depriving it of the revenue it otherwise should yield?

There are two stages more or less clearly defined in the history of every reform movement. One that of agitation, and the other that of actual operation. It appears to be certain that in this State the second stage has been reached.

The forestry operations commenced some years ago by the custodians of the Girard estate in Schuylkill county appear to be in a prosperous condition, and those under the same management in Centre county are yielding object lessons of great value in protection against forest fires. The most notable advance in a practical direction is that made near Ridgway, in Elk county, where on land generously provided by Mr. N. T. Arnold, the general government has undertaken the work of conducting an experimental forestry plantation. This work was commenced with the full knowledge and consent of your Commissioner of Forestry, between whom and Mr. Fernow, in charge of the Forestry Division in the Department of Agriculture, in Washington, there exists a perfect understanding and a hearty sympathy. It is but fair that it should be under direct control of the general government. The location in the heart of what was once the lumbering region of Pennsylvania, is most fortunate, and important results may be hoped for from the experiment. A liberal public spirit would welcome all help of this kind from any source whatever.

There cannot be too many such experiments tried. Whatever benefit accrues from them will be most largely reaped by the region in which they are conducted. For the first time in the history of the State there are indications that some of the large tracts from which the timber has been removed will soon be placed under competent forest management.

In order that there may be no misapprehension or misunderstanding as to the full meaning of the recent legislative enactments concerning forest fires, copies of these have been provided, and it is hoped that early in the new year every constable and every county commissioner within the limits of the Commonwealth will be fully informed upon the new duties which these laws have imposed upon them. We shall also see that they are circulated among such of our citizens as have an interest in them and who would be likely to call attention to any neglect to enforce them.

The public interest in the work of the Division of Forestry is evidently on the increase. Inquiries for information from this office almost invariably receive a prompt reply, and spontaneous offers of help from influential citizens are of daily occurrence. We have sent out during the past year about twelve thousand, five hundred circulars to the officials and citizens of the State. Most of these contained questions upon subjects which were under investigation here. The remainder were reports or copies of recently enacted forestry laws.

Respectfully yours,

J. T. ROTHROCK,
Commissioner of Forestry.

REPORT OF THE DAIRY AND FOOD COM- MISSIONER.

HARRISBURG, PA., January 1, 1898.

HON. THOMAS J. EDGE, SECRETARY OF AGRICULTURE :

Dear Sir: I have the honor to report the following review of the work of my Division of the Department of Agriculture, for the year 1897.

Work under the act of June 26, 1895, known as the pure food law, has been effectively carried on in nearly all sections of the State, and under its provisions, I think it is safe to say, that nine-tenths of food adulterations have been banished from the State. The saving in dollars and cents that this amounts to, for our citizens throughout the entire State, is a vast sum every year. The amount appropriated for the enforcement of the law is a mere trifle as compared to the amount saved. The law is generally popular and a large majority of dealers seem disposed to observe it. This makes it comparatively easy to execute.

We were crippled for a time in the proper enforcement of the law from an adverse decision rendered by Judge Hemphill of Chester county, in pronouncing the pure food law unconstitutional, from defect in title. This decision was appealed from, and on April 19, 1897, Judge Orlady filed the following opinion, reversing the decision of the lower court:

Commonwealth
vs.
William C. Curry.

} Appeal from the Quarter Ses-
sions of Chester County.
} Filed April 19, 1897.

“The defendant was convicted on an indictment framed under the act of June 26, 1895, P. L. 317, in which it was charged that he “unlawfully then and there did sell and offer for sale, as and for, and in imitation of, and under the name of olive oil, used for food by man, a large quantity of a certain adulterated article and compound, the name and components of the said adulterated article and compound being to this grand inquest as yet known,” and in a second count “unlawfully did then and there sell and offer for sale, as and for olive oil, used for food by man, a large quantity of a certain adulterated article and compound, then and there being an inferior and cheaper substance and compound substituted for olive oil, the name and components of said adulterated, inferior and cheaper substance and compound being to this grand inquest as yet unknown.”

Pa. Dept. of Agric., Bul. 41, 1899

REPORT OF THE COMMISSIONER OF FOR-
ESTRY.

Walter Mulford

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HARRISBURG, PA., Jan. 5, 1899.

HON. THOMAS J. EDGE, *Secretary of Agriculture*:

DEAR SIR: I have the honor to herewith present my preliminary report for the year 1898:

UNSEATED LANDS.

What, in law, constitutes unseated land is hard to state in a few words. Merely making a small clearing does not remove the tract from the unseated land list and thereby render it capable of being sold for taxes. But the cultivation of a few acres does, because it furnishes presumptive evidence that the person so clearing and cultivating intends to make his home there. "Actual and permanent occupancy of a tract for lumbering purposes renders it seated." Land once classified as seated, but afterwards abandoned and allowed to grow up in brush, is thereby liable to be sold for taxes as unseated land, though "a mere temporary suspension of occupancy is not sufficient for that purpose." Land "may be transferred from the seated to the unseated list without notice to the owner." A portion of a seated tract which is worthless cannot be abandoned and classified as unseated land and sold for non-payment of taxes. The responsibility for the taxes still remains in the owner, and the entire tract should be assessed as seated land.

If an intruder locates upon unseated land the fact of his occupancy "gives it the character of seated land only to the extent of his claim, but the improvement of any part of the tract, by the owner renders the whole tract seated."

"A sale of unseated lands, for taxes, will pass the title, though assessed in a wrong name, or by a wrong number, if otherwise designated so as to be capable of identification. The identity of the tract assessed and sold is a question of fact for the jury."

I have made the above statements and quotations from Brightly's Purdon's Digest (Vol. 2, pages 2052 and 2053), in order at the outset to give a clear view of the most important legal relations of unseated lands, and also, if possible, to show under what circumstances lands may be properly classed as unseated.

I have already intimated that unseated lands may be sold for taxes. All other real estate in this Commonwealth is exempt from sale for

injuries caused by the insects considered, and the remedies advised for their destruction. It is also desirable that these bulletins should not treat of a miscellaneous list of insects, but of those attacking some particular plant. Frequently the fruit grower discovers that some insect is attacking his peach trees, for example. If he has available a bulletin on "The Insects Injuring the Peach," it is probable that a few minutes examination of the bulletin will enable him to decide what the insect is which is troubling his trees, and also what remedies to use. Several such bulletins are in course of preparation, in response to frequent requests for them, and it is my desire to publish them as soon as circumstances will permit. Some of those most in demand are "Corn Insects," "Insects Injuring the Peach," "Insects Injurious to Wheat" and "Insects which Attack Woolen Goods and Carpets."

That such bulletins as these would be widely useful is evidenced by the number of letters received by the Division inquiring whether publications on these subjects have been issued.

In conclusion permit me to express my grateful appreciation of the kindness and encouragement so uniformly shown me, both by yourself and by the members of the Department, and especially by Dr. J. T. Rothrock, with whom I have been particularly closely associated by reason of the location of our offices. This assistance has been of great value to me and has enabled me to do much better work than would have otherwise been possible. I would also desire to mention the excellent aid rendered me by my clerk, Miss Rhone, who has often worked long after office hours when any matter arose which needed immediate attention.

Respectfully submitted,

H. T. FERNALD,
Economic Zoologist.

taxes so long as the owner or owners have enough of personal property by the sale of which the taxes can be raised. In other words, it is presumed that there is not on unseated lands enough of personal property to pay the taxes, and that on seated lands there is.

Taxes may be paid for a term not exceeding six years in advance upon unseated lands, the sum to be fixed at what the Commissioners may deem right. Joint owners of unseated land may pay proportionally of taxes, and the remainder of a tract may be sold. In general, in the case of lands sold for taxes in this State the rule of caveat emptor (purchase at your own risk) applies, as the purchaser is supposed to have examined into the validity of the sale. If the taxes due are paid by the first of March in the year in which the sales were to have been made, no fee is allowed for advertising the land.

“Unseated lands can only be sold by the County Treasurers in pursuance of public notice and by open vendue; they have no authority to make private sales.” It is not, in other words, a legal sale if a party other than the owner pays taxes and costs, except when done at a time and place previously published.

The right of redemption by the owner, or by anyone for him, remains for two years. But to so redeem them he must pay taxes and costs, and in addition the sum of 25 per cent.

In the event of suit being brought against the purchaser of lands sold for taxes, and the suit being decided against him, he may recover for all improvements made, and the purchaser is entitled to receive from the Treasurer, together with the redemption money, all of the taxes which he (the purchaser) has paid since he bought the land.

If unseated land once sold by the Treasurer of a county for taxes go for two years unredeemed, it then becomes the property of the purchaser.

If, on the other hand, unseated land be advertised by the County Treasurer for sale, and if at the time and place named no bid is made which equals the sum of the taxes and the cost for which the lands are advertised, then the County Commissioners may bid off the lands, and the Treasurer must then give a deed to the Commissioner or Commissioners. It is not the fact (as is generally supposed) that the Commissioners must bid off this land, if in their judgment it will be of no service to the county.

After this sale of unseated lands by the Treasurer to the Commissioners “the right of redemption shall remain in the real owner of such land for five years after such sale,” but he must pay all taxes, and costs, and interest which have accrued to the date of his redemption; then on producing the Treasurer’s receipt for the same the Commissioners must convey the land back to him.

If this unseated land which is in the hands of the County Commissioners remain for five years unredeemed by the owner, or owners,

"It shall be lawful for the Commissioners to sell any such land by public sale, and to make a deed therefor to the purchaser, but no tract shall be sold for a sum less than the amount of taxes, costs and interest, which shall be due at the time of such sale by the Commissioners."

There exists the right under certain circumstances for the Commissioners to sell unseated land for the best price which can be obtained.

There is an important decision which should be mentioned here: i. e., "when the biddings reach the amount of the taxes and costs, the duty of a County Commissioner, as a public officer, ceases, and he may purchase the land in his individual capacity."

The owner may also redeem land, with consent of the Commissioners, after five years, but he must have proof of such consent to make the redemption valid.

In Brightly's Purdon's Digest, Vol. 1, p. 523, I find the following from the act of March 31, 1860. It appears to be so commonly overlooked that I quote it here in full: "If any person shall cut down or fell any timber-tree or trees, knowing the same to be growing or standing upon the lands of another person, without the consent of the owner; or if any person shall purchase or receive any timber-tree or trees, knowing the same to have been cut or removed from the lands of another, without the consent of the owner thereof; or who shall purchase or receive any planks, boards, staves, shingles or other lumber made from such timber-tree or trees, so as aforesaid cut or removed, knowing the same to have been so made; the person so offending shall be guilty of a misdemeanor, and being thereof convicted, shall be sentenced to pay such fine, not exceeding one thousand dollars, or to such imprisonment, not exceeding one year, as the court, in their discretion, may think proper to impose."

"The act extends as well to unseated as seated lands."

"Possession under claim of title is enough. A tenant under lease of years may be described as owner." "And it is unnecessary to prove that the defendant knew who was the owner."

We further quote from the same source of information: "If any person shall knowingly and maliciously, cut, fell, alter or remove, any certain bounded tree, or other allowed landmark, to the wrong of his neighbor, or any other person, he shall be guilty of a misdemeanor, and on conviction be sentenced to pay a fine, not exceeding five hundred dollars, and to undergo an imprisonment, not exceeding one year."

It may be well here to mention that in the counties of Clinton, Centre, Butler, Lawrence and Mercer it is provided "that any person or persons who shall wilfully and maliciously trespass upon, walk over, beat down, trample or in any wise injure any grain, grass, vines, vegetables or other growing crop," is liable for double the amount of damage done and the cost of the suit. And in the same counties if any person or persons "enter any field, orchard, garden or close, with-

out the consent of the owner or owners thereof, * * * or wilfully deface, injure, break or destroy, garden or close as aforesaid," he or they are liable to a fine of not less than five, nor more than fifty dollars, or, to suffer imprisonment in the county jail of not less than ten or more than sixty days, and this does "not prevent the injured party from pursuing any civil remedy authorized by law."

I am of the opinion that the farmers of the State, who are the greatest sufferers from trespassers, will not think the punishments indicated above to be too severe, and that they would favor the application of the law to the entire Commonwealth instead of to the counties named.

From all of the foregoing statements it would appear that the rights of owners of seated and unseated lands were already sufficiently guarded. As a matter of fact, however, this is not the case. An illustration may make this clear. Suppose one purchases a tract of unseated land, and finds a squatter on it, and brings suit to test the titles, and the verdict is given in his favor and against the squatter. Appeals may be taken and after all legal processes have been exhausted the verdict still remains for the purchaser. Now mark, there is here no longer any doubt remaining. The squatter is informed perfectly that he has no title, and that he is simply a trespasser upon the ground. The owner cannot go himself and forcibly eject him without making himself liable to the charge of assault. He must employ the sheriff, at his, the owner's, expense to go and enforce the decision of the court. He has paid his taxes for protection which the county now refuses to accord him unless he pays an additional sum for it, notwithstanding that the intruder remains in such a defiance of the verdict that his conduct should be considered as contempt of court.

Nor is this all. It may be necessary to eject the same intruder from the same tract more than once. True, it can always be done, but it is attended with expense each time to the owner. It would appear that the expense of enforcing the verdict of the county court should be to the county itself.

Time is often an element in the ejection of an intruder, even after it has been decided that he has no claim to the land; and while he still remains there he may be doing an injury to the owner for which the latter may fail to recover damages, even if on trial a verdict is given in his favor, because the intruder has neither real or personal property. Indeed it may be stated as a matter of fact that such a man may be a pauper, living at the expense of the county, at the very time he is continuing his depredations upon a citizen who has paid to the uttermost farthing the taxes assessed upon him in aid of the government which is not only failing to protect him, but making it possible for an outlaw to prey upon him. I think you will agree with me that there is a defect here in existing law, and that the remedy should be for

the judge of the court which decided the trespasser had no title, to also have the additional power to lock such a man up at the expense of the county as a common enemy or outlaw, until he expressed himself as willing to recognize the verdict of the court, and cease his depredations.

There is also, it appears to me, an additional defect in existing law relating to unseated lands. For example, there is nothing stated which prevents the purchaser, or the owner, of lands sold for taxes at Treasurer's sale, from cutting and removing timber from the ground during the two years period of redemption. Purchases are often made in the expectation that once the deed has been made out to the purchaser (but before the period of redemption has passed) he, the purchaser, may succeed in removing considerable bodies of timber before the owner can have a writ of estrepement issued and served.

It is true that the writ of estrepement is the legal remedy, but it is often a costly one, to both parties, and might be easily prevented by the law distinctly prohibiting any cutting, or felling of timber, until the period of redemption had passed; unless by a distinct agreement between the parties interested. This would certainly save much litigation, and neither wrong any party, nor prevent lumbering by mutual agreement, nor take any advantage of the Commonwealth.

In addition to the suggestions already made there is urgently required some prompt method of dealing with ordinary trespassers on timber lands. Wrong done to the single owner may indeed be small, but the aggregate injury to the State during the course of the year is often enormous. For example, a large portion of the forest fires are started by this class of persons, who are often not only pecuniarily irresponsible, but who very frequently do not belong in the community and have no interest in it. Forest owners are entitled to protection. Plea for it is not made as an act of charity to them, but because it is inherently right that they should have it.

In order to heighten the contrast we quote here in full the act of June 18, 1895, which accords full protection to the property and products of the farmer against trespass:

AN ACT

To amend an act, entitled "An act to protect fruit, gardens, growing crops, grass, etc., and punish trespass," approved the eighth day of June, Anno Domini one thousand eight hundred and eighty-one, so as to protect berries and nuts by punishing trespass.

Section 1. Be it enacted, &c., That section one of an act, entitled "An act to protect fruit, gardens, growing crops, grass, et cetera," approved the eighth day of June, Anno Domini one thousand eight hundred and eighty-one, which reads as follows, viz: "That any person

or persons who shall wilfully enter or break down, through or over any field, orchard, garden or yard fence, hot bed or green house, or who shall wrongfully club, stone, cut, break, bark or otherwise mutilate, or damage any field crop, nut, fruit or ornamental tree, shrub, bush, plant or vine, trellis, arbor, hot bed, hot or green house, or who shall trample, or in any wise injure, any grain, grass, vine, vegetables or any other growing crop, or who shall wilfully take or carry away any grain, corn, rye, wheat or other field crop, fruit or vegetable, plants, fruit or ornamental trees, vines or shrubs, whether the same be attached to the soil or not, shall subject said person or persons to a penalty of not less than five, nor more than fifty dollars for each and every offense," be and the same is hereby amended to read as follows:

That any person or persons who shall wilfully enter or break down, through or over any field, orchard, garden or yard fence, hot bed or green house, or who shall wrongfully club, stone, cut, break, bark or otherwise mutilate or damage any field crop, nut, fruit or ornamental tree, shrub, bush, plant or vine, trellis, arbor, hot bed, hot or green house, or who shall trample or in any wise injure any grain, grass, vine, vegetable or other growing crop, or who shall wilfully take or carry away any grain, corn, rye, wheat or other field crop, fruit or vegetable, plants, nuts or berries, or any fruit or ornamental trees, vine or shrubs, whether the same be attached to the soil or not, shall be subject to a penalty not exceeding fifty dollars for each and every offense.

Approved—The 18th day of June, A. D. 1895.

DANIEL H. HASTINGS.

It is a common impression that hunters and fishermen as a class deplete upon the unseated lands of the Commonwealth. While there is truth in the idea, it should be distinctly remembered that no class of the community is more sincerely desirous of seeing the land owners properly protected than the best representatives among the hunters and fishermen, and it is respectfully suggested that all forest rights would be more secure if the friendly aid of these persons were more cultivated by the land owners and more appreciated by the State. The true sportsman has everything to gain by assisting in detection and punishment of those who break the laws which are designed to protect the forests and its inmates.

The time may be near at hand when it will be an act of political wisdom, and wise economy, on the part of the State to pay the entire cost of suppression of forest fires on unseated lands in such counties as Pike, Sullivan and Forest, where the area to be guarded is enormous in proportion to the population. Indeed I should favor immediate action in this direction.

It must be said that so long as those who create forest fires go unpunished, we may expect the destruction to continue. There is but

one method of appeal to a class that is directly responsible for a very large portion of our conflagrations.

While it is wise on the part of the State to suppress, as promptly as possible, forest fires when they occur, it is most unwise to allow a single case to pass without a serious and determined effort to discover how or by whom it was caused, and then if there was guilt, or negligence, associated with it, to bring the offender to justice.

The past season has been by no means one of serious forest fires. This was due in part to the damp weather and also, in part, to the fact that the continuous agitation against them has had a certain effect in awakening public attention to the losses which they occasion, and to the need of care to prevent them.

The law of 1897, which made constables of townships ex-officio fire wardens, has been tested and given, so far as I am informed, fairly satisfactory results. It could hardly have been expected that such an innovation could have been made without causing more or less friction. We may fairly assume that time will adjust the new conditions.

The act of July 15, 1897, which makes it the duty of the County Commissioners to appoint persons to ferret out those who create forest fires, was the best that it seemed possible to procure at the time. If rigidly enforced it will be a power for good. There is, however, in my judgment, a serious defect in it. First, the appointments of detectives to find and bring the culprits to justice are very likely to be made upon political grounds, and these detectives are the ones, of all others, the ones least likely to wish to incriminate their neighbors. It would be vastly better if a reasonable sum of money were placed at the disposal of the Commissioner of Forestry for the specific purpose of hiring competent and willing officials to do this work. It would relieve others of a disagreeable though necessary duty, and probably result in securing a larger number of convictions than are obtained under the present law.

REBATE OF TAX ON STANDING TIMBER.

It is doubtful if any measure passed by the Legislature in its last session will ultimately be of greater general good than the one introduced by the Hon. Ziba T. Moore, which "provides for the preservation of forests and partially relieving forest lands from taxation." In itself, immediately considered, it appears like an unimportant measure, but it came as a distinct relief to our farmers, many of whom are now taking advantage of it. The real principle which the State, by the passage of this act, has allowed, is that standing timber confers a benefit upon the community at large, and that so long as the owner allows it to stand he is entitled to a partial relief from taxes, because of the benefit which his trees are conferring upon the Commonwealth.

INCREASE IN OUR AREAS OF EVAPORATION.

Our areas of evaporation are becoming larger and our areas of water-retention are being correspondingly reduced. What this means may be easily understood when we remember that from a mile square of water surface there would evaporate during the month of July on the average 3,339,304 gallons of water. Our larger, as well as our smaller, streams, are however during the warmer months of the year reduced in evaporating area until but a small portion of the stream bed is covered with water. The thirsty air makes, therefore, increasing demands upon the moisture in the agricultural areas, until the drought jeopardizes the very life of the growing crops; notwithstanding the fact that as much rain falls as formerly. There can be no doubt but that one reason for this great loss of water from the State's surface is due to the removal of forest covering, which changes the condition from a water-retaining surface to an evaporating surface. Even granting that land in crops is shaded and hence to a certain extent protected from the direct rays of the sun, it is well known that from such ground the rate of evaporation is much larger than from a forest covered area.

The above statements might be put in a practical form by taking adjacent parts of the counties of Dauphin and Perry. The Susquehanna river separates these counties, and the Juniata runs through the northeastern portion of Perry. The aggregate surface area of these two stream beds from Georgetown to Rockville and from Middletown to Juniata bridge, would probably be not less than thirty-one miles. If one square mile during a summer month is capable of evaporating 3,339,304 gallons of water, then from this thirty-one miles there should be evaporated 103,518,424 gallons of water. If, however, by reason of low water, one-half of the stream bed becomes dry, then the evaporation is reduced to 51,759,212 gallons. In other words, the air passing over the adjacent regions is so much less near the point of saturation and therefore the more eager to absorb moisture from the cultivated surfaces.

Or we may put the proposition in another form. Air which would have the whole of the above quantity of water (103,518,424 gallons) in the form of vapor would be much more likely to deposit a portion of it in the form of dew, which to a certain extent is directly or indirectly available for the support of plant life, even if it did not occasionally take the form of showers which would refresh the whole plant through the roots.

From all of the facts, available now, it would appear that the denuded condition of so much of our ground is becoming a menace to our general prosperity. If this is so then it is a duty of the hour to anticipate and prevent it, by encouraging the renewal of timber on lands

which are now stripped of timber, and which have little or no agricultural value.

THE STATE FORESTRY RESERVATIONS.

By act of the last Legislature the Governor of the Commonwealth was authorized to appoint a commission which should locate three State Forestry Reservations of not less than 40,000 acres each, one of which was to be upon the headwaters of each of the three principal streams of the Commonwealth.

For good reasons this Commission has not yet been completed and the work commenced. It is thought, however, that the importance of these reservations is now so evident, and the demand for them among our more thoughtful citizens so general, and the probable loss to the State by delay so certain, that the work should be commenced at once. It is very clear that the longer this is postponed the more it will cost to obtain the land and the poorer it will be when purchased.

From whatever standpoint we consider the relation of these reservations to the future policy of the State it will appear that they are needed. No investment that the Commonwealth may make will more surely be approved by the future. We need them on sanitary grounds, and for the purpose of regulating the water flow from our highlands. And to aid in conserving the very moisture in our air, as well as to maintain a valuable crop of timber on lands which have no other productive capacity.

If it were a new experience in government we might hesitate about making the start, but our neighboring State of New York is already well satisfied with the wisdom of setting apart, for public purposes, large areas in the Adirondacks. The General Government too is already pledged to the policy. England, in India, is already reaping a golden harvest for the forestry policy she inaugurated. If the German government were to be deprived of the revenue it receives from the State forests it would dwindle to a second-class power.

COST OF SUPPRESSING FOREST FIRES.

Up to date of the delivery of this manuscript (January 19th, 1899), there have been received at this office reports from 39 counties. Of these 30 have been approved and forwarded to the Auditor General for payment. The cost to the Commonwealth so far as heard from has been \$2,143.59. We append here a tabulated statement:

AMOUNTS PAID OUT BY THE SEVERAL COUNTIES OF PENNSYLVANIA FOR THE SUPPRESSION OF FOREST FIRES, AND THE DETECTION OF THOSE WHO CREATED THEM, UNDER THE ACTS OF MARCH 30TH, 1897, AND JULY 15TH, 1897.

Counties.	Amount paid wardens, under act March 30, 1897.	State's portion.	Amount paid detectives, under act July 15, 1897.	State's portion.
Adams,	\$36 51	\$18 26		
Allegheny (no expenses),				
Armstrong,				
Beaver,				
Bedford,	87 19	43 59	\$4 40	\$2 20
Berks,	62 55	31 27	300 00	150 00
Blair,	41 55	20 77		
Bradford,	14 22	7 11		
Bucks,				
Butler,				
Cambria (no expenses),				
Cameron,	42 24	21 12		
Carbon,				
Centre,	269 25	134 63	44 42	22 21
Chester,				
Clarion,	6 12	3 06		
Clearfield,	49 11	24 55		
Clinton,	3 51	1 76	65 00	32 50
Columbia,	162 88	81 44		
Crawford,				
Cumberland,	107 98	53 99	262 50	131 25
Dauphin,	135 20	67 60	150 00	75 00
Delaware,				
Elk,	25 35	12 68		
Erie (no expenses),				
Fayette,				
Forest,	163 17	81 58		
Franklin,	158 75	79 38	63 50	31 75
Fulton,	17 77	8 89		
Greene,				
Huntingdon,				
Indiana,			112 50	56 25
Jefferson (no expenses),				
Juniata,				
Lackawanna,				
Lancaster,				
Lawrence,				
Lebanon,				
Lehigh,	121 22	60 61		
Luzerne,				
Lycoming,				
McKean,	3 12	1 56	99 70	49 85
Mercer,				
Mifflin,	284 05	142 03		
Monroe,				
Montgomery,	19 14	9 57		
Montour,	13 83	6 92	100 00	50 00
Northampton,				
Northumberland,				
Perry,	75 45	37 73		
Philadelphia,				
Pike,				
Potter,	106 55	53 28		
Schuylkill,	360 69	180 35	400 00	200 00
Snyder,	22 29	11 15		
Somerset,				
Sullivan,	44 16	22 08		
Susquehanna,	38 64	19 32		
Tioga,				
Union,	29 03	14 52		
Venango,	19 95	9 98		
Warren,			21 00	10 50
Washington,				
Wayne (no expenses),				
Westmoreland (no expenses),				
Wyoming,	142 59	71 30		
York,				
Totals,	\$2,664 06	\$1,332 08	\$1,623 02	\$811 61

We believe that the money has been well expended and that the continued operation of the law will be productive of great good to the State.

It is furthermore worthy of note that there is a strong effort to make constables of the State game and fish wardens for the future, as they are already fire wardens, thus extending and increasing the successful operation of the forestry law.

ASSESSORS' METHODS OF REPORTING TIMBER LANDS.

We have repeatedly called attention to the inexact method of the assessors in reporting the areas of the timber lands of the State. Such methods might have been tolerated in earlier years, but they are valueless for scientific or statistical purposes, and actually mislead rather than help any one desiring information for personal or State investigation. Some better system cannot be employed too soon.

Attention is also called to a change which might be advantageously made in the act of March 30, 1897. As the law now stands it is made the duty of the County Treasurers and County Commissioners to give notice of lands about to be sold for non-payment of taxes, by publication once a week, for six successive weeks, in at least two newspapers of general circulation, etc. It is thought that the words "four successive weeks" might advantageously be substituted for "six successive weeks." As the law now stands it is alleged to prove a hardship in some of the more sparsely populated counties.

ADDITIONAL METHODS OF OBTAINING LANDS FOR STATE PURPOSES.

We may well profit by the example of the State of New York in some methods of obtaining land for State purposes. Originally it acquired much forest property by purchase of tracts sold for taxes, as we are now doing. It was unavoidable that between the tracts so acquired there would be other areas which in themselves were of equal value and which, if added to the tracts already purchased, would greatly enhance the value of the public possessions.

Authority was given to those having the State lands in charge to exchange outlying areas for those intervening ones, so that the property of the Commonwealth might thereby be consolidated. Then too certain tracts were turned over or sold to the State conditionally, as part of the reservation, by the owner, who retained certain privileges. The main purpose of the State was the protection of the water shed. To this all the others were subservient, even the pecuniary value of the timber being of secondary importance. If the owner retained his hunting or fishing privileges, and even his summer residence there, it is certainly conceivable that he might do so without in any way interfering with the purposes of the State. New York has wisely recognized this and so acquired a number of tracts which are of great value as parts of her already large forest domain.

We have in one sense recognized the co-operative element in exempting from seizure "any land by any corporation created for the purpose of the preservation of forests!"

It is therefore suggested that it would be wise if the Commissioner of Forestry were authorized to secure tracts for the State which were from any reason specially valuable to it, provided that the price paid should not exceed the assessed value of the lands and that the purchase be made with the knowledge and consent of the Governor and of the Board of Property of the State, which consists of the Attorney General, the Secretary of the Commonwealth and the Secretary of Internal Affairs. It would appear as if under such protection to the Commonwealth it would be advantageous to so enlarge the powers of the Commissioner of Forestry as to enable him to secure for the Commonwealth other lands than those which were sold for the non-payment of taxes.

THE WOOD PULP INDUSTRY.

Though of recent origin this bids fair to be one of our most important industries. Looking at the possibilities it would appear as if they were almost infinite. The one condition upon which most depends is an adequate supply of the raw material. Unfortunately this cannot, so far as Pennsylvania is concerned, be regarded as assured under present conditions. On the other hand, there is no reason why, under proper encouragement, the State should not continue indefinitely to produce each year vast quantities of suitable material for the pulp industry.

It was hoped during last season to have undertaken an investigation of the various problems connected with the future supply of pulp wood by Pennsylvania. But the pressure of work prevented, and it is on the list for 1899. This should include, first of all, a study of the kinds of wood best fitted for pulp making, whether these be native here, or introduced. Examination should also be made into the best methods of planting and raising such wood, the length of time required before it becomes ready for use, and the soils best adapted to its growth, as well also as the kinds of soil, if such there be, where it will grow, and upon which other valuable timber cannot be raised.

It should also be remembered that the pulp wood manufacturer can utilize wood long before it becomes valuable to the lumberman, and that he can use to advantage wood of a quality so inferior in length of stem that it never would have a value at the saw mill.

The facts indicate that we have a large area in Pennsylvania which should at the earliest possible hour be devoted to the growth of pulp wood, because it is now raising no crop of value and because also, the demand for this product is certain soon to exceed the supply. The urgency of this subject is well illustrated by the fact that the manufacturers of pulp are already pronounced advocates of scientific for-

estry, because they recognize that the stock of wood in sight, and suitable for their work, will probably soon become low and that nothing but the most prompt and certain means of increasing the supply will enable them to maintain and increase their business.

In fact the pulp manufacturer promises in the near future to be not only the greatest purchaser of wood, but also among the best friends of the forestry movement, because as timber grows more scarce he will be driven to utilize the smaller portions of the tree trunks which never can have value to the lumberman. In short, he will probably clean up and remove from the forests much of the debris which now remains and furnishes the fuel for our most destructive fires.

PLANT LIFE AS AFFECTED BY ATMOSPHERIC IMPURITIES.

We hoped during the season of 1898 to have had investigations made of the plant life in the Western part of the State as alleged to be affected by atmospheric impurities. The office, however, was so busy that it was impossible to do so. This should be one of the first lines of investigation undertaken during the present season and the work should be continued until a thoroughly satisfactory and practical, business-like answer shall have been obtained.

INSECT DEPREDACTIONS.

Civilized life always changes the conditions existing before it appeared and the changes continue as the conditions vary. Hence it is, that we may expect insect and fungal foes to our plant life to continue their depredations with constantly changing results as the years pass. It is one function of government to give the earliest possible warning of the approach of these enemies and to check their ravages as early as may be possible. It is clearly beyond the power of the individual to do so, and if these depredators are allowed to continue, the harm they work is often beyond estimate.

The truth of these statements will become more and more clear as our population becomes more dense, and our national life more intensely active.

Forest trees, as well as our crops, are frequent sufferers from these insect and fungal foes. In some instances large areas of timber are destroyed, and some insects hitherto causing but little damage are now becoming serious pests.

It is probably fair to assume that the recent appearance (and the more frequent appearance as well) of these enemies is partly due to our disturbing the balance which formerly existed here among living things. Thus the birds destroyed many of the noxious insects; but as we destroyed the nesting places and drove off the birds the insects upon which they fed have multiplied until we now recognize, as we never did before, their presence by the injuries they do.

It is therefore of the first importance that investigations into the life histories of these foes be made in order that methods may be discovered of destroying them. Our own negligence in this respect is in strong contrast with the constant vigilance which other nations have learned must be observed.

UNSEATED LANDS PURCHASED BY THE STATE.

The latest information we can furnish concerning the lands obtained for the State by the authority of the above act is that we have purchased, in all, in the counties of Cameron, Clearfield, Clinton, Elk, Lycoming, Monroe and Pike, 55,281 acres and 84 perches. Of these, 51,799 acres and 33 perches were purchased at Treasurers' sales, and 3,482 acres and 51 perches at Commissioners' sales. That obtained from the Commissioners is now absolutely the property of the State. The lands obtained at Treasurers' sales are subject to redemption by the owners for a period of two years. In fact, 3,037 acres and 68 perches have already been redeemed.

STARTING FOREST TREES FROM SEED.

We are in receipt of so many inquiries as to the best methods of starting young trees of the following species from seeds that we append the following:

PLANTING SEED OF FOREST TREES.

In order to make a success of growing nuts some knowledge of detail is required. First of all, there is a very nice little book, published by Orange Judd Company, New York, entitled "Fuller's Nut Culturist." It is a cheap book, not costing over a dollar or a dollar and a half, and full of good, practical information.

Each of these nuts—chestnuts, hickory nuts and walnuts—requires a special treatment. For example, to plant chestnuts successfully one must not allow the nut to become dry. A dry chestnut seldom, if ever germinates. Therefore, get your chestnuts fresh, put them away in damp, not wet, sand, in a cool place, until you are certain they would not sprout that season if planted. Then plant them in a shallow furrow, which is not over two inches deep, cover them very lightly with leaves, and put on the leaves just enough of fine earth to keep them from being blown away. Your chestnuts will come up early in the spring and make a growth of possibly eighteen inches during the first year. When they are one year old, lift them carefully, prune off any excess of tap root, and put them out again before their roots have become dry. This will bunch the roots and enable you to transplant them easily wherever you wish them to go.

Another way is to take the chestnuts out of the sand box and take small baskets, like the quart strawberry baskets, put in a fine layer of

richly pulverized earth, and a layer of chestnuts, then another layer of earth and another layer of chestnuts, and so on until the basket is full. Bury the basket, or baskets, in the earth, like one would potatoes, but don't cover too deep. In the early spring, about April 1, take the basket out, turn out the earth and you will likely find that the chestnuts have sprouted. Plant them carefully, cover them an inch deep, and you will probably have no trouble.

Now as for walnuts. Get your walnuts in the fall, bruise the outer green husk, so that it is broken, but without injuring the inner shell. Plant them at once in a shallow furrow under an inch and one-half of fine soil. When they are one year old dig them up carefully, injuring the roots as little as possible, but cut the tap root back until it is about six inches long. Transplant immediately. Most of them will grow, and can be transplanted the second time, when they are two years old, where you want them to remain.

Shellbarks are uncertain, possibly because many of the nuts fail of fertilization in the flower, and therefore can not start a young plant. The best plan, however, in my judgment, is to keep them moist in a cool, damp place, in sand, until late in the fall, then plant them as you did the chestnuts. Their growth will be slow and unsatisfactory, probably. But when they are a foot high, which will be in two or three years, lift them carefully, cut back the tap root, and plant them as directed for the walnuts. When they are two or three feet high the young shellbarks can be planted where they are to remain. There will be great uncertainty about inducing young shellbarks of this size to grow when transplanted unless their tap root has been cut back when a year or two old.

Beech nuts, or beech trees, have never yet come in this country to be considered a crop. The beech nut requires about the same care and the same method of treatment that have been advised for the chestnut.

There is another class of trees, concerning which inquiries are frequently made as to methods of planting; such, for example, as the wild black cherry. It is commonly stated that the fruit of this tree, planted in the autumn, will not grow. There is a misapprehension about this, as the young trees may be readily produced from the wild cherry, provided we follow the intimation that nature has given us.

Fruits of this character having a soft pulp are usually bright colored and widely diffused over the region in which they will grow. The bright colored covering is an attraction to the birds. This is well known in the case of the gum tree, the wild cherry and even the pokeberry. If these fruits are allowed to dry, with the pulp on them, the hardened exterior seems to prevent, in some way or other, the growth of the young plant within. Evidently nature intends that these fruits shall be eaten by the birds, the pulp digested off and the seeds, themselves, passing unharmed through the alimentary canal, be scattered

over the region inhabited by the birds. The horticulturists are aware of this fact and get rid of the fleshy covering of the fruit, either by washing them or macerating them in water until the pulp is wholly removed from the seed. The seeds may then be placed away, kept over winter, sown in the spring, or in the autumn.

It is well to bear in mind that many efforts at planting of tree seeds fail of success because the seeds are planted too deeply; nature herself seldom gives them more than a covering of leaves. If planted too deeply the seeds may commence growth, but the young plant may fail to reach the surface because its store of nourishment becomes exhausted before it reaches daylight, and it can only reproduce a fresh supply after the surface of the soil is reached and green leaves formed.

I am sir, with great respect,

J. T. ROTHROCK,
Commissioner of Forestry.

REPORT OF THE DAIRY AND FOOD COMMISSIONER.

HARRISBURG, PA., January 1, 1899.

HON. THOS. J. EDGE, *Secretary of Agriculture:*

DEAR SIR: I have the honor to report as follows concerning the work of this division of your Department under my direction for the year just closed.

We have at present, regularly at work, seven agents collecting samples and instituting prosecutions, etc., for violations of the various laws in different parts of the State. We have six chemists employed, some giving nearly their entire time to the work of analyzing the various samples sent in by our agents. We have one salaried attorney in Philadelphia and one in Pittsburg. Others are temporarily employed as the exigencies of the work require.

The recent decision of the United States Supreme Court pronouncing our prohibitory law governing the sale of oleomargarine unconstitutional, so far as it relates to sales by manufacturers or their agents in an original package, has had the effect of largely increasing the sale of oleomargarine in our State. Large concerns that had moved out and carried on their business in adjoining states have returned and now are carrying on their business here, as they undoubtedly have a legal right to do, provided they confine their sales to the original package as construed by the United States Supreme Court.

This decision has incidentally been the cause, in my opinion, of flooding our State with agents, who are interested in the sale of oleo, seeking to establish local agencies and often, no doubt, going far beyond the limit authorized by the Supreme Court decision, until persons are deceived and led to believe that they have a legal right to engage in its sale.

Many reputable business firms are misled in this way, believing they have a right to sell, and, when confronted with an arrest, persist in continuing the business until the matter is decided in court.

The New Hampshire act requiring that oleo shall be made a designated color, was recently pronounced unconstitutional by the United States Court because it was virtually prohibitory; and for this reason alone. In view of this fact we have good reasons to know what to expect should our prohibitory law in its entirety come again before this court.

I consider that my province as Commissioner is to enforce as far as

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THE PENNSYLVANIA
STATE COLLEGE
AGRICULTURAL EXPERIMENT STATION.

BULLETIN No. 23.

FOREST FIRES.

EXPERIENCE WITH EVERGREENS IN PENNSYLVANIA

APRIL, 1893.

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AGRICULTURAL EXPERIMENT STATION.

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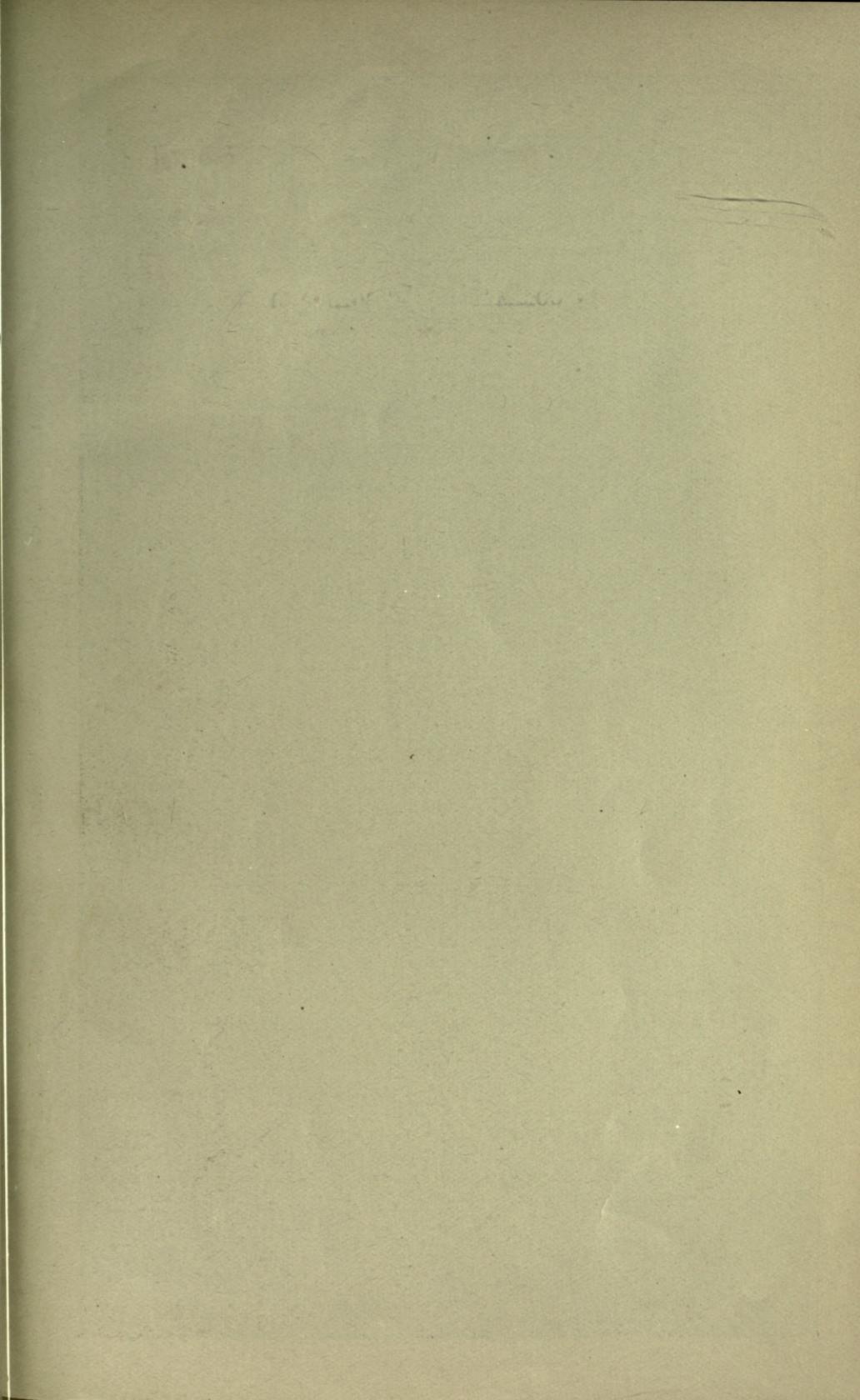
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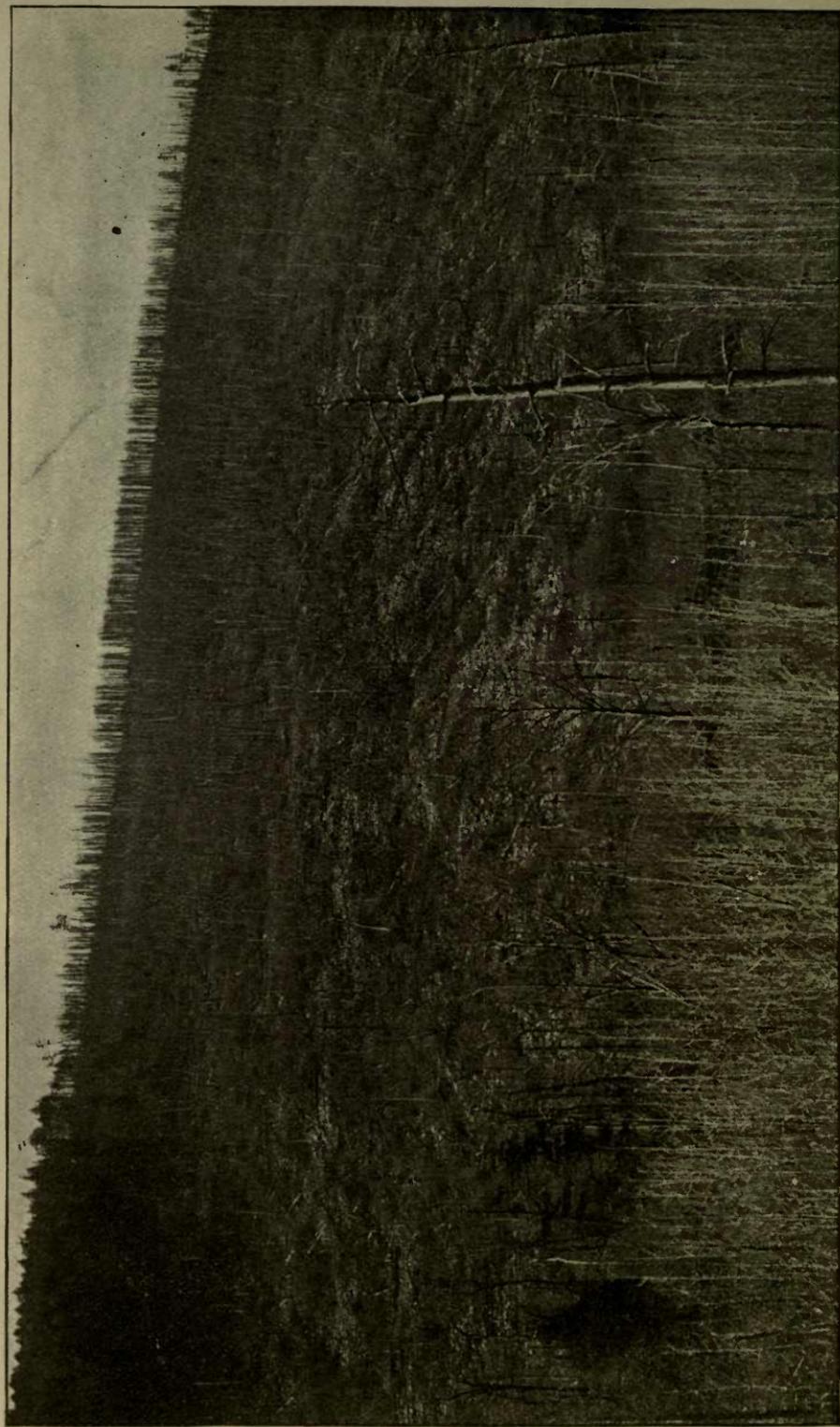
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 The bulletins and reports of this Station will be mailed regularly, free of charge, to all residents of the state who request it, so far as the supply will permit. Address, *Director of Experiment Station, State College, Centre County, Pa.*

Visitors will be welcomed at all times and given every opportunity to inspect the Station in all its departments.





VIEW ON WHITE MOUNTAIN, MIFFLIN COUNTY, PENNSYLVANIA, SHOWING EFFECTS OF FOREST FIRES.

THE PENNSYLVANIA
STATE COLLEGE
AGRICULTURAL EXPERIMENT STATION

BULLETIN No. 23.

FOREST FIRES.

BY WM. A. BUCKHOUT.

The time of the year is at hand when forest fires are wide spread and destructive. So common have they become in many parts of our state that their appearance causes but little surprise, and they are looked upon almost as a matter of course, little if anything being done to prevent or to extinguish them, unless they threaten to involve specially valuable timber, fences or buildings. On our mountain and other lands from which the usable timber has been pretty fully gleaned fire is almost an annual occurrence. The drying winds of spring put the loose combustible matter in such condition, that the slightest spark starts a fire which spreads with great rapidity, often involving several square miles of territory, and extending to a distance determined only by the character of the weather and the amount of young sappy growth encountered. The common opinion seems to be that no great harm is done since there is so little visible which has any market value, and hence our mountain and other lands which should be in process of reforestation are periodically burned over, and even the owners appear to pay little heed to it. Every one admits that if fire could be kept out new tree growth would gradually get a foothold, and in time complete reforestation would take place through seedlings and sprout growth. In favorable places which have been protected from the inroads of fire this second growth has often become an important factor in the timber supply; and in some parts even of the older settled districts there is now a

greater acreage of timber than there was forty or more years ago just after the original growth had been removed. But since this reforestation is a slow process, and under present conditions the danger from fire so great, few pay adequate attention to the matter. It does not seem to be worth what it will cost.

While the value of this second growth is a prime reason for using all means necessary to secure it, there is another reason for so doing, namely, because of the generally beneficial climatic value which a moderate proportion of woodland gives. This climatic influence, difficult to state exactly, consists in part in the mechanical protection which a well-wooded surface affords against very rapid melting of snow, and the the eroding, plowing action of mountain torrents, in protection from severe winds, and, in part, in the more uniform moisture and heat imparted to the surrounding atmosphere. Small and difficult of measurement as such influences may be over an acre of ground, they become great over square miles of territory, and no better bulwark can be secured against the periodical washing and gullying of freshets than through the maintenance of our mountain and other forests. Forest fires thus destroy the new growth which would in time be of direct money value, and also open the way to and permit those extremes of flood and drought, and those destructive winds which render more precarious and uncertain all our labors. Not only this but there is still a third reason why they are such a serious injury, namely, because they destroy those conditions of soil and surface which make forest growth possible. For, on mountain and rocky land particularly, the most serious bar to tree growth is the extreme thinness and poverty of the soil, derived from rock disintegration and the accumulation of organic matter. Anything which interferes with this natural process by which all soils have been produced, by so much prolongs the time before trees can gain a foothold, and by so much retards their rapidity of growth. Fires, by consuming the leaves and twigs, leave a mere film of ashes in place of the decomposing mass which is so potent in the production of a soil. This is swept away by the first rain or strong wind, and any district periodically burned over loses more or less fully this beneficial covering. For these reasons the destructiveness of forest fires, although not readily estimated in dollars and cents, is none the less real, and the necessity for their prevention or better control none the less imperative.

The accompanying illustration shows in a very striking man-

ner both the direct effect of a fire in destroying standing timber and the indirect effect in destroying forest conditions, whereby reforestation becomes exceedingly difficult and prolonged. It represents a part of the north side of White Mountain, Mifflin county, Pennsylvania. It is by no means an extreme case, but can be paralleled at many other places in the state.

We find that the causes of forest fires vary greatly in different localities, and that from the circumstances of the case, they are often difficult to detect. There can be no doubt, however, but that they are frequently due to criminal carelessness and indifference on the part of hunters, fishermen, berry pickers and the like. Such persons being permitted to range at will for some minor purpose are indifferent to, or contemptuous of, the potent value of wild lands, and, since little of direct value is in sight, think but lightly of starting a fire which may get beyond their control, or even of firing directly, if it suits them to do it.

Men who are fully alive to the value of buildings and bonds, and would never think of applying the torch to them, have sometimes no hesitation in starting a mountain fire, which may burn over square miles of territory before it stops, and do inestimable damage in destroying forest conditions. It is against such ignorance, indifference and malice that we should lift a warning voice, and enlist all the force at our command. Forestry, in this country, with all its attendant benefits, can never take a strong hold and become well rooted in our economy until this state of affairs becomes radically changed.

It is a standing menace to any effective forest legislation or practice. It renders all our efforts weak and uncertain, causes the withdrawal of what little capital is invested in lands capable of reforestation, and, if continued, will make all such lands as barren and unproductive as a Sahara in spite of our favorable climate and the spasmodic efforts of nature to repair the injury. More than this, it will react more or less directly upon our use of cultivated land, and, indeed, upon all industries since they are so intimately bound together that the prosperity of one is the prosperity of all.

How to remedy or improve this lamentable condition of affairs is the practical question which confronts us to-day. We have some laws upon the subject, and although they are generally admitted to be imperfect and but partially effective, it is equally evident that they are not put in operation as they should and

might be, if all persons were to insist upon their right under them. Before we can hope for thoroughly effective and satisfactory laws of any kind, we must determine by fair and full trial the operation of those already in existence.

The laws of general application and force at the present time are two.

1. An act to protect timber lands from fire, approved June 2, 1870.

WHEREAS, It is important to the people of the state that timber lands should be protected from fire, which, owing to malicious conduct and carelessness of individuals, is causing vast havoc to the young growing timber, especially among our mountains; therefore,

SECTION 1. *Be it enacted by the Senate and House of Representatives of the Commonwealth of Pennsylvania in general assembly met, and it is hereby enacted by the authority of the same,* That it shall be the duty of the commissioners of the several counties of this commonwealth to appoint persons under oath, whose duty it shall be to ferret out and bring to punishment all persons who, either wilfully or otherwise, cause the burning of timber lands, and to take measures to have such fires extinguished where it can be done; the expenses thereof to be paid out of the county treasury, the unseated land tax to be the first applied to such expenses.

By act approved May 19, 1871, the county of Lycoming is exempted from the provisions of the act of June 2, 1870.

Few persons have taken advantage of the privileges conferred by this law, partly, perhaps, from ignorance of it, and partly because of the trouble involved. It is obvious that the application for appointments under the act must be made before a fire occurs, when it is suspected only that there is danger of fire, since evidence can be but rarely obtained afterwards. There is apparently no good reason why this may not be done. Should the law then prove ineffective or unwise it should be amended or repealed. At present it is practically a dead letter.

2. An act to prevent the burning of woods in any of the counties of this commonwealth, approved June 11, 1879.

SECTION 1. *Be it enacted, etc.,* That any person or persons who shall wantonly and wilfully kindle any fire on the lands of another, so as to set on fire any woodlands, barrens or moors, within the limits of this commonwealth, shall be guilty of a misde-

meanor, and on conviction thereof shall be sentenced to pay a fine not exceeding \$300, and undergo an imprisonment not exceeding twelve months, or either or both at the discretion of the court; and prosecutions for such offenses may be commenced at any time within two years from the commission thereof.

SECTION 2. Upon the conviction of any person or persons from any of the offenses aforesaid, the commissioners of the county in which such conviction is had, shall pay to the prosecutor in every such case the sum of \$50 out of the county treasury as a reward for the apprehension and conviction of the offender, and the defendant or defendants shall pay the same, with the costs, as in other cases, into the hands of the sheriff for the use of the county, and nothing herein contained shall prevent the prosecutor from being a competent witness in the prosecution aforesaid.

Cases and convictions under this act are likewise of infrequent occurrence. It is seldom that satisfactory evidence can be obtained.

A large portion of the land exposed to firing is the property of companies or non-residents, and protection does not seem to them to be worth what it costs. A further complication arises from the ease and freedom with which such lands are overrun by a miscellaneous horde of hunters, fishermen and berry pickers, who are, for the time being, as the owners themselves, cutting, burning, destroying without let or hindrance. Against them the ordinary laws regarding trespass are seldom enforced.

These laws which give large control into the hands of an owner are, on the whole, but little employed, from fear of incurring ill will and malice, and too often from a greatly mistaken idea of the insignificant values threatened and impaired by such trespassing.

We need a radical change of practice in these regards. Notwithstanding the laxity of public sentiment and the imperfectness of our laws, it is possible to accomplish a good deal if there is community of action.

Let all organizations, not only of granges, farmers' clubs and agricultural societies, but also all bodies which own or control our forest lands, combine to apply and enforce the laws regarding trespass and firing, and agree to support one another in so doing. Judicious action of this kind could hardly fail to inaugurate a new era, and to pave the way for a new law whereby some township officer, perhaps a new one, shall be a firewarden, re-

quired to be on the alert to prevent fires, and empowered to summon help to extinguish or surround them. The time has arrived and seems favorable for this radical change. And no state is more in need of it or will be more benefited by it than Pennsylvania. With a large acreage of land unfitted by nature for any purpose but forestry, and admirably placed for conferring continuously all those benefits which flow from the preservation of a liberal percentage of land in forests, its greatest lack is adequate protection from fire and trespass. This is both a disgrace to our civilization and an injury to our prosperity. The remedy lies with the people themselves. They should not be slow to apply it.

EXPERIENCE WITH EVERGREENS IN PENNSYLVANIA.

BY GEORGE C. BUTZ.

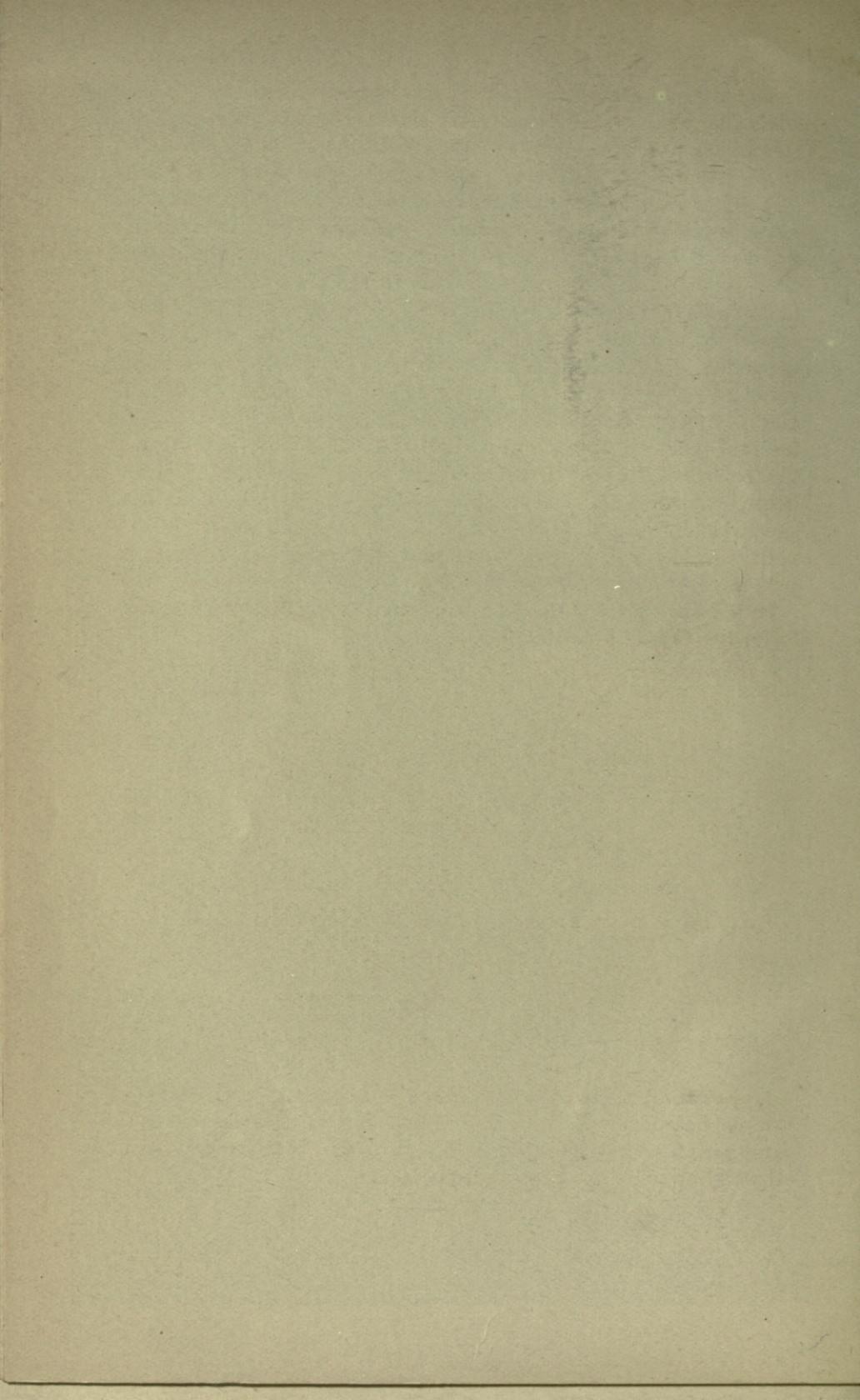
Of the great variety of evergreen trees grown for sale in the larger nurseries, only a very few species are selected for general planting, and the amount of such planting of Coniferæ seems to diminish in the cities of Pennsylvania; not, however, from a lack of appreciation of the beauty which such trees possess, but because of the conditions which prove so adverse to their health and growth. The gases of closely built cities cause a loose and stunted growth, which is more marked on evergreens than on deciduous trees, and very soon a heavy coat of soot and dust covers the trees and forever hides the varied beauty of color in bark and foliage. The ornamental features of an evergreen tree are: the perfect symmetry of form maintained throughout life; the graceful habit of the branches and branchlets; the color, form and persistency of the foliage, and in some cases the fruit. If these features are destroyed or concealed the tree or shrub, instead of being an ornament, would be an object fit only for the flames.

With the rapid improvement in the taste displayed in the ornamentation of home grounds, parks and cemeteries, the demand for the rarer varieties of evergreens will be proportionately increased. Such homes and public grounds are more commonly located at some distance from manufacturing establishments, and every element of beauty in tree or flower can be preserved.

Much more evidence than we now possess is needed to prove



PICEA NORDMANNII.



the adaptability and hardiness of the newer varieties of Coniferæ when planted in the different soils, and conditions prevailing in this state. We may plant, without fear of results, almost anywhere the well-known Norway Spruce, American Arbor Vitæ and others, but this fact is no guarantee of sturdy characters in the many more graceful and beautiful varieties of these species, which have been evolved by the work and careful selection of the nurserymen. An illustration of this fact is present with us. I find among the very few records of the earliest plantings of nursery stock (which were very extensive in 1860), upon the college grounds, that a large number of species, as well as some of their varieties, of evergreens were imported from the nursery of Louis Leroy, Angers, France, and to-day there are to be found only a few sturdy specimens as representatives. The early notes upon the behavior of these trees, and the time and causes of their death, have long ago been lost, and this is greatly to be regretted; for while many of the plants succumbed under the severity of our winters, some undoubtedly disappeared through pure neglect or careless destruction.

In the bill of goods received from the above nursery I find the following Coniferæ were obtained:

Pinus Austriaca.	Juniperus oblonga pendula.
“ mitis.	“ “ fragrans.
“ pinaster.	“ “ alba.
“ Laricio Corsica.	“ prostrata.
“ halepensis.	“ recurva.
“ pinda.	“ religiosa.
“ pumilis.	“ stricta.
Larix Europea.	“ squamata.
Sequoia gigantea.	“ sabina cupressifolia.
Juniperus nana.	“ “ variegata.
“ thurifera.	“ Virginiana pendula.

From other sources were obtained the following:

Picea nigra.	Pinus sylvestris.
“ excelsa.	Juniperus communis Hibernica.
Abies balsamea.	“ Chinensis,
“ pectinata.	“ Japonica.
Thuya Siberica.	“ occidentalis.
“ occidentalis.	

Out of this entire collection there are remaining on the college campus only a few of the above-named, the balance (as far as I can learn) had disappeared previous to 1870. The survivors are all well-known as hardy evergreens, namely:

- Pinus Austriaca—Austrian Pine.
 “ sylvestris—Scotch Pine.
 Larix Europea—European Larch.
 Picea nigra—Black Spruce.
 “ excelsa—Norway Spruce.
 Abies balsamea—Balsam Fir.
 “ pectinata—Silver Fir.
 Juniperus communis Hibernica—Irish Juniper.
 “ oblonga pendula—Weeping Juniper.

One serious hindrance to success with this class of plants is the stiff clayey nature of our soil. The evergreens as a rule prefer a light porous soil, with good drainage; if sand is present this condition is secured. Much difficulty has been experienced in transplanting the young trees in heavy soils, even of the common forms of conifers. Though the root-system is greatly made up of fibrous roots which tend to make removals successful, yet repeated failures occur. The young trees, when established, are more subject to winter-killing or other serious injury which effects the growth.

CONIFERÆ INDIGENOUS TO PENNSYLVANIA.

The most of our native conifers are found in loose, sandy, or otherwise well-drained soils. Only about one-half of the species growing in Pennsylvania are met with in cultivation. A complete list of our natives follows:

Abies balsamea, Mill.—*Balsam Fir*.—A northern tree reaching into Pennsylvania along the mountains. A few trees occur in the Bear Meadow's region of Centre county. The fine specimens on the college grounds had reached their highest degree of beauty when, three years ago, it became necessary to destroy them. It loses its beauty rapidly after it is about fifteen years old. Once a great favorite, now supplanted with better firs.

Juniperus Virginiana, L.—*Red Cedar*.—Growing over the state, often showing a great variety of forms. It is frequently planted for hedges, but should not be used near apples. The fungus (*Roestelia pirata*) causing the “cedar apple,” causes also the rust on the apple foliage. Specimen trees become very picturesque with age. The red cedar is easily grown from seed and will succeed in a great variety of soils.

Juniperus communis, L.—*Common Juniper*.—A variable shrub reaching down from the north into Pennsylvania. It grows from

five to ten feet in height. A great number of distinct varieties have sprung from this species, the well-known Irish juniper being the most frequently planted. The species is valuable in landscape for large rockeries or rugged hillsides.

Larix Americana, Michx.—*Black Larch*.—A northern tree known in Canada as Hackmatack. Found in the upper sections of Pennsylvania. "The wood is heavy, hard, very strong, rather coarse-grained, compact and durable in contact with the soil."—*Sargent*. This is more valuable as a timber tree, being less desirable for ornament than the European larch.

Picea nigra, Link.—*Black Spruce*.—A northern tree whose southern limit extends into Pennsylvania along the mountains, usually seen in swamps and cold mountain woods. The specimens on our grounds, now fifteen feet high, are far from being beautiful. It is a slow grower and early loses its lower branches. This cannot be recommended for ornamental purposes. The celebrated spruce beer is made from its branchlets.

Pinus inops, Ait.—*Jersey or Scrub Pine*.—Occasionally met with in Pennsylvania, in sandy soils, common in the pine barrens of New Jersey. It is of little value for ornamental planting. Some tastes will admire the picturesque shapes into which it grows.

Pinus pungens, Michx. f.—*Table Mountain Pine*.—Common in the Allegheny mountains from Pennsylvania to Tennessee. Formerly it was largely converted into charcoal in this state. This pine has not been employed much in cultivation. Considered as an ornamental tree, it must be classed with the preceding, and used sparingly. The varying irregularity of its form, with dense, short foliage, has a pleasing effect. The cones remain on the trees for many years, and impart to the tree a very distinct and singular effect.

Pinus resinosa, Ait.—*Red Pine*.—This is a native of Canada, is found in New York and, perhaps, occasionally in Pennsylvania. Its peculiar attractions are its beautiful red bark, and its tendency to produce tufts of leaves at the ends of the branches. While it is extremely hardy and succeeds in a variety of soils, yet it is not recommended for general planting.

Pinus rigida, Mill.—*Pitch Pine*.—A very common pine in this state, frequently called *Yellow Pine*. It abounds in dry, sandy, barren regions, never showing a thrifty growth, with a very

rough bark, and its living branches all clustered near the top of the tree, it presents always a sickly appearance. This cannot be recommended as an ornamental tree, neither is there much value in the wood, which possesses a preponderance of pitch and many knots.

Pinus Strobus, L.—*White Pine*.—Another very common pine in Pennsylvania, found often alone constituting extensive pine forests, from which large quantities of excellent lumber are taken annually. In cultivation this is the favorite native pine. It has a smooth bark, light green, slender leaves and usually a thrifty growth. It was first cultivated in England in 1705, and soon after large quantities were planted on English places. It will never be superseded as an ornamental pine for this latitude. Considerable space should be allotted to it to obtain fine specimen trees. It is easily grown from fresh seed and the seedlings bear transplanting very well while young. Too often attempts are made to transplant specimens four and five feet high from the woods, and these attempts result in failures; one, two or three year old seedlings may be so handled, or larger specimens from the nurseries.

Taxus baccata, var. *Canadensis*, Gray.—*American Yew*.—A straggling conifer, often called the Ground Hemlock, because in foliage it closely resembles the hemlock. This dwarf evergreen does well in cultivation if given a shaded situation. It seldom grows higher than four feet.

Tsuga Canadensis, Carr.—*Hemlock*.—The well-known and widely extended conifer of our mountains and forests bordering on streams. The lovers of evergreen trees are almost unanimous in pronouncing this the most beautiful evergreen in cultivation. It is very graceful in habit, retains a good green color throughout the winter and maintains living branches all the way to the ground, longer than any other coniferous tree we grow. In most locations the tree is very dense, greatly concealing the trunk and interior branches. Excellent hedges are made of this hemlock, and with proper pruning this may be kept as low as three or four feet, green to the base at least thirty years. The lumber is largely used as building material.

Thuja occidentalis, L.—*American Arbor Vitæ*.—The well-known evergreen of cultivation. It is very common along streams and in moist places of the north, extending southward into Pennsylvania. It is called White Cedar in Canada and along

the lakes. It is perhaps the most useful evergreen to-day in this section of the country. To grow good specimens, great care should be exercised to allow only one trunk to form, because heavy snows are very apt to injure their symmetrical form when two or more reach the top of the tree.

OBSERVATIONS ON FOREIGN CONIFERÆ GROWN FOR SEVERAL YEARS
ON THE COLLEGE GROUNDS.

Abies Normanniana, Link.—*Nordmann's Fir*.—Habitat, the Crimea and the Caucasus. A very desirable evergreen closely resembling the better known Silver Fir; having larger and more glossy green leaves. The young trees in our heavy soil seem slow in growth, although they carry an abundance of beautiful leaves, and seem not to be affected by the winters. Its adaptability in Pennsylvania has been sufficiently tested to pronounce it a very useful fir for a more general planting.

The accompanying illustration shows a very good specimen planted fourteen years in the clayey soil common in this valley. It stands fifteen feet high with a very dense growth and healthy foliage.

Abies pectinata, De Can.—*Silver Fir*.—Habitat, S. Europe. This very common fir has a noticeably slender form, its horizontal branches being short, and soon die away from below. Very young specimens are beautiful, but older trees lack many qualities that make up an ornamental evergreen. Specimens on the grounds are probably thirty years old; they stand thirty feet high with no branches under ten feet.

Biota orientalis, Don.—*Chinese Arbor Vitæ*.—Habitat, China and Japan. This was once much planted both for hedges and specimens, but has fallen into disfavor in America. It has a much slower growth than the American *Arbor Vitæ*, but a finer and brighter green foliage, which, however, turns a red brown early in the fall. Our best specimen is about twenty years old, but only seven feet high, loose and ragged in outline. This is in clayey soil; much better trees are grown in lighter and more porous soils.

Cupressus Lawsoniana, Mur.—*Lawson's Cypress*.—Habitat, N. California. Very deserving of greater popularity in Pennsylvania. It was formerly feared that it would not be perfectly hardy in this state. Our tree, now six feet high, has been planted here for about fifteen years, and has shown no signs

of suffering from a lack of hardiness. It is only now beginning to push strongly upward. The habit of the plant is exceedingly graceful, and the rich, glaucous green foliage distinguishes it among other evergreens of the same type. A great number of varieties have been selected from the seedlings of the Lawson's Cypress, showing very distinct characters.

Juniperus Chinensis mas, L.—*Chinese Juniper*.—Habitat, China and Japan. Our specimen of this large shrub is the male form (this species is dioecious) most frequently found in our nurseries. It greatly resembles our red cedar, but exhibits a special beauty in the spring when its very many male flowers are shedding their golden pollen over the plant. It has maintained a healthy condition in our soil, and shows no damage done by severe weather. At the approach of winter it turns brown only in a slight degree.

Juniperus communis Hibernica, Lod.—*Irish Juniper*.—Habitat, Ireland. A common juniper of lawns, that retains its green color remarkably well during the winter. A good specimen about sixteen feet high, thirty years old, began to die out seriously and became unsightly. Young plants four to ten feet high are at their best. Straggling branches should be tied in with a wire loop.

Juniperus oblonga pendula, Loudon.—*Weeping Juniper*.—Habitat, China and Japan. This is more of a shrub than a tree, for as it gets large the branches rest upon the ground, somewhat procumbent; the ends of the little branches are pendant, and produce the weeping effect. A specimen standing in our soil covered a space twenty-five feet in diameter, somewhat after the fashion of a Savin; the central stem standing ten feet high. The tips of the small branches were sometimes hurt by hot sun in summer.

Juniperus occidentalis, Hooker.—*Western Juniper*.—Habitat, Oregon. In some nursery catalogues under the name of *J. venusta*. It has a spreading habit, turns somewhat brown in winter. Young plants are slow growers, but sufficiently hardy for general planting in Pennsylvania.

Larix Europea, De Can.—*European Larch*.—Habitat, Europe. The reputation of this tree for ornamental planting is well known. It bears transplanting comparatively well, and succeeds in a variety of soils. Even in the heavy soil of our valley may be seen many very fine specimens.

Picea alba, Link.—*White Spruce*.—Habitat, Canada. A beautiful spruce in contrast with the next, having a whitish-green foliage, branches stiffer and more closely set. It is much slower of growth when young, but this fact will serve to recommend it for situations where large trees could not be tolerated.

Picea excelsa, Link.—*Norway Spruce*.—Habitat, N. Europe. The most useful spruce in cultivation for specimens, groups or hedges. It succeeds well in almost any soil and location. If the shears are used freely a very dense growth can be induced in young trees. After reaching a height of thirty feet this spruce grows very slowly at the top, soon resulting in a blunt apex that might be considered a defect.

Pinus Austriaca, Hoess.—*Austrian Pine*.—Habitat, Austria. A sombre looking pine of very rapid growth, and most extensively planted. It was not introduced into England until 1835. It will succeed wherever the Norway spruce will grow. There is a coarseness and stiffness about this tree that would tend to force it into the background.

Pinus ponderosa, Dougl.—*Heavy Wooded Pine*.—Habitat, western North America. This pine has long bright green leaves and seems perfectly hardy here. Many seedlings have been grown with success. We have no trees of this pine on our grounds large enough to indicate its character as an ornamental tree. The leaves on two-year plants are six inches long; on trees they become six to twelve inches long.

Pinus sylvestris, L.—*Scotch Pine*.—Habitat, Europe and Asia. The reputation of this pine places it next to the Austrian pine in importance. Its foliage is much shorter and has a light green color, which, on the whole, gives it a neater and cleaner appearance. This is a very beautiful pine for specimen trees.

Retinospora obtusa, Siebold.—*Japan Cypress*.—Habitat, Japan. This is deserving of a wider reputation than it now has, being well tested and found to be hardy. To the person unacquainted with the cypress it might be described as a refined arbor vitæ, with bluish-green foliage on upright frondose branches, holding its good color in the winter. A good plant of this fine evergreen has been on the grounds through ten winters, is four feet high and making better growth each successive year. It is an excellent plant for small lawns as well as for choice situations in larger grounds.

Retinospora pisifera aurea, Fortune.—*Golden Pea-fruited Cypress*.—A garden variety. We have a good specimen twelve years old, three feet high, bearing good color and health. When first introduced its hardiness was considered doubtful. This is a very attractive shrubby cypress. Its yellow top is truly beautiful. It has grown but little each year, which is probably due to a heavy soil.

Retinospora squarrosa, Siebold.—Habitat, Japan. In his book on *Evergreens*, Josiah Hoopes supposes this to be too tender for our climate. Several trees on our campus have done very well for the last ten years, being now ten feet high. This *Retinospora* does not resemble the preceding, having more of the appearance of a young Red Cedar. The leaves are one-fourth inch long, spreading light glaucous green. The branches are open, and yet the tree has a habit of dying out in the center. This is less desirable than the other forms of *Retinosporas*, although a good effect is obtained in the unusual color of the foliage maintained all the year round.

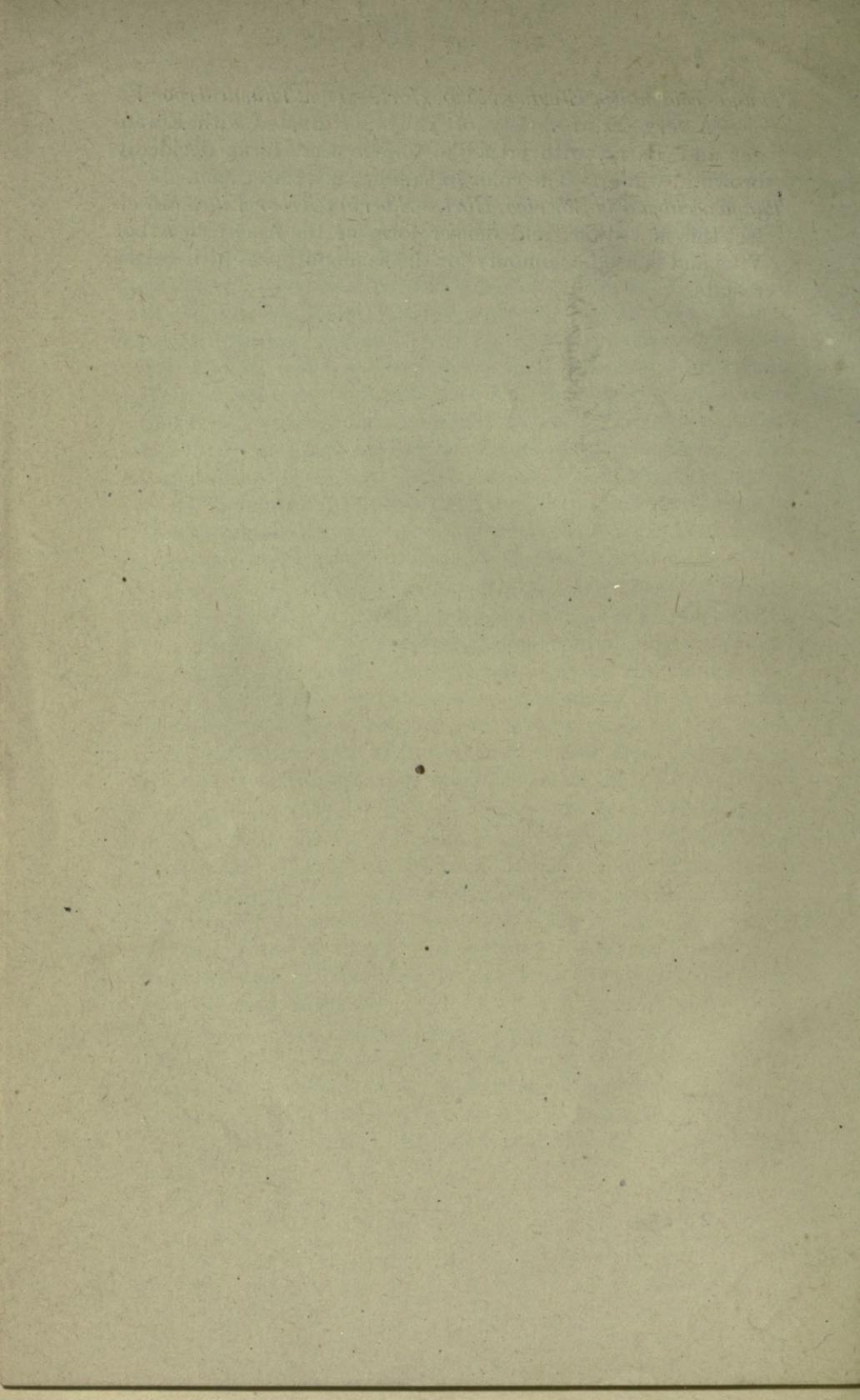
Salisburia adiantifolia, Smith.—*Maiden-Hair Tree*.—Habitat, China and Japan. Scarcely recognized as a conifer, having very broad fan-shaped *deciduous* leaves, resembling the pinnae of a maiden-hair fern. It is known also as the Ginko tree. Tree is a rapid grower and seems quite hardy in this region. Fruiting trees are to be found in various parts of this state. The form of the tree is like that of a pear tree. Always attractive, should be planted in choice locations.

Sciadopytis verticillata, Siebold.—*Umbrella Pine*.—Habitat, Japan. A new and rare form of conifer recently brought into cultivation. The leaves are broad needles about three inches long arranged at the ends of branches in a whorl radiating like the ribs of an extended umbrella. The foliage turns only slightly brown in winter, and the plant seems quite hardy for Pennsylvania. When variety or rarity is sought, this evergreen should be chosen.

Taxodium distichum, Rich.—*Bald Cypress*.—Habitat, Southern States. This is a deciduous conifer, with bright green leaves in summer, arranged in two directions, distichous. In moist locations it soon becomes a tree, and grows rapidly upward. It is exceedingly ornamental and deserving of a place on the lawn.

Thuja occidentalis Elwangeriana, Hort.—*Tom Thumb Arbor Vitæ*.—A very dwarf variety of *Thuja*, originated with Elwanger and Barry, with erica-like foliage that turns decidedly brown in winter. The color in summer is a dull green.

Thuja occidentalis Siberica, Hort.—*Siberian Arbor Vitæ*.—In effect this is a dwarf and denser form of the American *Arbor Vitæ* and is used commonly for the same purposes with better results.



DEPARTMENT OF AGRICULTURE.

BULLETIN No. 20.

REPORTS

OF THE

SECRETARY OF AGRICULTURE.

DEPUTY SECRETARY OF AGRICULTURE.

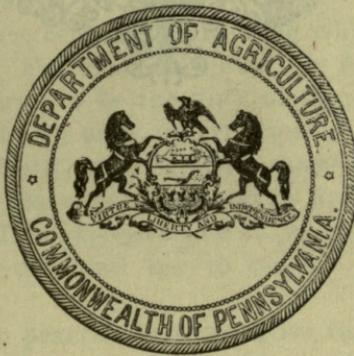
ECONOMIC ZOOLOGIST.

COMMISSIONER OF FORESTRY.

DAIRY AND FOOD COMMISSIONER.

STATE VETERINARIAN.

FOR 1896.



Published by Direction of the Secretary.

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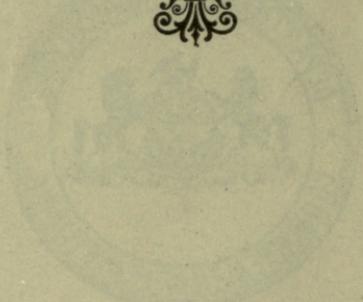
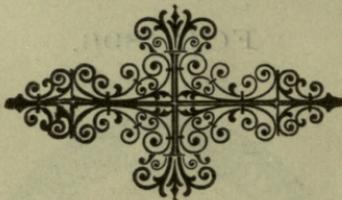
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Published by direction of the Secretary

WASHINGTON, D. C.

REPORT OF THE COMMISSIONER OF FORESTRY.

HARRISBURG, PA., January 1, 1897.

HON. THOMAS J. EDGE, Secretary of Agriculture:

Sir: I have the honor to submit the following statement of the work done in the Division of Forestry, and to suggest some measures which appear to be of sufficient importance to merit careful consideration.

The brief paper upon forest fires which appeared in the last annual report was merely preliminary to a more full consideration of the subject. Upon this the division is now engaged, and it is hoped, when all the facts are ready for the public, that it will lead to a more general attempt to discover and bring to justice those who are guilty of starting these fires.

There are, however, certain points upon which immediate legislation should be had. For example, under the Act of June 2, 1870 (P. L., 1316), it is declared to be the duty of the county commissioners to appoint persons, under oath, to ferret out and bring to punishment all persons who wilfully, or otherwise, cause the burning of timber lands and to take measures to have such fires extinguished, where it can be done. The expenses are to be paid out of the county treasury, the unseated land tax to be the first applied to such expenses.

This law has been practically inoperative for more than a quarter of a century. It was not because the law was deemed unnecessary by the citizens, but because, first, there was no clause compelling the county commissioners to appoint detectives to ferret out the offenders; and, second, because if they had done so the county would have been required to pay for the services.

The time has come when public opinion demands that the law shall be compulsory upon the county commissioners, and furthermore, it is no longer doubted that the State has as much to gain in preventing forest fires as the counties have, and that, therefore, the Commonwealth should share in the cost as well as in the benefits.

At present, Lehigh is the only county in the State which complies with the law, so far as we are informed. Three or four counties offer

rewards for detection of incendiaries, and the remainder appear to wholly ignore the act.

I would, therefore, most respectfully submit for your consideration that the Act of June 2, 1870, be amended: First, to compel the commissioners of the various counties to appoint detectives, as specified already in the act; and, second, to place half of the cost of the services upon the State.

Nothing more inequitable appears upon our statute books than the law as it now stands. The benefits of continuous, even water flow, guarding against freshets on the one hand and low water on the other, accrue to the entire community. The most potent factor in ensuring this desirable condition is the forest cover upon the headwaters of the streams. The counties with the largest areas of timber, or even brush land, are those most active in guarding the water flow of the State, but they also have the smallest population. For the State's good they are, as the law now is, compelled to protect the largest areas, to pay out the most for the common good, while on the one hand they have the smallest income by tax, and on the other they receive the least from the State for the services rendered. The counties with the largest revenues would never feel the drain upon them in protecting their forest areas, while a similar service would keep Pike or Forest counties in a condition of bankruptcy.

It is now well understood that the actual loss to the State each year from forest fires is enormous (greatly exceeding any cost of protection), but the destruction of young timber, of leaf mould and of good soil from the same cause is, if possible, a vastly greater calamity. In short, it is so great that it is no mere figure of speech to say it threatens the continued prosperity of the Commonwealth. In the present state of public information upon this important topic it would seem to be the duty of the State to keep continually before its citizens the fact that forest fires are a public foe. To this end, I would respectfully suggest that constables be required by law to report at each court of quarter sessions the number of fires within their districts, the season at which they occurred, the causes thereof, the damage done, and the measures taken to apprehend those who caused them, the said report to be made in duplicate upon blanks furnished by the Commissioner of Forestry, and that one copy be retained by the court and the other be forwarded promptly by mail to the Commissioner of Forestry, and that the constables be paid jointly by the counties and the Commonwealth for the service.

In this connection, it might be well to call attention to the fact that in some instances it was found to be impossible to obtain from county officials information, which it was not less for the good of the county than of the Commonwealth, should be published. With

your permission, I would suggest that not only would the work of this division be advanced, but that of the whole Department (and possibly of other departments) if there were had some legal relief in this respect.

By Act of Legislature (June 18, 1883, P. L. 112), the county commissioners, through the assessors, were required to furnish annually upon the first day of June, "a full statement of all property taxable for county purposes, showing the real and personal in separate columns"—"the same to be enclosed by mail to the Secretary of Internal Affairs."

The returns are made upon blanks furnished by the Department of Internal Affairs, which (blanks) contain separate columns for cleared land and timber land. In the report of the Secretary of Internal Affairs, Part II, for 1895, pages 216a and 217a, is a very clear showing of the insufficiency of this classification of the area of the State for the purposes of that Department. With the best intention and even after laborious effort to report the exact ratio of cleared and timbered land, there might still be wide discrepancies in the statements of two observers, if placed in the same district. For example, take the latest statistics from the county of Wayne, and we find that the proportion of timber land to that of the whole county is placed at 9.2 per cent. Whereas, in the adjacent county of Lackawanna, the proportion of timber land to the entire area of the county is placed at 16 per cent. It must be clear to any observer passing through these counties that Wayne, as a matter of fact, has a larger proportion of its area in real lumber than Lackawanna. The discrepancy here arises from the fact that some of the assessors in Wayne county failed, probably, to consider hard wood, such as beech, birch and maple, as timber, because it had so little value in the market, or was so little used for purposes of construction. The "acid factories" have been unusually active in that region because of the abundance of these woods.

The real fact is that a very large proportion, even of our country citizens, fail to discriminate sufficiently between the different kinds of trees. Of course this lack of exact knowledge is, as a rule, even more marked among those who have spent their entire lives in the towns. This condition of affairs is humiliating, but it has to be reckoned with in all of our reports. Much as this division desires exact specific knowledge, it is thought better to suggest a classification of the wild or wooded lands not under cultivation, which will now lead to the least error and encourage the hope that in the near future we may be able to insist upon a more exact classification.

I would suggest, first, that for the purposes of the Department of Agriculture, land which is now in sod, or in crops, or which has been cultivated within three years, or which is about to be cultivated for the first time, be regarded as cleared land.

Second. That land not in either of the above conditions, but covered with a growth of shrubbery less than 15 feet high, be designated as brush land, and this divided into two classes; i. e., valuable, if it promises to mature into timber; or, valueless, if it gives no promise of producing timber.

Third. That land in a woody growth which is over 15 feet high, be designated as timber land, and divided (a) into evergreen, stating whether pine (white or yellow), hemlock, spruce or cedar predominates; and (b) into hard wood, stating whether oak, hickory, chestnut, beech, birch, maple, poplar, basswood or cherry predominates; adding whether this timber is best adapted to production of ties, sawed timber, or of no use except as fuel. Is the timber in this third division one-fourth, one-half, or three-fourths grown, or is it mature?

There appears to be nothing in this which a man of ordinary intelligence could not readily place in proper form if a proper blank were furnished him. It is confessedly superficial, but it is far in advance of what we have hitherto been able to obtain.

It is fairly a question whether or not it is wise to allow the redemption within two years of land sold for taxes. As a rule, those to whom such land belongs are not straightened in circumstances. The redemption clause simply, in many instances, interferes with improvement of the forest conditions of such land which can be undertaken none too soon. Furthermore, if that redemption clause were repealed, it is more than likely that, very often, if not in most cases, the tax would be paid, rather than allow the land to go to sale. The county, at least, would then receive benefits from the change.

The whole question of taxes in relation to timber lands is as important as it is anomalous. It may be briefly stated at the outset that the only class of property which existing law compels an owner to destroy in self-protection is timber. There are thousands of acres within the limits of this Commonwealth which might have been (in the interest of the State) in timber to this day, if uncertain protection against fire and certain demands for taxes had not driven the owners to remove the timber. If it is true, as asserted, and as the experience of those nations with which we must compare ourselves seems to show, that a state must in its own interest have a certain (variable) proportion of its area in timber, or suffer in lack of it, then our laws defeat their own purpose by driving the citizen to despoil rather than to strengthen the State. An illustration may be worth more than any abstract statement, however clear or pointed.

In one of the interior counties of the State there was situated a tract of land covered with valuable hemlock. For the purposes of taxation this land was assessed at the rate of two dollars an acre, then raised to four, then to six, when the owner protested. The fol-

lowing year it was assessed at eight dollars an acre. Protest made was unavailing and the owner immediately put in mills, removed the timber and allowed the county to take the land.

The plea for increasing the tax was that the township depended on that land for the money to spend on its roads. What was the result? Removal of the timber left no tax for the roads, and gave the county a large area of unproductive land. It was not solely the payment of the taxes which drove the owner to remove the timber, but because after paying the taxes he had no protection against the fires which the State allows to go, year after year, unchecked. Here is the proper place to call attention to the fact that it is no longer true that fire does but little damage in green timber. The time was when it was practically true. That time has passed, for in this State so large a portion is already bare of trees, barren and sun-exposed, that evaporation removes the moisture from those areas, and then from even the woods, until in seasons of ordinary summer drought vigorous forests may be killed where they stand. One instance of this, in Clearfield county, comes to mind now. Another example was furnished three years ago in the southwestern part of Wayne county, where a very valuable tract of hemlock, which was specially guarded, was destroyed in spite of all the protection which could be furnished. A condition so anomalous as this indicated cannot endure in the larger intelligence of the near future. What the remedy shall be is a question which merits, and doubtless will receive, careful consideration from our legislators before long. It will press for a solution.

A most important problem presents itself for consideration, namely, that of forest reservations. Strip it of collateral ideas and the fact at the bottom of the whole question is—the State must have a due proportion of woodland. It is an absolute condition upon which not only our prosperity but the very protection of the surface of the State depends.

The first inquiry following this is: How can it be most surely, speedily and economically produced, by the State itself directly owning and directing the machinery, or by the State making it possible for the citizen to do this?

While it is true that in Pennsylvania local conditions will make it to the advantage of the Commonwealth that the citizen should become a timber producer and himself see that it was guarded from trespass and from fire, it is nevertheless true that the State should be the largest producer, because it has the largest interest, because the century required to mature a crop of trees is as nothing to it, but is disheartening to the individual, and chiefly because in the land which the State should own there are involved possibilities for

good or evil, to every citizen, which are too vital to be trusted to any man or to any set of men.

The idea is not new to our people. It may be well to note how far it has progressed and assumed the favor of a popular demand.

1st. The State Grange of Pennsylvania, in the last two annual meetings, passed resolutions calling upon the Legislature to provide State forestry reservations.

2d. The Maritime Exchange, of Philadelphia, has petitioned the Legislature for State forestry reservations.

3d. The Board of Trade, of Philadelphia, has done the same.

4th. The Pennsylvania Forestry Association, with a membership in every county in the Commonwealth, has joined in the request.

5th. The Engineer Club, of Philadelphia, has also asked for it.

6th. Almost every leading newspaper in the Commonwealth has repeatedly, editorially and otherwise, joined in the general call for State forestry reservations.

7th. Various leading industrial journals, such as the "Manufacturer," have been outspoken in their demand that in their interest and protection the State assume control of the high water sheds of the Commonwealth, where the water power which they require is produced.

It will be seen that already a most respectable following is earnestly asking the State to act in this direction.

If it were new or untried in this country, we might well pause before taking the initiative; but it is neither. The adjacent State of New York has been the pioneer in this movement, and secured as public property already a large portion of the Adirondack region. The wisdom of the action was voted upon three years by the people, and of all the constitutional amendments brought before that tribunal for their sanction, the one measure which passed unchallenged was that in favor of the State forestry reservations. Within a month the question was again placed before the people as to whether the State should allow settlement by cottagers of any part of the forest reserve, and so anxious were the citizens to confirm forever the safety of these reservations that they defeated the constitutional amendment, which made an invasion possible, by the largest majority (345,000) ever given to any measure, State or National, in New York. It was most remarkable that on this issue the average citizen and the largest manufacturing interests were in perfect, earnest, working harmony. Almost every great newspaper in the State called and kept calling upon the citizens to defeat the proposed constitutional amendment. The threatened danger produced the most universal popular rising and protest which the Empire State ever witnessed.

There must be some reason for this. Such things do not come

about by chance. It would be almost impossible to have produced such an overwhelming sentiment by any party machinery.

The fact is that the cause of alarm sounded in New Hampshire by the Hon. T. Jefferson Coolidge, was already working in New York. It is worth dwelling upon.

I have been at the pains of verifying the following abstract which is taken from the "Manufacturer," Philadelphia, October 31st, 1896. As I can neither condense nor improve upon the presentation, I submit it for your consideration:

FORESTS AND FACTORIES.

"In his annual report to the Amoskeag Manufacturing Company, whose great mills are located at Manchester, New Hampshire, utilizing, as those below at Nashua and Lowell do, the splendid water power of the Merrimack river, the treasurer of the company, Hon. T. Jefferson Coolidge, of Boston, stated some important facts concerning the usefulness of the river for manufacturing purposes. He describes first, the great freshet in the Merrimack, on April 16, 1895, when the water rose to the highest point that until then had ever been known, injuring the Amoskeag dam, and compelling extensive and costly repairs. He then describes the terrific freshet of March 2, 1896, which rose $1\frac{1}{2}$ feet higher than even that of the preceding year, and which compelled the stoppage of the mills, with their 6,000 operatives, for some time, and would have done immense damage to the mills, had it not been for the strong repair construction of the previous year.

"I need not say," proceeds Mr. Coolidge, "what a terrible loss to the city of Manchester such accidents are, and how desirable it is to take any measures which may diminish the probability of future and higher freshets. When you consider that the Merrimack has for the past few summers been lower than in previous years, it is evident that some cause is at work turning the stream into a torrent with long droughts and fearful discharges of water."

"There is but one explanation, he further says of this phenomenon. It is simply, 'the cutting down of the forests around the headwaters of the Merrimack, the Pemigewasset and other affluents. The woods hold back the water and allow it to trickle slowly into the streams; cut down the woods and the rain running rapidly over the surface of the ground, which is baked by the sun or frozen hard by the winter's cold, pours all at once into the streams, turns them into roaring torrents, and finds its way all at once into the Merrimack, sweeping everything before it. In a few days the river sinks rapidly and becomes in time of drought an insignificant stream. Had the forest been left, no sudden discharge of water would have taken

place, and all through low water, streams would have trickled through the woods and swollen the Merrimack when it was low.'

"Remarking upon the experience of European countries in this matter, especially France, along the valley of the Rhone, by which they were compelled to adopt stringent measures to protect the forests along the rivers and their affluents, Mr. Coolidge proceeds to point out the great seriousness of the subject to such a city as Manchester, and such a state as New Hampshire. It is the power of her rivers which gives New Hampshire its greatest importance. The damage done, he declares, is already most serious, 'and if this state of things continues, manufacturing by the water power of the Merrimack will become, in my judgment, impossible. No new mills will be put up and the old ones will have to use steam, which places them at a great disadvantage with regard to other manufacturing cities where coal is much cheaper owing to less transportation. Our coal has to be carried to the seaboard at Baltimore or Newport News, transported by water to Portsmouth at a cost ranging from sixty cents to \$2 per ton, and taken by car to Manchester at an additional price of twenty-five cents for unloading and seventy-five cents for freight from Portsmouth to Manchester.'

"The strength of such manufactories as the Amoskeag Mills consists largely in their situation where nature pours over their water-wheels, at the lowest possible cost, the power that moves their spindles and looms. If these water powers are to be destroyed, such industries will be practically destroyed. If steam must be used, and coal brought from the distant mines, the condition will be revolutionized. Compared with Fall River, Manchester is at a disadvantage of \$1 a ton in the purchase of coal, and compared with mills in the South, \$2 a ton. 'I appeal to you, gentlemen,' earnestly says Mr. Coolidge, 'for the interest of New Hampshire, which depends on the success of the manufacturing corporations situated on the Merrimack and the other streams of the State, to exert your utmost influence to induce the next Legislature to protect the forests remaining.'"

You will recognize that this most vital relation of the forests to the water power of the State is not new here. It was most fully brought out by the Commissioner of Forestry and enforced by photographic illustrations at the meeting of the State Board of Agriculture, held in Bethlehem in June, 1893. What gives, however, special weight to it now is the fact that the statement above quoted is from a practical man, with large business interests, and is his well-weighed, deliberate utterance, after the threatened danger had developed into an accomplished fact. Surely, it may be regarded as beyond the dictation of mere sentiment, and as a timely and needed warning to us. If the condition of things which Mr. Coolidge depicts

as existing in New Hampshire calls for State interference there to protect the manufacturing interests, a similar condition here equally demands that our State shall interfere to arrest the calamities which have already threatened to wreck and injure the prosperity of another state.

It may be taken for granted that in the near future Pennsylvania will follow the example already set by the State of New York.

The question remaining is, how shall the land be acquired? It is in vain to hope that the Commonwealth will come into possession of any area worthy to be called a state forestry reservation upon which a mature forest now stands, for such no longer exists within our limits. Every such body of timber is reduced in size, and circumscribed by clearings. The very utmost that we can do will be to secure the location and to produce the forest. We will be wise if we obtain the place before we are obliged to produce the soil as well as the trees. Even now it is probable that it will cost the Commonwealth as much to obtain the naked, treeless area as it received for the same ground when it was covered with timber, out of which fortunes have grown. It is quite clear that as the necessity of these lands to the State become more and more real, they will be held higher by the owners, even though each succeeding year has rendered the soil more and more impoverished. Neither will there ever be a time when the demand made upon the State Treasury will be so light as to render the acquisition of the needed land easier than now if they are to be acquired by exercise of the right of eminent domain and subsequently paid for.

It is proper here to call attention to the measure recommended after very careful consideration and laid before the last Legislature. It received a negative recommendation from the committee on appropriations, as it was thought the condition of the State Treasury would not at the time warrant the expenditure. It is again submitted for your consideration, though with the statement that it could be improved upon by some slight alteration:

AN ACT

TO PROVIDE STATE RESERVATIONS.

Section 1. *Be it enacted by the Senate and House of Representatives of the Commonwealth of Pennsylvania in General Assembly met, and it is hereby enacted by the authority of the same, That the State Forestry Commission shall locate and report to the Governor or to the Legislature if it is in session, the following state forestry reservations:*

(1.) One of not less than 40,000 acres in Pike, Monroe, Luzerne or Lackawanna counties.

(2.) One of not less than 40,000 acres in Sullivan, Lycoming, Clinton, Centre or Potter counties.

(3.) One of not less than 40,000 acres in Clearfield, Elk, Cameron, McKean or Forest counties.

Provided, That each of these reservations shall be in one continuous area, which may be taken from one or more of the counties indicated above.

Sec. 2. That the lands selected shall be of a character better suited to the growth of trees than to mining or agriculture, and that at least fifty per cent. of the area of each reservation shall have an altitude of not less than 800 feet above the level of the sea.

Sec. 3. That the said commission shall be authorized to purchase the lands they have selected for the purposes aforesaid at a price not exceeding two dollars per acre, or, failing to accomplish this, that it shall have full power to take by right of eminent domain and condemn said lands as State reservations for the use and behoof of the Commonwealth and subject to such conditions as the legally constituted authorities may impose: *And provided further*, That wherever it shall be necessary to have recourse to a jury to assess the damages for any property to be taken as aforesaid, the said jury shall consist of such number and shall proceed and their award shall be reviewed and enforced in the same manner as now provided by law in the taking of land for the opening of roads in said respective counties. And all the lands acquired by the State for public reservations by the action of said Commission shall be paid for by the State Treasurer upon a warrant drawn by the Auditor General of the Commonwealth, after approval by the Governor.

Sec. 4. The commissioners of the State Geological Survey shall make or cause to be made at the expense of the State, an examination of the lands so acquired, and report upon their value as watersheds and reservoirs to the areas they supply with water, and that the report prepared by the said commissioners of the State Geological Survey shall be illustrated by suitable geological and topographical maps.

Sec. 5. It shall be the duty of the State Board of Health to make an annual examination of the State forestry reservations, to report on their value to the health of the public, and to suggest such measures to the officers in charge of the said reservations as will lead to the best results for the public health.

The State Board of Agriculture shall make annual report upon the conditions of the forestry reservations of the Commonwealth, and suggest such measures as will increase their general utility.

Sec. 6. It shall be the duty of the State Fishery Commissioners to stock the waters of the said public reservations with such species of fish as are best adapted to each reservation, to make regulations in

conformity to the laws of the State for the conduct of those who fish therein, and to enforce the penalties for any infraction of the said regulations.

Sec. 7. The general control of the said public reservations so acquired for the use and behoof of the State shall be vested in the State Board of Agriculture, and the annual report of the said Board shall contain a full statement of the actual conditions of the said reservations and their general relation to the industries and the health of the State.

Sec. 8. The necessary expenses of travel and all other necessary expenses incurred under the provisions of this act in ordaining the lands for the public reservations shall be paid by the State Treasurer on the warrant of the Auditor General, after being duly certified.

The state of New York acquired most of its present reservation in the Adirondack (I believe), by sale for unpaid taxes.

This raises the question as to whether Pennsylvania might not do the same. It is within bounds to say that there is a million of acres within our limits upon which the owners now refuse to pay taxes. Or to speak exactly, we may put it thus, that "in 1894, the amount of land, seated and unseated, advertised to be sold for taxes in the different counties of the Commonwealth, so far as heard from, was upward of 1,500,000, or 2,358 square miles." These figures come from lists furnished by county treasurers. This land lies in great part within the limits which the Forestry Commission has suggested as being suitable for State forestry purposes. One may then readily see that if the State were to acquire title to all such lands, but few years would elapse before either taxes would be paid to the counties, or the State would be in possession of all the land required for its forestry purposes. The chief objection to land so acquired would be: It would at first be more or less scattered and therefore relatively costly to protect and manage.

It is no longer a problem as to whether forest lands, under proper State management, can, or should be, made a source of revenue to the government. The magnificent results attending the forestry operations of Germany, Sweden and Norway, and England in India, leave no doubt that no other line of public policy returns a surer or larger revenue, involving at the same time less injury to the individual or less loss to the government. That it can be made to pay here we may infer from the prices which are offered to New York for spruce grown under state protection.

There remains yet one more aspect of this many sided question. Communal forests are managed in Germany in local interests. To adapt this statement to our own conditions it would appear as though a county having a considerable area of land thrown upon it by non-payment of taxes, might under judicious care and protection, in a comparatively few years, obtain a very large portion of its needed revenue from sale of wood from such land. The whole success of such an attempt would lie in honest, intelligent management; but it would relieve the citizens of the burdens of taxation just in proportion as it was successful.

There are towns in Germany which have made themselves practically free from taxation by the sale of forest products. The fact is an unfortunate commentary on the methods we have employed to reach our present condition, as a State and as a Nation, that though there never will come a time when our best kinds of timber will cease to have a value, that the true Northern yellow pine (*Pinus mitis*) has practically disappeared from our forests, and there is reason to fear that in the very near future yellow poplar, black walnut and wild black cherry, hemlock and white pine will cease to have large commercial value here, because of scarcity.

The report of the Forestry Commission has been so kindly received and is in such demand that the edition will probably be speedily exhausted.

The Commissioner of Forestry proposes to prepare the following papers as speedily as possible:

First. Report on Forest Fires.

Second. Report on Walnut Tree, producing fruit with the outer covering of the hickory nut.

Third. Report on the Engle Chestnut Orchard.

Fourth. Report on Some Troublesome Weeds.

Fifth. Abstract from Recent German Forestry Reports.

Sixth. The "Yearly Cut" of Timber in Pennsylvania.

Seventh. Forests as Soil Formers and Soil Preservers.

I am sir, with great respect,

Your most obedient servant,

J. T. ROTHROCK,
Commissioner of Forestry.

COMMONWEALTH OF PENNSYLVANIA—DEPARTMENT OF AGRICULTURE,
DIVISION OF FORESTRY.

Walter Mulford

7

PRELIMINARY REPORT

OF THE

COMMISSIONER OF FORESTRY

FOR 1896.

ALSO MISCELLANEOUS PAPERS ON FORESTRY CONTAINED IN ANNUAL REPORT,
DEPARTMENT OF AGRICULTURE, FOR 1896.

BY J. T. ROTHROCK, M. D.,

COMMISSIONER OF FORESTRY.

CLARENCE M. BUSCH,
STATE PRINTER OF PENNSYLVANIA,
1897.



PRELIMINARY REPORT.

HARRISBURG, PA., January 1, 1897.

HON. THOMAS J. EDGE, Secretary of Agriculture :

Sir: I have the honor to submit the following statement of the work done in the Division of Forestry, and to suggest some measures which appear to be of sufficient importance to merit careful consideration.

The brief paper upon forest fires which appeared in the last annual report was merely preliminary to a more full consideration of the subject. Upon this the division is now engaged, and it is hoped, when all the facts are ready for the public, that it will lead to a more general attempt to discover and bring to justice those who are guilty of starting these fires.

There are, however, certain points upon which immediate legislation should be had. For example, under the Act of June 2, 1870 (P. L., 1316), it is declared to be the duty of the county commissioners to appoint persons, under oath, to ferret out and bring to punishment all persons who wilfully, or otherwise, cause the burning of timber lands and to take measures to have such fires extinguished, where it can be done. The expenses are to be paid out of the county treasury, the unseated land tax to be the first applied to such expenses.

This law has been practically inoperative for more than a quarter of a century. It was not because the law was deemed unnecessary by the citizens, but because, first, there was no clause compelling the county commissioners to appoint detectives to ferret out the offenders; and second, because if they had done so the county would have been required to pay for the services.

The time has come when public opinion demands that the law shall be compulsory upon the county commissioners, and furthermore, it is no longer doubted that the State has as much to gain in preventing forest fires as the counties have, and that, therefore, the Commonwealth should share in the cost as well as in the benefits.

At present, Lehigh is the only county in the State which complies with the law, so far as we are informed. Three or four counties offer rewards for detection of incendiaries, and the remainder appear to wholly ignore the act.

I would, therefore, most respectfully submit for your consideration that the Act of June 2, 1870, be amended: First, to compel the commissioners of the various counties to appoint detectives, as specified already in the act; and second, to place half of the cost of the services upon the State.*

Nothing more inequitable appears upon our statute books than the law as it now stands. The benefits of continuous, even water flow, guarding against freshets on the one hand and low water on the other, accrue to the entire community. The most potent factor in ensuring this desirable condition is the forest cover upon the headwaters of the streams. The counties with the largest areas of timber, or even brush land, are those most active in guarding the water flow of the State, but they also have the smallest population. For the State's good they are, as the law now is, compelled to protect the largest areas, to pay out the most for the common good, while on the one hand they have the smallest income by tax, and on the other they receive the least from the State for the service rendered. The counties with the largest revenues would never feel the drain upon them in protecting their forest areas, while a similar service would keep Pike or Forest counties in a condition of bankruptcy.

It is now well understood that the actual loss to the State each year from forest fires is enormous (greatly exceeding any cost of protection), but the destruction of young timber, of leaf mould and of good soil from the same cause is, if possible, a vastly greater calamity. In short, it is so great that it is no mere figure of speech to say it threatens the continued prosperity of the Commonwealth. In the present state of public information upon this important topic it would seem to be the duty of the State to keep continually before its citizens the fact that forest fires are a public foe. To this end, I would respectfully suggest that constables be required by law to report at each court of quarter sessions the number of fires within their districts, the season at which they occurred, the causes thereof, the damage done, and the measures taken to apprehend those who caused them, the said report to be made in duplicate upon blanks furnished by the Commissioner of Forestry, and that one copy be retained by the court and the other be forwarded promptly by mail to the Commissioner of Forestry, and that the constables be paid jointly by the counties and the Commonwealth for the service.†

In this connection, it might be well to call attention to the fact that in some instances it was found to be impossible to obtain from county officials information, which it was not less for the good of the county than of the Commonwealth, should be published. With

* Act of July 15, 1897, amends act as suggested.

† Act of March 30, 1897, make constables ex-officio fire wardens.

your permission, I would suggest that not only would the work of this division be advanced, but that of the whole Department (and possibly of other departments) if there were had some legal relief in this respect.*

By Act of Legislature (June 18, 1883, P. L. 112), the county commissioners, through the assessors, were required to furnish annually, upon the first day of June, "a full statement of all property taxable for county purposes, showing the real and personal in separate columns"—"the same to be enclosed by mail to the Secretary of Internal Affairs."

The returns are made upon blanks furnished by the Department of Internal Affairs, which (blanks) contain separate columns for cleared land and timber land. In the report of the Secretary of Internal Affairs, Part II, for 1895, pages 216a and 217a, is a very clear showing of the insufficiency of this classification of the area of the State for the purposes of that Department. With the best intention and even after laborious effort to report the exact ratio of cleared and timbered land, there might still be wide discrepancies in the statements of two observers, if placed in the same district. For example, take the latest statistics from the county of Wayne, and we find that the proportion of timber land to that of the whole county is placed at 9.2 per cent. Whereas, in the adjoining county of Lackawanna, the proportion of timber land to the entire area of the county is placed at 16 per cent. It must be clear to any observer passing through these counties that Wayne, as a matter of fact, has a larger proportion of its area in real lumber than Lackawanna. The discrepancy here arises from the fact that some of the assessors in Wayne county failed, probably, to consider hard wood, such as beech, birch and maple, as timber, because it had so little value in the market, or was so little used for purposes of construction. The "acid factories" have been unusually active in that region because of the abundance of these woods.

The real fact is that a very large proportion, even of our country citizens, fail to discriminate sufficiently between the different kinds of trees. Of course this lack of exact knowledge is, as a rule, even more marked among those who have spent their entire lives in the towns. This condition of affairs is humiliating, but it has to be reckoned with in all of our reports. Much as this division desires exact specific knowledge, it is thought better to suggest a classification of the wild or wooded lands not under cultivation, which will now lead to the least error and encourage the hope that in the near future we may be able to insist upon a more exact classification.

I would suggest, first, that for the purposes of the Department of

* Act approved April 14, 1897, makes it the duty of county officials to furnish information asked for.

Agriculture, land which is now in sod, or in crops, or which has been cultivated within three years, or which is about to be cultivated for the first time, be regarded as cleared land.

Second. That land not in either of the above conditions, but covered with a growth of shrubbery less than 15 feet high, be designated as brush land, and this be divided into two classes; i. e., valuable, if it promises to mature into timber; or, valueless, if it gives no promise of producing timber.

Third. That land in a woody growth which is over 15 feet high, be designated as timber land, and divided (a) into evergreen, stating whether pine (white or yellow), hemlock, spruce or cedar predominates; and (b) into hard wood, stating whether oak, hickory, chestnut, beech, birch, maple, poplar, basswood or cherry predominates; adding whether this timber is best adapted to production of ties, sawed timber, or of no use except as fuel. Is the timber in this third division one-fourth, one-half, or three-fourths grown, or is it mature?

There appears to be nothing in this which a man of ordinary intelligence could not readily place in proper form if a proper blank were furnished him. It is confessedly superficial, but it is far in advance of what we have hitherto been able to obtain.

It is fairly a question whether or not it is wise to allow the redemption within two years of land sold for taxes. As a rule, those to whom such land belongs are not straightened in circumstances. The redemption clause simply, in many instances, interferes with improvement of the forest conditions of such land which can be undertaken none too soon. Furthermore, if that redemption clause were repealed, it is more than likely that, very often, if not in most cases, the tax would be paid, rather than allow the land to go to sale. The county, at least, would then receive benefits from the change.

The whole question of taxes in relation to timber lands is as important as it is anomalous. It may be briefly stated at the outset that the only class of property which existing law compels an owner to destroy in self-protection is timber. There are thousands of acres within the limits of this Commonwealth which might have been (in the interest of the State) in timber to this day, if uncertain protection against fire and certain demands for taxes had not driven the owners to remove the timber. If it is true, as asserted, and as the experience of those nations with which we must compare ourselves seems to show, that a state must in its own interest have a certain (variable) proportion of its area in timber, or suffer in lack of it, then our laws defeat their own purpose by driving the citizen to despoil rather than to strengthen the State. An illustration may be worth more than any abstract statement, however clear or pointed.

In one of the interior counties of the State there was situated

a tract of land covered with valuable hemlock. For the purposes of taxation this land was assessed at the rate of two dollars an acre, then raised to four, then to six, when the owner protested. The following year it was assessed at eight dollars an acre. Protest made was unavailing and the owner immediately put in mills, removed the timber and allowed the county to take the land.

The plea for increasing the tax was that the township depended on that land for the money to spend on its roads. What was the result? Removal of the timber left no tax for the roads, and gave the county a large area of unproductive land. It was not solely the payment of the taxes which drove the owner to remove the timber, but because after paying the taxes he had no protection against the fires which the State allows to go, year after year, unchecked. Here is the proper place to call attention to the fact that it is no longer true that fire does but little damage in green timber. The time was when it was practically true. That time has passed, for in this State so large a portion is already bare of trees, barren and sun-exposed, that evaporation removes the moisture from those areas, and then from even the woods, until in seasons of ordinary summer drought vigorous forests may be killed where they stand. One instance of this, in Clearfield county, comes to mind now. Another example was furnished three years ago in the southwestern part of Wayne county, where a very valuable tract of hemlock, which was specially guarded, was destroyed in spite of all the protection which could be furnished. A condition so anomalous as this indicated cannot endure in the larger intelligence of the near future. What the remedy shall be is a question which merits, and doubtless will receive, careful consideration from our legislators before long. It will press for a solution.*

A most important problem presents itself for consideration; namely, that of forest reservations. Strip it of collateral ideas and the fact at the bottom of the whole question is—the State must have a due proportion of woodland. It is an absolute condition upon which not only our prosperity but the very protection of the surface of the State depends.

The first inquiry following this is: How can it be most surely, speedily and economically produced, by the State itself directly owning and directing the machinery, or by the State making it possible for the citizen to do this?

While it is true that in Pennsylvania local conditions will make it to the advantage of the Commonwealth that the citizen should become a timber producer and himself see that it was guarded from

* By act approved May 25, 1897, there is allowed a maximum tax rebate of forty-five cents per acre on not more than fifty acres to each farm property owner, providing there are fifty trees to the acre which average eight inches in diameter at six feet above the ground.

trespass and from fire, it is nevertheless true that the State should be the largest producer, because it has the largest interest, because the century required to mature a crop of trees is as nothing to it, but is disheartening to the individual, and chiefly because in the land which the State should own there are involved possibilities for good or evil, to every citizen, which are too vital to be trusted to any man or to any set of men.

The idea is not new to our people. It may be well to note how far it has progressed and assumed the favor of a popular demand.

1st. The State Grange of Pennsylvania, in the last two annual meetings, passed resolutions calling upon the Legislature to provide State forestry reservations.

2d. The Maritime Exchange, of Philadelphia, has petitioned the Legislature for State forestry reservations.

3d. The Board of Trade, of Philadelphia, has done the same.

4th. The Pennsylvania Forestry Association, with a membership in every county in the Commonwealth, has joined in the request.

5th. The Engineer Club, of Philadelphia, has also asked for it.

6th. Almost every leading newspaper in the Commonwealth has repeatedly, editorially and otherwise, joined in the general call for State forestry reservations.

7th. Various leading industrial journals, such as the "Manufacturer," have been outspoken in their demand that in their interest and protection the State assume control of the high water sheds of the Commonwealth, where the water power which they require is produced.

It will be seen that already a most respectable following is earnestly asking the State to act in this direction.

If it were new or untried in this country, we might well pause before taking the initiative; but it is neither. The adjacent State of New York has been the pioneer in this movement, and secured as public property already a large portion of the Adirondack region. The wisdom of the action was voted upon three years by the people, and of all the constitutional amendments brought before that tribunal for their sanction, the one measure which passed unchallenged was that in favor of the State forestry reservations. Within a month the question was again placed before the people as to whether the State should allow settlements by cottagers of any part of the forest reserve, and so anxious were the citizens to confirm forever the safety of these reservations that they defeated the constitutional amendment, which made an invasion possible, by the largest majority (345,000) ever given to any measure, State or National, in New York. It was most remarkable that on this issue the average citizen and the largest manufacturing interests were in perfect, earnest, working harmony. Almost every great newspaper

in the State called and kept calling upon the citizens to defeat the proposed constitutional amendment. The threatened danger produced the most universal popular rising and protest which the Empire State ever witnessed.

There must be some reason for this. Such things do not come about by chance. It would be almost impossible to have produced such an overwhelming sentiment by any party machinery.

The fact is that the cause of alarm sounded in New Hampshire by the Hon. T. Jefferson Coolidge, was already working in New York. It is worth dwelling upon.

I have been at the pains of verifying the following abstract which is taken from the "Manufacturer," Philadelphia, October 31st, 1896. As I can neither condense nor improve upon the presentation, I submit it for your consideration:

FORESTS AND FACTORIES.

"In his annual report to the Amoskeag Manufacturing Company, whose great mills are located at Manchester, New Hampshire, utilizing, as those below at Nashua and Lowell do, the splendid water power of the Merrimack river, the treasurer of the company, Hon. T. Jefferson Coolidge, of Boston, stated some important facts concerning the usefulness of the river for manufacturing purposes. He describes first, the great freshet in the Merrimack, on April 16, 1895, when the water rose to the highest point that until then had ever been known, injuring the Amoskeag dam, and compelling extensive and costly repairs. He then describes the terrific freshet of March 2, 1896, which rose $1\frac{1}{2}$ feet higher than even that of the preceding year, and which compelled the stoppage of the mills, with their 6,000 operatives, for some time, and would have done immense damage to the mills, had it not been for the strong repair construction of the previous year.

"I need not say," proceeds Mr. Coolidge, 'what a terrible loss to the city of Manchester such accidents are, and how desirable it is to take any measures which may diminish the probability of future and higher freshets. When you consider that the Merrimack has for the past few summers been lower than in previous years, it is evident that some cause is at work turning the stream into a torrent with long droughts and fearful discharges of water.'

"There is but one explanation, he further says of this phenomenon. It is simply, 'the cutting down of the forests around the headwaters of the Merrimack, the Pemigewasset and other affluents. The woods hold back the water and allow it to trickle slowly into the streams;

cut down the woods and the rain running rapidly over the surface of the ground, which is baked by the sun or frozen hard by the winter's cold, pours all at once into the streams, turns them into roaring torrents, and finds its way all at once into the Merrimack, sweeping everything before it. In a few days the river sinks rapidly and becomes in time of drought an insignificant stream. Had the forest been left, no sudden discharge of water would have taken place, and all through low water, streams would have trickled through the woods and swollen the Merrimack when it was low.'

"Remarking upon the experience of European countries in this matter, especially France, along the valley of the Rhone, by which they were compelled to adopt stringent measures to protect the forests along the rivers and their affluents, Mr. Coolidge proceeds to point out the great seriousness of the subject to such a city as Manchester, and such a state as New Hampshire. It is the power of her rivers which gives New Hampshire its greatest importance. The damage done, he declares, is already most serious, 'and if this state of things continues, manufacturing by the water power of the Merrimack will become, in my judgment, impossible. No new mills will be put up and the old ones will have to use steam, which places them at a great disadvantage with regard to other manufacturing cities where coal is much cheaper owing to less transportation. Our coal has to be carried to the seaboard at Baltimore or Newport News, transported by water to Portsmouth at a cost ranging from sixty cents to \$2 a ton, and taken by car to Manchester at an additional price of twenty-five cents for unloading and seventy-five cents for freight from Portsmouth to Manchester.'

"The strength of such manufactories as the Amoskeag Mills consists largely in their situation where nature pours over their water-wheels, at the lowest possible cost, the power that moves their spindles and looms. If these water powers are to be destroyed, such industries will be practically destroyed. If steam must be used, and coal brought from the distant mines, the condition will be revolutionized. Compared with Falls River, Manchester is at a disadvantage of \$1 a ton in the purchase of coal, and compared with mills in the South, \$2 a ton. 'I appeal to you, gentlemen,' earnestly says Mr. Coolidge, 'for the interest of New Hampshire, which depends on the success of the manufacturing corporations situated on the Merrimack and the other streams of the State, to exert your utmost influence to induce the next Legislature to protect the forests remaining.'"

You will recognize that this most vital relation of the forests to the water powers of the State is not new here. It was most fully brought out by the Commissioner of Forestry and enforced by photographic illustrations at the meeting of the State Board of Agricul-

ture, held in Bethlehem in June, 1893. What gives, however, special weight to it now is the fact that the statement above quoted is from a practical man, with large business interests, and is his well weighed, deliberate utterance, after the threatened danger had developed into an accomplished fact. Surely, it may be regarded as beyond the dictation of mere sentiment, and as a timely and needed warning to us. If the condition of things which Mr. Coolidge depicts as existing in New Hampshire calls for State interference there to protect the manufacturing interests, a similar condition here equally demands that our State shall interfere to arrest the calamities which have already threatened to wreck and injure the prosperity of another State.

It may be taken for granted that in the near future Pennsylvania will follow the example already set by the State of New York.

The question remaining is, how shall the land be acquired? It is in vain to hope that the Commonwealth will come into possession of any area worthy to be called a state forestry reservation upon which a mature forest now stands, for such no longer exists within our limits. Every such body of timber is reduced in size, and circumscribed by clearings. The very utmost that we can do will be to secure the location and to produce the forest. We will be wise if we obtain the place before we are obliged to produce the soil as well as the trees. Even now it is probable that it will cost the Commonwealth as much to obtain the naked, treeless area as it received for the same ground when it was covered with timber, out of which fortunes have grown. It is quite clear that as the necessity of these lands to the State become more and more real, they will be held higher by the owners, even though each succeeding year has rendered the soil more and more impoverished. Neither will there ever be a time when the demand made upon the State Treasury will be so light as to render the acquisition of the needed land easier than now if they are to be acquired by exercise of the right of eminent domain and subsequently paid for.

The state of New York acquired most of its present reservation in the Adirondack (I believe), by sale for unpaid taxes.

This raises the question as to whether Pennsylvania might not do the same. It is within bounds to say that there is a million of acres within our limits upon which the owners now refuse to pay taxes. Or to speak exactly, we may put it thus, that "in 1894, the amount of land, seated and unseated, advertised to be sold for taxes in the different counties of the Commonwealth, so far as heard from, was upwards of 1,500,000, or 2,358 square miles." These figures come from lists furnished by county treasurers. This land lies in great part within the limits which the Forestry Commission has suggested as being suitable for State forestry purposes. One may

then readily see that if the State were to acquire title to all such lands, but few years would elapse before either taxes would be paid to the counties, or the State would be in possession of all the land required for its forestry purposes. The chief objection to land so acquired would be: It would at first be more or less scattered and therefore relatively costly to protect and manage.

It is no longer a problem as to whether forest lands, under proper State management, can, or should be, made a source of revenue to the government. The magnificent results attending the forestry operations of Germany, Sweden and Norway, and England in India, leave no doubt that no other line of public policy returns a surer or larger revenue, involving at the same time less injury to the individual or less loss to the government. That it can be made to pay here we may infer from the prices which are offered to New York for spruce grown under state protection.*

There remains yet one more aspect of this many sided question. Communal forests are managed in Germany in local interests. To adapt this statement to our own conditions it would appear as though a county having a considerable area of land thrown upon it by non-payment of taxes, might under judicious care and protection, in a comparatively few years, obtain a very large portion of its needed revenue from sale of wood from such land. The whole success of such an attempt would lie in honest, intelligent management; but it would relieve the citizens of the burdens of taxation just in proportion as it was successful.

There are towns in Germany which have made themselves practically free from taxation by the sale of forest products. The fact is an unfortunate commentary on the methods we have employed to reach our present condition, as a State and as a Nation, that though there will never come a time when our best kinds of timber will cease to have a value, that the true Northern yellow pine (*Pinus mitis*) has practically disappeared from our forests, and there is reason to fear that in the very near future yellow poplar, black walnut and wild black cherry, hemlock and white pine will cease to have large commercial value here, because of scarcity.

The report of the Forestry Commission has been so kindly received and is in such demand that the edition will probably be speedily exhausted.

The Commissioner of Forestry proposes to prepare the following papers as speedily as possible:

First. Report on Forest Fires.

*Since the above was written the Legislature has passed, and the Governor has approved, two acts providing for State Forestry Reservations—one by purchase of a reservation of not less than 40,000 acres at the head waters of each of our three principal rivers (act of May 25, 1897); the other by the State paying the taxes on land sold at treasurers' and commissioners' sales for taxes (act of March 30, 1897.)

Second. Report on Walnut Tree, producing fruit with the outer covering of the hickory nut.

Third. Report on the Engle Chestnut Orchard.

Fourth. Report on Some Troublesome Weeds.

Fifth. Abstract from Recent German Forestry Reports.

Sixth. The "Yearly Cut" of Timber in Pennsylvania.

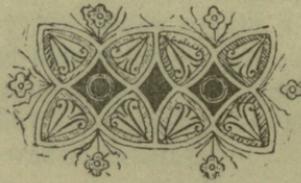
Seventh. Forests as Soil Formers and Soil Preservers.

I am sir, with respect,

Your most obedient servant,

J. T. ROTHROCK,

Commissioner of Forestry.



MISCELLANEOUS PAPERS

ON

FORESTRY,

FROM

ANNUAL REPORT,

DEPARTMENT OF AGRICULTURE

FOR 1896

BY J. T. ROTHROCK, M. D.,
COMMISSIONER OF FORESTRY.

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DEPARTMENT OF AGRICULTURE
DIVISION OF FORESTRY

MISCELLANEOUS PAPERS

FORESTRY

ANNUAL REPORT

DEPARTMENT OF AGRICULTURE



BY J. J. ROTHBROCK, M. D.
COMMISSIONER OF FORESTRY

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RELATION OF FORESTS TO THE FARMER.

Nothing stands absolutely alone in itself and by itself. Every created thing has its relations to other things and forces. Indeed, the whole orderly procession of nature is the result of forces which have become mutually associated and inter-dependent. It sometimes happens that the most obvious purposes are in reality the least important. The forests furnish a striking example of this. If asked to name their uses the first answer would almost certainly be: for lumber and fuel. Yet in the eternal scheme these are the very least of all the important purposes they subserve, and the results of these uses are probably the least enduring of all which spring from the forests. To obtain these utilities the trees, as a living body, must be sacrificed. They cease to operate as a portion of any natural plan the very moment they become either lumber or fuel. Not only so, but in serving either of these purposes they compete with substances which, to a greater or less extent, could be substituted for them. In such functions trees are in strong contrast with themselves, when we remember that as living things their uses are unique, and that nothing which they do for the rest of creation could be so well done by anything else.

Without thought, we regard the earth as having been always timber-clad, until human energy opened the clearings in which crops were to be produced. Such, however, is not the fact. All science is in accord with the belief that forest trees, as we now know them, are the end of a long line of plant life. When extensive areas emerged from the waves to become dry land, and at length the abode of human beings, nothing of higher form than a rock moss or a lichen was there to represent the vegetable kingdom. Indeed we are driven to this conclusion by many arguments, and by none more forcibly than by the fact that soil capable of supporting a large-sized tree did not exist. There was no soft substance into which the roots could penetrate to fix the trunk in an erect position, or from which it could draw the needed nourishment, which the air failed to supply. Our large trees won their hold upon the earth only after lichens, mosses and ferns and palms had preceded and prepared the way for them. Even then there remained ages upon ages during which we should have recognized among the stately forms none of the familiar trees of our own time. Whatever possibilities of lumber or fuel were in the stick were to remain until the earth, largely through the agency

of trees, became fitted for its final occupant—man. Then, and then only, almost as an afterthought, the possibilities of lumber and fuel appeared.

The object of this preliminary statement is not in any sense to undervalue the importance of either lumber or fuel, for they are most important portions of the foundation upon which human prosperity has been built, but to emphasize the fact that forests had a history of development before there was a man upon earth, and that they have been largely instrumental in preparing it for his home.

In further discussing this subject it will be convenient to consider:

First—How forests came.

Second—What they have done in the past.

Third—What they may and should do in the future.

Fourth—Can they be spared?

1. How Forests Came.—Any conception of the early history of our globe involves ideas which are strange to some persons and incredible to others. Briefly stated, however, the earth is regarded as a ball which has cooled down from a molten or semi-molten condition, and that in its interior there still remains a core of fire. Such we assume to have been in part the history of the other bodies floating around us in space. The process of solidification and cooling was not only a gradual, but a very slow one. The first plant life was probably in the water which collected in the depressions on the earth's surface. Later those gray, scale-like masses, which we call lichens, or rock moss, appeared on the dry surface of the rock. The reproductive bodies of these lichens are microscopic in size and of the simplest character, so far as a structure is concerned. Cast loosely upon the rock, any blast of wind might carry them away. Indeed, many of them are thus transplanted. But they have the power to dissolve the substance of the rock, form a minute nest for themselves, such as befits their size, and then to produce threads, by growth, which eventually unite with small green bodies, likewise of microscopic size, and form a living crust on the surface of the rock. The growth of such a lichen is exceedingly slow; and, therefore, its life is correspondingly long. When, however, it does die, there is left behind a thin stratum—the beginning of a soil—the nest in which another lichen may begin an easier life, or where, possibly, some plant of higher organization may appear. It is not to be supposed that there was no other force at work in forming the first soil. The weight of a falling raindrop may loosen a stony particle. Snow, when it at length could remain on the earth's surface; ice and frost each did their share in rending the rocks, and in proportion as these solid masses became smaller, the work of soil production became easier and more rapid, because an increasingly greater surface was ex-

posed to the action of these disintegrating forces. Mosses in all probability came later, grew along with the lichens, and dying, added their remains to increase the bulk of that union of broken down rock and vegetable matter which we call soil. Ferns and club mosses, both of goodly size, sprang up where the lichen and the moss had prepared the way. Palms succeeded these, and after a long interval the familiar trees of our own forest appeared upon the scene.

Such, in brief, are the stages leading up to the forests which we assume the right to destroy at will, as if blotting them from the surface of a country could be effected without doing a most serious injury to an order of events which had required vast periods of time to mutually adjust.

2. What Have Forests Done in the Past?—By this we mean before man appeared upon the earth, and apparently in anticipation of his coming. The assertion has been made that a probable cause of the disappearance of the luxuriant vegetation of the coal-forming period was that the plants themselves had extracted so much of the carbonic acid gas, or carbon dioxide, from the atmosphere that their successors were no longer able to live. If that be so, then we may be well assured that they were making the air, by so far, more fit for animal life. The question, however, here is not as to the fact, but as to the extent of its operation. There is not only no doubt whatever that all plant life does make an atmosphere better fitted for us, but that it is the most active known agent in maintaining that salubrity. Most other things, living or dead, tend to abstract oxygen from, and many, in addition, pour out carbon dioxide into the atmosphere. In fact, so long as plant life is vigorous, active and engaged in increasing the sum total of vegetable substance, just so long plants, and our long-lived trees especially, are enriching the atmosphere for our uses. It is only when they are flowering, fruiting or decaying that this statement is reversed and a surplus of carbon dioxide given off. Just here the special value of the trees becomes strikingly apparent. In them decay is usually long postponed. The flowers are but a small proportion of the surface of the tree, and the maturing fruit is even less. The preponderance of the healthful agency over the noxious becomes at once clear in this light.

Hills and valleys are produced in two ways. By the one process, as the crust of the earth cooled it contracted on the central core. The diameter of the earth is decreasing with each successive age, just in proportion as the loss of internal heat allows it to contract. The outer crust (upon which we live) wrinkles, as it contracts, as an apple does, when, from evaporation, it parts with the moisture contained under the skin. These wrinkles on the earth's surface, which appear so vast to us, are the mountains and the valleys. Taken,

however, in the measure of the earth's diameter, they are ridiculously small. If you had a globe eleven and one-half feet in diameter, a raised line one-sixteenth of an inch high upon it would about represent the height of our mountains to the diameter of the globe, and the one-thousandth of the thickness of that tiny line (equal to one-sixteen thousandth of an inch) would approximately represent the depth of the surface which we know as soil, and with which we, as food producers for the rest of the earth's population, have to do.

If these folds, or ridges and mountains, did not exist, the earth's surface would be a monotonous plain, practically everywhere equally distant from the centre of the earth, except in so far as that distance was modified by the differences between the polar and the equatorial diameters of the earth. Our streams would flow slowly-- in the Northern hemisphere toward the northeast, and in the Southern hemisphere toward the southeast, and the large masses of water would gravitate to the poles, as those would be the portions of the earth least remote from the earth's centre. The continental land masses would tend to be in the equatorial diameter of the globe because the land there would be the highest, i. e., most distant from the earth's centre.

The introduction, however, of these shrinkage folds, which we now recognize as mountains, completely changes these relations. Water will flow downward along the lines of least resistance, and as it flows will wear away the soil first and the rock next, in exact proportion, other things being equal, to the rapidity of its flow. We see this in the washes on our hillsides and in the constantly changing courses of our stream channels. But other things are not equal. If they were, the tendency to the formation of ravines and gulches, by erosion, would not exist, and everywhere over an equal slope the wearing away of the soil would proceed evenly, and the unbroken character of the country would in great measure be preserved, or more properly speaking, the tendency to an even reduction of our mountains would everywhere exist.

As it is, vast discrepancies in the character of soils and rocks occur; some yielding to erosion by flowing water more easily than others—and it is along such lines of least resistance that currents of equal velocity carve out their valley channels to the ocean, following, of course (in most instances) the trend of the larger valleys made by the folds in the earth's crust.

The one factor which is potent in giving character to the earth's surface, and which we can indirectly control, is the rapidity of the water flow. Under natural conditions, in a timbered country, the normal tendency of the water would be to the least rapidity of flow, because of the hindrances afforded, directly and indirectly, by the

trees. This fact has been well put by Professor Shaler.* "In a single day a tilled field may lose from its surface more soil than would be taken from it in a century of its forest state."

The above opinion is unquestionably true. The principle is, to put it in the words of Major Raymond, of the United States Engineer Corps, "as well established as any other in physical science." Since then it is so important, it is worth a consideration in detail. Briefly the proposition may be thus stated:

Forests by retarding the rapidity of the water flow tend, in so far, to prevent the washing away of the surface soil, which is one of the most important elements in agricultural prosperity.

The expression, "pelting of the storm," is no mere figure of speech. Those who have felt the weight of a falling rain-drop in an open country will readily recognize that it brings with it a positively appreciable force. If careful observation is made where the drop falls on the earth, it will be noted that it has loosened the soil and made a miniature excavation. The water of the fallen drop immediately dissolves (at least in part) this loosened soil and begins its journey downward. Careful observation will also show that in an ordinary uncovered space, each drop does an appreciable work—if the soil is at all soft. The aggregate of the fallen drops produces the inundation. The aggregate of the soil so removed produces the muddiness of the stream, whether that be very marked, or the contrary. In other words, the muddiness of the flowing water is the measure of valuable, soluble soil removed from the country. It is mostly soil in condition to be used in one way or another by those growing plants which we denominate crops and in whose abundance we find the reward of our labor.† If that soluble portion of the surface of the earth were infinite, or more exactly, if the most fertile part of it, which the plants most need, were inexhaustible, we could contemplate its removal from our fields calmly. But instead of being abundant, there are but few places on the earth's surface where there is enough of it to enable the farmer for any considerable period to pursue his calling without impoverishing his land, unless he takes active, costly measures to restore it. The farmer does not create that fertility. Whether it comes to him through the medium of his barnyard, or by purchase as an artificial fertilizer, he is simply using over and again the old elements which he has transported back to his tilled acres. Hence the wisdom, the actual imperative necessity of holding on to that fertility by all possible methods. This, however, is not all. The increased rapidity with which water drains out of a treeless country is a prolific cause of disaster, not only to those parts

*Aspects of the Earth, p. 275.

†The word soluble here is used not in its chemical sense; but in the sense commonly accepted—i. e., the particles of soil are held suspended in the water.

whence the flood came, but to those into which it flows. Every small stream furnishes an example of this. The severe dashes of rain which were so common during the past summer in countless instances over the State, visibly, palpably, before our eyes, washed the finest, best soil from our fields, where it was needed, into the public roads where it lay first as mud and then as dust, to the detriment of travel. The ordinary brook, unless it be so narrow that every shower flushes and scours it out completely, will show that the sediment from higher up has clogged its course, and what has taken place in this small way is repeated on a grander scale after the tributaries have become confluent into a main channel. The delta of the Nile, and in our own country, the delta of the Mississippi, alike are made up of soil which has followed the course of the river from a greater or less distance to its final destination—the tide water; and silt and soil of the same quality which clogs the channels of the streams above the tide water is mostly fertility on its way to the tide level. Let me again quote from Shaler, 1, c. p. 275: "Brief as has been our use of the American land, a perceptible portion of it, probably as much as one-hundredth part of the tillable area, has been reduced to a state of destitution which it will require ages to repair—which indeed is scarcely reparable by the hand of man."

Not only are these facts well known and proven, but the laws governing the rate of water flow requisite to transport material of different sizes can be clearly stated. Thus, in the upper part of the stream bed where the water flows as a torrent, massive rocks may be driven before the flood. Lower down as the current slackens its pace the rocks will have been left behind and simply pebbles will be found; and still lower, where the water flow has been reduced in speed to that of an average river, the wash will be simply sand and soil. The figures startle us, but no less authority than Dana has quoted from Humphrey's and Abbott's report the statement that in an average year the Mississippi carries to the Mexican Gulf an amount of silt equal to 812,500,000,000 pounds. This would cover 241 square miles evenly one foot deep. Geikie (Great Ice Age; page 315) states it thus: "Then again we have to bear in mind that the whole surface of the country is being subjected to the abrading action of running water. Under the influences of rain, soil is continually traveling down from higher to lower levels; rills and brooklets are gouging out deep trenches in the sub-soils and soil rocks; streams and rivers are constantly wearing away their banks and transporting sediment to the sea. The gravel and sand and silt that pave the numerous water courses are but the wreck and ruin of the land."

It is then, under this view of the case, most important for us to bear in mind that of all the substances essential to successful, continuous cultivation of the earth, the one thing most difficult to restore

is this soil, and that the one agency most active in reproducing it, and most valuable in restraining its waste, is the forest cover to the land.

If this were the only function of the forests it would be ample reason for throwing around them every protective care which was not inconsistent with their legitimate uses for lumber and for fuel. It is, however, but a part of what they accomplish. Not only do they mechanically restrain the destructive force of the surface water, but by that very act they give it a better chance to soak into and saturate the adjacent earth. The downward pointing roots furthermore serve as lines along which, with increased facility, the water penetrates to the depths beneath, where it is safe from immediate evaporation, and where it continues (possibly for months) to nourish the smaller streams and to maintain the perpetual flow of our springs. It is further to be observed that this water so saved is in immediate proximity to the smallest rootlets, and is by them absorbed, taken up through trunk and branches to the leaves, where it is evaporated or transpired into the open air. In this flow upward from the earth it not only carries the nutrient matters of the soil, to form the fabric of the tree, but it returns in the form of vapor, to moderate the temperature, a quantity of moisture which might well seem fabulous. Thus it has been estimated by Dr. Evermayer that a beech tree "fifty to sixty years old would transpire about twenty-two pounds of water daily." Multiply this by four or five hundred trees and that by the number of growing days in the year and the immense volume of water which an acre of forest land may furnish through the leaves of the trees is at once apparent. Such an acre would restore to the atmosphere during the six months, from April 1st to the last days of September, about one thousand tons of water by evaporation and transpiration from the leaves, and in the same basis a square mile would furnish 640,000 tons of water, or reduce the number of trees one half, and each square mile during the growing season would return, to the air, over 300,000 tons of water.

It has never been shown that this tremendous volume of water, filtered out from the earth to the clouds, through the trees, actually increases rainfall over the region. But it does bring the atmosphere there, by so much, nearer the point of saturation with moisture, and just so much less water from other sources is needed to load the air with moisture enough to cause a downpour of rain.

There is, however, a relation of the utmost importance to the humidity of the country, in which forests play a large part. It is in preventing, directly and indirectly, the rapid evaporation of moisture from not only the surface which they cover, but from even the surface of the streams themselves, as well as from the areas under actual cultivation. Every pound of water restored by the trees to

the atmosphere is a check upon that dry condition which results in parched earth, and the general dry condition which we have so expressively denominated "drought."

But even here the end of the forest usefulness has not been reached. Coming from above downward, the heat from the sun penetrates our atmosphere readily, and during the day accumulates in the earth more rapidly than it escapes. This constitutes a safeguard which the farmer seldom has fully appreciated. Allow this heat to escape and the surface of the earth to become reduced to, or even near to the temperature of surrounding space, and it would mean destruction of most of our crops. It is the heat of the sun which is stored in our earth that prevents this reduction in temperature, and it is the moisture in the air which holds this life-preserving heat for our benefit. In this respect the value of the forests as producers of watery vapor is simply incalculable.

The network of roots descending from tree, shrub or herb, renders the earth more porous, and to a certain extent produces a sieve-like condition, by means of which the water percolates to the depths below.

We have not yet alluded to the mere mechanical action of the dead leaves in retaining moisture as they strew the forest floor. A very simple experiment will make all this quite plain. Take a basket of leaves in the autumn, just as they have fallen from the trees, weigh them and note the weight. Now place that same basket, with the same contents, out where the snow of winter may fall upon it and melt, as the spring advances. Then weigh it. You will be surprised at the increase of weight. Yet it is caused solely by the water which the leaves have retained. Now, instead of limiting this experiment to a surface of a foot or two, imagine the effect of such a collection of leaves extending over miles of forest floor, and the vast importance of even the dead leaves appears. Every pound of that water, too, is acting as a protection against the dry condition of the atmosphere which prevails during a drought. The leaves, however, have not only been gathering moisture themselves, but they have first aided in the safe storing of the surplus water beneath the earth's surface, and then they have been the most efficient agent in preventing the loss of that water by a rapid and premature evaporation. Furthermore, as these same leaves decayed they have furnished carbon dioxide gas to the water, as it trickled down into the earth, and to a very marked degree aided thus in the dissolving of certain kinds of rocks into the condition of soil.

This vista of the usefulness of the forest to the farmer is endless. It is endless simply because the order of things existing in nature is the result of forces operating through almost endless years, until each has become adapted to the other. The touch of the human

hand when it removes the forest covering, to a certain extent, disarranges this established order. It is unavoidable, nay, it is necessary for human well-being that this should be disarranged; but to effect the change in a hasty, destructive manner, without regard to the operation of any natural law, is but to invoke here the disaster which has already overtaken other nations. On page 261, of "Aspects of the Earth," Professor Shaler has in his usual clear style portrayed some of the consequences: "The most serious misfortune connected with the reckless destruction of the forest arises from the loss of the soil from large areas of land, by which regions naturally fertile have been converted into deserts of irredeemable sterility. Already a large part of many fertile regions has been sterilized in this fashion, and each year a larger portion of this infinitely precious heritage of life slips into the rivers and finds its way to the sea because we have deprived it of the protecting coating of vegetation."

We may now briefly consider what the forests may and should do for us in the future.

First of all, the forests should continue to do for us in the future all that they have done in the past—that is, in so far as their decreased areas will allow that to be possible; but they should do more than this still. They should be made the active agent in restoration of fertility to acres that have already become so unproductive that they will no longer compensate the farmer for his labor upon them.

Mankind, and especially we of this Western world, are still young in our relation to natural laws and but half awake to the impending results of violations of those laws. It is true that in some of the earlier seats of civilized power, deserts have taken the place of fertile fields, and that want exists in the very regions which once were the granaries of great nations. The connection between cause and effect is plain enough when attention is called to it. It is hard, however, to induce the individual to make a personal application of even the plainest lessons. We have not yet reached the point as a people of recognizing that we are responsible for the prosperity of those whom we have begotten, or that at least we have no moral right to leave the world in a worse condition for the support of our children than we found it for ourselves. We have, in full justice, but the usufruct of the lands to which we hold the titles.

This all applies, with full force, to the manner to which we impoverish our hill lands by slovenly farming and then abandon them to the descending rains and melting snows, until they have passed first into an unproductive condition and then into that of a desert.

If there is any one statement which, among the farmers is more common than another, it is that "farming don't pay." Of course upon even that point opinions may differ, and much may depend

upon how the farming is done. It is quite clear that farming cannot continue to pay upon land which is constantly becoming poorer. There must, under such circumstances, come a time when it will cease to be remunerative and then perforce must be abandoned. It is absolutely true that at this very hour a very considerable portion of our State has already reached this deplorable condition. In the nature of the case we cannot say just what the proportion is, but it would probably be safe to say that at least one-tenth of our cleared area has ceased to be remunerative under any ordinary system of agriculture. Furthermore, almost every acre of this land is becoming worse. This condition has become a pressing practical problem, which rises beyond the domain of politics, and into that of statesmanship. Whatever else may be doubtful, it is absolutely certain that no state can continue to be prosperous if its population is increasing and its resources decreasing. The only promise such a condition makes for the future, is want, increased severity in the struggle for food, and political unrest. The only effective measures of relief must be based upon a restoration of those unproductive acres to a productive condition. We are limited, too, in the direction that these measures take, for they must involve a minimum of expense with a maximum of good results.

Thus far we know of but one method by which this can be done. It is to restore all such land to a timbered condition. This proposition is radical, possibly ahead of the times, but it is true nevertheless, and in the experience of men will appear more and more true each succeeding year. It is therefore the height of folly to ignore it.

The one practical question is, how can a change be brought about? This involves two ideas. First, What can the individual farmer do? Second, What should the State do? In what follows it is to be understood that we now speak solely of land which has been farmed and become impoverished, or which has for years at least, been considered part of a farm holding, even though it has never been cleared. We do not refer at present to those larger areas from which the lumber has been removed and which have been abandoned, without care, to the yearly forest fire. Such lands demand a separate consideration.

First, what can the individual farmer do? If he derives no revenue from any lands for his labor he can, at least, wisely suspend unpromising labor upon them and devote his time to something which promises remuneration. This is simple, ordinary sense, and any man may be supposed to be capable of appreciating the argument. He could also, at nominal cost, encourage the growth of forest trees upon them. There are thousands of acres in this Commonwealth which were once fields, but which are now covered with a growth of young, thrifty yellow pine. There is hardly any land

so poor that white poplar would not thrive upon it, and in a brief period producing a remunerative crop of pulp wood. Even Ailantus, which will grow almost anywhere, gives promise of coming value as a lumber for the cabinetmaker. The cost of these trees as a first growth is almost nothing. Meanwhile they would form shade and soil in which other, more desirable trees, would grow. The essential fact to bear in mind is that on land which yielded nothing, and was becoming poorer, fertility, under forest conditions, is increasing, a crop of some value is being raised, and almost no money or labor is expended. The gain, however small, is on the side of the farmer, or land owner. Furthermore, this gain promises, if the business is wisely conducted, to become greater each year, because of increasing scarcity of wood and increasing demand for it. It must be remembered that new uses are being discovered for wood faster than substitutes for it are found. But if such a plan is to succeed, fires and cattle must be kept off of the ground. Ultimately we shall, on just such land, come to plant chestnut, locust, various oaks and white pine. Indeed, once the first growth or protective cover is formed, a day in autumn devoted to dropping acorns, chestnuts and locust seed, in shallow holes, and then giving them a slight covering of earth and leaves, would more than likely show results which would surprise the planter. These, however, are details which cannot be considered in this connection.

To meet just this condition of affairs the State has wisely enacted the following law:

AN ACT

For the encouragement of forest culture, and providing penalties for the injury and destruction of forests.

Section 1. Be it enacted, etc., That in consideration of the public benefit to be derived from the planting and cultivation of forest or timber trees, the owner or owners of any land in this Commonwealth planted with forest or timber trees in number not less than twelve hundred to the acre, shall, on making due proof thereof, be entitled to receive annually from the commissioners of their respective counties, during the period that the said trees are maintained in sound condition upon the said land, the following sums of money:

For a period of ten years after the land has been so planted a sum equal to ninety per centum of all the taxes annually assessed and paid upon the said land, or so much of the ninety per centum as shall not exceed the sum of forty-five cents per acre.

For a second period of ten years, a sum equal to eighty per centum of the said taxes, or so much of the eighty per centum as shall not exceed the sum of forty cents per acre.

For a third and final period of ten years, a sum equal to fifty

per centum of the said taxes, or so much of the said fifty per centum as shall not exceed the sum of twenty-five cents per acre.

Provided, That it shall be lawful for the owner or owners of the said land, after the same has been so planted for at least ten years, to thin out and reduce the number of trees growing thereon to not less than six hundred to the acre, so long as no portion of the said land shall be absolutely cleared of the said trees;

And provided also, That the benefits of this act shall not be extended to nurserymen or others growing trees for sale for future planting.

Section 2. The owner or owners of forest or timber land in this Commonwealth, which has been cleared of merchantable timber, who shall, within one year after the said land has been so cleared, have given notice to the commissioners of their respective counties that the said land is to be maintained in timber, and who shall maintain upon the said land young forest or timber trees in sound condition, in number at least twelve hundred to the acre, shall, on making due proof thereof be entitled to receive annually from the commissioners of their respective counties the sums of money mentioned in the first section of this act: Provided, That the first period of ten years shall be counted from the time that the said land has been cleared of merchantable timber, and, that after the said first period of ten years, the number of trees upon the said land may be reduced as in the first section is provided.

Section 3. Any person or persons who shall wilfully or carelessly cut bark from, or otherwise cut, burn or injure any tree, plant, shrub or sprout planted, growing or being on any land in this Commonwealth, without the consent of the owner or owners thereof first had, obtained, or who without such consent, shall kindle, or cause to be kindled, a fire on any forest or timber land in this Commonwealth, or who shall carry into or over any forest or timber land any lighted candle, lamp or torch, or other fire, without having the same secured in a lantern or other closed vessel, or who shall discharge or set off fireworks of any kind on said land or among the trees thereon, or who shall wilfully or carelessly burn or fire upon his or their own land, or that of others, any tree, brush, stubble or other combustible material whereby fire shall be communicated to the leaves, brush or timber upon any forest or timber lands belonging to other parties, shall be subject to a penalty not exceeding one hundred dollars for each offense committed, with costs of suit: Provided, That if the defendant or defendants neglect or refuse to pay at once the penalty imposed and costs, or shall not enter sufficient bail for the payment of the same within ten days, he or they shall be committed to the common jail of said county for a period of not less than one day for each dollar of the penalty imposed:

And provided, When the penalty imposed is above five dollars, the defendant or defendants may enter into a recognizance, with good security, to answer said complaint on a charge of misdemeanor, before the court of quarter sessions of the peace of the county in which the offense is committed, which court, on conviction of the defendant or defendants of the offense so charged and failure to pay the penalty imposed by this act, with costs, shall commit said defendant or defendants to the common jail of the county for a period of not less than one day for each dollar of penalty imposed.

Section 4. Any justice of the peace or alderman, upon information or complaint made before him by the affidavit of one or more persons of the violation of this act, by any person or persons shall issue his warrant to any constable or police officer to cause such person or persons to be arrested and brought before the said justice of the peace or alderman, who shall hear and determine the guilt or innocence of the person or persons so charged, who, if convicted of the said offense, shall be sentenced to pay the penalty aforesaid.

Section 5. The commissioners of each county shall, within one month after the passage of this act, cause the same to be published one or more times, in one newspaper of general circulation in their respective counties.

Pamphlet Laws, 1887, p. 287.

As this paper deals with the relations of the forest to the farmer, it would be out of place to introduce the wider bearings of State forest reservations. There are, however, most important connections existing between the State, the farmers and the forests, and it is proper that they should be more fully understood. For example, one may assume that so long as a forest stands on a portion of a farm it is doing a public service, because of its relations to the atmosphere and the rainfall. In fact it would usually be hard to show that the owner derived any more benefit from his standing timber than the citizens generally did. He, however, pays all the tax upon it. Indeed, during the financial stress of recent years, the owners have frequently been obliged to remove the trees in order to realize something from land upon which they were paying money out. This may seem incredible, but it can be proven. In other words, in self protection, the farmer was driven to remove forest growth, which, under existing circumstances, was actually of more value to the Commonwealth than the taxes paid upon it were. Clearly there must be something wrong with legislation which drives a man to impoverish the State! It should also be remembered at the same time that forest property is the most open to damage by intruders, and yet as a matter of fact, though taxes are paid upon it, the State practically accords it, now, no protection. The injustice of

this whole system of forest taxation (on farm land) is so plainly recognized by the farmers that repeated attempts have been made to remove it from the list of taxable property.

It is clear, however, that it would be unconstitutional to exempt it from taxation wholly. It is not named by the constitution among the privileged classes of property, and therefore must for the present remain subject to tax. That there may be no doubt upon this point, we quote Article IX, Sec. I, of the State Constitution:

"All taxes must be uniform, upon the same class of subjects, within the territorial limits of the authority levying the tax, and shall be levied and collected under general laws; but the General Assembly may, by general laws, exempt from taxation public property used for public purposes, actual places of religious worship, places of burial not used or held for private or corporate profit, and institutions of a purely public charity.

"Section 2. All laws exempting property from taxation, other than the property above enumerated, shall be void."

There is, however, a most hopeful alternative. That the power exists to classify property for the purposes of taxation is clear from the wording of Article IX, Sec. I, because the expression, "class of subjects," is used therein. That this power belongs to the General Assembly of the Commonwealth seems to be equally clear. See discussion of this subject by J. Carroll Hayes, attorney-at-law, Report of Department of Agriculture, 1895, Part II, p. 39, et seq.

Such classification in real estate is already made, "as seated lands and unseated lands." Paxson, J., in *Wheeler vs. Philadelphia*, 77 Pa. 349, writes: "Thus, timber lands, arable lands, mineral lands, urban and rural, may be divided into distinct classes, and subject to different rates."

It would appear to be possible to place farm timber lands in a distinct class and then, without wholly exempting them from taxes, subject them to a minimum rate. It should further be urged that this measure of relief is of vastly more importance to the State than it is to the land owners. It is merely a question whether it is more economical for the Commonwealth to grow and maintain that due proportion of timber land which science, observation and history have shown to be requisite for the continued prosperity of its citizens, or whether it cannot (in part at least,) be done to greater advantage by the land owners, if the State will make it possible for them to do so without pecuniary loss to themselves.

The fourth and last point remaining for discussion may be briefly disposed of, i. e.:

Can we afford to do without forests? It is a safe axiom of political economy that no State can afford to do without anything of value which it can produce almost without cost, on ground that is

capable of producing nothing else. It may furthermore be affirmed that the rule is no less applicable to the individual land owner than it is to the State. In other words, neither State nor individual can afford to allow resources to remain unutilized. This idea admits of a wide discussion; but we content ourselves with a mere statement of the principle.

The farmers of Pennsylvania, in common with other classes of citizens, may now witness the passing of two great industries which still are, or but recently were, largely developed within our limits, i. e., lumbering and tanning. Whatever diminishes their importance here will increase the cost of our lumbering and tanning products. It is furthermore worthy of remark that the producer can do, as he has done in the past, shift the scene of his operations and still conduct a profitable business; but the consumer located here must pay the additional cost of transportation. These industries give steady, remunerative employment to thousands of men who demand our farm products and whose wages pay for them.

In short the Pennsylvania farmer can no more afford to do without the forests which crown our high lands and mountain sides, and are a part of the farm areas, than he can afford to do without timber, without soil renewal, or without a constant, even supply of pure water.

If we remove, without restoring the forests on the otherwise unproductive lands of the Commonwealth, we cannot expect to escape the evil effects which always follow when the long-established order of nature has been suddenly violated.

REMOVAL OF THE FERTILE SOIL FROM THE FARM BY WATER.

In a brief paper elsewhere in this volume the writer has stated in general terms the relations between forests and the soil of farms. This article is intended to present some more detailed and practical suggestions upon the same subject.

Just how valuable this soil is which is washed away from our cultivated acres will appear from the following statement made by a gentleman who was well-known in Pennsylvania and recognized as one of our most wide-awake farmers. The late Colonel James Young, of Middletown, was asked at a meeting of the State Board of Agriculture, what fertilizer he derived the largest returns from. He replied promptly, that in the winter he kept men employed cleaning out the bottom of the canal, which ran through his land, and that he thought this paid him better than any form of fertilizer he could use. In short, he said, that it was about the most profitable industry on his farm. Colonel Young was simply gathering up the wash from his own land and from that of others, further up stream, and restoring it all to his own land. It was a far-sighted, legitimate enterprise, one which was an example of the application of common sense to farming. It also converted his productive farms into object lessons for the rest of the community.

Just how great the volume of this fertile soil wash is very few persons have any idea of. Usually it goes on and attracts but little attention. Unless it in some way becomes conspicuous by its unusual amount, or by becoming a nuisance in the form of mud or dust in our roads.

The illustration accompanying this article is one, however, out of many which might have been had this summer. The space included within the dark lines shows the location of such a wash, and to a certain extent its volume. The history of that pile of fertility (indicated by the lines aforesaid), is this: Last summer, it was observed that the corn field above the road, having an average slope of probably three degrees, was badly washed after each heavy shower. The loss of soil was very apparent. The field was in corn, and of course its surface was loose. Over the whole surface, observation showed, there had been a general removal of material, which

can possibly be done in this direction. Whenever such crops become possible and profitable, capitalists will invest their money in timber lands instead of bonds, and leave as a legacy to their families, thousands of acres of land which will ensure them a steady and perpetual income, and incidentally, benefit and enrich the State.

To induce investments, the tax rate on such lands should be but nominal, sufficient only to keep the property listed in the records of the county, and whenever these lands are cleared a certain percentage of the value of the product should be paid to the State for the protection afforded during the period of growth. To insure immunity from fire, it is absolutely essential that proper persons be appointed and paid to watch the reservations during the season when fires prevail, and that railway companies shall station watchmen along the lines of their road during the fire season, who shall patrol all forest districts through which railroads run, after every train. Severe penalties should be required from all, who either through intent or carelessness, are found guilty of setting out forest fires. The general public cannot be expected to give the careful and watchful attention to the prevention of fires upon the reservations that their value and importance require. The responsibility for their safety must devolve upon the owner, which is the State, and this means that the State must employ the same methods for protection that individuals find it necessary to adopt in order to secure the same end. A modern city could not exist without a regularly organized fire department, assisted by a police force that is constantly on the watch; neither can exposed and inflammable property, such as forests, be secure against evil disposed and careless persons, unless efficient guardians are provided who shall discover and arrest offenders and extinguish fires. A law, therefore, should be at once enacted which shall authorize the employment of watchmen upon the State reservations, and provide for their proper compensation adequate for the service required.

The report of the Commissioner is largely devoted to a recital of what has been done to arrest offenders and prevent forest fires during the past year. He shows how frequent and destructive these have been, and how inadequate are the means now provided to prevent them. The importance of the question, therefore, cannot be exaggerated, and all of our experience, as well as that of others, shows that this is not only the weak place in our system of forest management, but is also primary, in any plan, if it is to be effective in forest preservation and for the securing of timber growth.

DIVISION OF VETERINARY SCIENCE.

The Live Stock interests of the State are valued at over \$150,000,000.00. Previous to the establishment of the Department of Agriculture, five years ago, there was scarcely any official recognition on the part of the State of the existence of such an industry. A law did exist, passed in 1889, which authorized the Secretary of the State Board of Agriculture to take action in case of certain "contagious" diseases, but no skilled veterinarian was in charge to make constant study of the conditions that existed and to prescribe remedies to meet them. As a consequence, the spread of certain diseases among our domestic animals was practically unrestrained, and when the Department was organized and the State Live Stock Sanitary Board took charge of the work, it was found that fully 25 per cent. of the herds of cattle in the State were infected with tuberculosis, and many of the animals were in a condition so dangerous as to be a menace to the public health.

The establishment of a Division in the Department, in charge of a skilled veterinarian, at once placed the work of the care of the health of our domestic animals under expert control, and the results have shown the wisdom of this, in the decrease of the number of diseased animals and the better protection of those that are in health.

The Veterinarian reports that "the losses from disease among domestic animals have been distinctly less for the past year than for any previous year since the establishment of the Department." The Division has "nearly 300 regular correspondents through the State, and about as many more who write as occasion requires." The system of reporting, therefore, is quite complete and no outbreak of disease can occur anywhere in the State without its being immediately known by the Veterinarian and means taken to suppress it.

Much of the work of the Veterinarian has been in the inspection of herds for the detection of tuberculosis. Sixty thousand doses of tuberculin were prepared by the bacteriologist of the Division. Six hundred and fourteen herds, composing nine thousand two hundred and seventy-four cattle have been tested by this method. As many more were subjected to a physical examination. Out of this number, 1,227 were condemned as tuberculous and killed. The law



of Horticulture, Vegetable Gardening, Floriculture and Nursery Management. At least five experts should be employed in this Division to at all properly equip it."

DIVISION OF FORESTRY.

As the forests of Pennsylvania have now about disappeared, our citizens are coming to realize their great importance as entering into the wealth of the State. The accumulation of centuries of growth was present in our trees, and to the citizens of Pennsylvania, during the past forty years, this forest growth was a valuable gift, inherited or purchased at a nominal price. The wonderful development of the country during this period has made a demand for timber, which the lumbermen supplied, disposing at a profit this raw material, which required but little intermediary work to prepare for market. The professional lumberman, with his army of employes, has lost his occupation and has left Pennsylvania for other harvest fields. Since the forests have disappeared, the farmer who remains, no longer has a timber tract to enter, cut and dispose of in payment of his debts or to enrich his bank account. We have suddenly come to realize that our forests are gone, and with them has disappeared one of our most valuable sources of wealth.

We have begun none too soon to attempt to remedy the serious injury which this industry has suffered through the past reckless waste of our resources as a timber producing State. The problem of another crop is now upon us for solution, a problem of no ordinary difficulty, but one that will take years of patient, intelligent effort on the part of our public and private citizens to properly solve. A beginning has been made in Pennsylvania by the enactment of such legislation as forms a broad and strong foundation for future work.

Authority is granted to the Commissioner of Forestry for the purchase of lands, suitable for forest purposes, at tax sales, at a price not to exceed the amount of taxes for the non-payment of which the lands are being sold, together with the added costs. He has also authority, subject to the approval of the Board of Property of the State, to purchase forest lands at a price to be agreed upon and approved by the Board of Property, and not to exceed the assessed value of the property, and in no event to be above \$5.00 per acre.

The Legislature has also constituted a Forestry Commission, composed of the Commissioner of Forestry, the chairman of the State Board of Health, the Deputy Secretary of Internal Affairs, and two other persons to be appointed by the Governor. This Commission has power to locate and condemn, subject to jury damages, three reservations of not less than 40,000 acres each, upon the head waters of the Delaware, Susquehanna and Ohio rivers. The Commissioner reports that at this time the State is in possession of 40,605 acres and 99 perches, purchased under the acts of 30th of March, 1897, and April 28, 1899, and these lands are under the control of the Department of Agriculture as custodian for the State.

There have been purchased, in addition, by the Forestry Commission, under act of May 25, 1897, 57,768 acres and 12 perches, making a total of 98,370 acres and 111 perches. Additional lands have been reported to the Commission, amounting to 15,542.71, which if approved, will make the State the owner of 113,916 acres and 22 perches. The lands are situate in Elk, Lycoming, Clearfield, Clinton, Pike, Cameron, Tioga, Centre and Mifflin counties.

The proper care of the lands already purchased and of those which the State shall in the future secure, is a subject of great importance. The policy to be pursued should be carefully planned so as to avoid the necessity for change in future years, to the detriment of the interests of the State. A well considered body of principles for their management should be compiled and embodied into law, so as to prevent future Forestry Commissioners, who may be unfamiliar with the purpose of the State, from overturning the entire work of their predecessors.

A well digested plan for future guidance should be at once secured, and all efforts hereafter be directed to the carrying out of this plan in the most economical and satisfactory way. Before any forestry reservation system can be successful, there must be, first of all, an effective means for preventing forest fires. This is fundamental in the forestry question in America, and no progress can be made until this is secured. This being secured, the way is comparatively clear. Mere protection from fire will ensure in most localities a fair growth of timber in a reasonable time, without much additional care. No doubt, in time, we shall set out plantations of trees, selected with regard to their value in the arts, and to their rapid maturing characteristics. In time, also, quick growing trees will doubtless be discovered which can be cropped every fifteen or twenty years; trees adapted to special uses and cultivated to produce the qualities required in the shortest time and with the greatest certainty. Locust, hickory, chestnut, willow, poplar, linden, white pine and others not yet discovered, are examples of what

was the best, because it was the most *soluble, and therefore best adapted to the uses of the growing crop. This soil had also, in each depression, been worn out more deeply because the water had there gathered into small rivulets or streams, and its erosive power was greater along such lines. Finally, this soluble soil found its way out of the field and into the edge of the road, where it lay during most of the summer in a condition alternating between mud and dust. If the soil which had been washed away from that acre of good land, in a single season, had been placed on one of the many impoverished acres of the Commonwealth, it is probable that there would have been enough of it to have produced a fair crop. As it was, instead of being a source of benefit to the land owner, it had become more or less of a nuisance to the traveling community. In the autumn this material was gathered up (wisely enough) to be replaced upon the field whence it came. It is worthy of note that in the woods adjacent (visible in the illustration,) there is almost no sign of wash. The rain appears to have been either wholly absorbed, or its flow so held in check that it was incapable of doing any damage on woodland having that same degree of slope. Its damage upon the same field, if it had been in sod, would have been vastly less than it was on the plowed field, but it would, probably, have been considerably greater than in the woods.

Another instance of the effect of wash it may be worth while to give here. In traveling through a very beautiful valley in the central part of Pennsylvania, it was observed that portions had but recently been cleared of the trees. There were signs of abundant crops on the ground from which the stumps had not as yet wholly disappeared. On the other hand, where the land had been longer under cultivation the yield was scanty. The solution of this was easily reached when the wash from the field into the road was observed.

The question is sometimes asked why a ridge top, or a portion of a hillside near the top, remains fertile so much longer than the ground just at the foot of the hill. Instances, or alleged instances, have recently come to my notice. The fact is not hard to understand, though the same explanation will not always answer on the same spot. Time is an element of the problem. For example, when the land is first cleared, that portion which is highest, whether it be the top of a hillside or a level table-land, can receive no considerable volume of water from any higher point. On the table-land an immense proportion of the rainfall goes into the ground. The decomposing rocks below the surface renew fertility as fast as it is washed out on the surface. The same is true of the top of the hill-

*Not soluble in a chemical sense, but capable of being suspended in and carried by water.

side. Each foot, for example, carries but little more water than fell upon it. Neither rain nor melting snow have had time or chance to gather into a torrent with great eroding power. The land at the bottom may be in one of two conditions. Before it was cleared a small quantity of fertile soil, humus resulting in great part from decomposing leaves, had gradually been carried down the slope above and been arrested at that point. Hence, as a rule, the foot of the hill in a wooded condition is more fertile than the higher portions. This is clearly shown by the product being larger and more vigorous. This condition of affairs continues after the clearing has been made for a varying period of time, the length of which will depend upon the conditions. Sooner or later, however, the land at the foot of the hill becomes at least as unproductive as that above. The reason of this is obvious. The water which flows from the top of the hill flows with an ever-increasing velocity as it descends. It has but little force when it starts, but gathers strength and erosive power as it reaches the bottom. The result is inevitable. Not only is the soil which was accumulating while the wood remained on the ground removed, but beside this, the original natural surface goes with it. Surface impoverishment goes on more rapidly than soil formation does below, hence results a greater sterility on the lower grounds than those of the plateau, or of the hill top. Or to state the same idea as is more generally done, the top of the hill has become richer than the foot and the lower part of the side.

The present condition of a very large portion of the steeper regions of the State is already in a deplorable condition. The northern tier of counties is within the belt once covered by glaciers. Or perhaps it would be better to state that the signs of glacial action are most marked there. Such regions, as Prof. Shaler has well remarked, do not suffer severely from washing out of the elements of fertility, because "owing to the depth and loose aggregation" of the materials deposited by the ice masses, a large part of the water soaks into the ground. It is, therefore, quite as likely to increase the quantity of material fit for plant food as it is to remove it. When, however, we study the counties which make up the southern half of the Commonwealth, a different condition of affairs is at once visible. The traces of glacial action are less plain and signs of soil impoverishment are correspondingly more common. Even in such counties as Chester and York, which, on the whole, possess a vast agricultural wealth, there is probably a larger acreage of land so impoverished, that it cannot be counted upon for a crop, than there is in Susquehanna county. The unpleasant truth had better be stated that Pennsylvania possesses a vast acreage now under a nominal system of agriculture, which is falling lower each year in the scale of productiveness, which gives no promise of future agricul-

tural value, and which should, with the least possible delay, be restored to a forest condition. The steep, shaly ridges within our limits which have but little natural productiveness, which impose upon the unfortunate who attempts to farm them an extra labor and cost to maintain them in a remunerative condition, and even then very frequently fail to answer to even moderate expectations, are examples.

It may be well here to quote a general statement from the "Economic Aspects of Soil Erosion," by Professor N. S. Shaler, whose observations upon this point have been careful, long-continued, and have extended over wide areas. "Owing to the fact that in North America generally the rainfall is apt to have a torrential character (the precipitation taking place at a rate which is not common in Europe) and to the fact that these downpours are likely to occur on ground which has been loosened by the frost, our soils are exposed to a measure of danger much greater than that which menaces the fields of the Old World. There appears to be but one way by which we may meet this danger—this is by limiting the work of the plow to those fields which have a degree of slope so slight that with proper tillage they may not be exposed to scouring action. Although this classification has to be made for each district and species of soil, it may in general be said that no field which has a greater slope than five feet vertical in one hundred feet of length should in any country be exposed to the danger which ordinary cropping inflicts. Areas from this measure of inclination upward to thrice this rate of slope, or to a maximum of fifteen feet in the hundred, may reasonably be plowed in order to bring them into the state of grass lands, but should not be tilled more than is necessary to retain them in this state. All areas having a slope of more than fifteen feet in one hundred should by the rules which the conservator of the soils is disposed to lay down, be devoted to forests which afford the only crop that can be harvested from such ground without a swift and immediate loss of fertility."

There remains for consideration the other aspect of this problem; i. e., the effects of the wash upon the land where it may be arrested. If this soil so deposited is fertile the land receiving it is a gainer. If, on the other hand, as often happens, sand, stone and pebbles are deposited upon the lower land, the effect is most destructive. This latter condition seldom occurs except where deep gulches have been worn out of the hillside above, and where the water flow has assumed the character of a torrent. In this country land lost to cultivation by the overflow of sand and rocks is not large in area. Certainly not, at least as compared with certain districts in Europe. For example, we are reliably informed that the "French government and the farmers together have spent during the last thirty

years over \$40,000,000, and expect to spend three or four times that amount to reforest 1,000,000 acres of denuded mountain sides, the soil and debris from which have been carried by the torrents of water into the plain covering over 8,000,000 acres of fertile ground and making it useless for agriculture." Still it is important enough here to merit our consideration.

How may the damage already done be repaired? This resolves itself mainly into filling up the gulches worn into the hillsides and bringing the areas overflowed by the deluge of debris into a fit condition of farming purposes. The latter part is simply to remove surface stones and add fertility enough to secure a crop. This, however, is subsequent to filling up the gulches, as if done before the wash was arrested, it would simply be labor lost. The important part of the problem then is to arrest the water flow in the gulches. Attack an enemy in his weakest point. In the case of water flow it is where it begins. In hilly regions, where such washes are most frequent and most damaging, there is usually an abundance of stones which may with advantage to the farm, be gathered and dumped into the upper end of the gully, thus lowering the point at which the wash begins, and to that extent lessening the destructive force of the flowing water. Every foot thus gained at the upper end renders the task easier.

There are, however, extensive gulches in which such direct, unaided repair would be an immense task. We must make the torrent itself expend its power in repairing the damages it has caused. In France and Germany this has developed almost into a science. The thing aimed at is: First, to check the velocity of the descending water, and second, to arrest permanently the soil which the water carries downward with it. All such soil (or stone) is thus deposited where it will do the best service. To accomplish these desirable objects the course of the ravine is partly filled at various points with brush, which is held in place, that it be not washed out, by weights such as stones, logs placed transversely to the course of the gulch and firmly fixed in position. It requires no explanation to understand how so simple a device as this may both retard the speed of the water and encourage deposition of the earthy matters which it carries. Furthermore, the water will flow in all ordinary times through the interstices. The undermining process in the sides of the deepest part of the gully are largely arrested. This allows chance to further bind the bank by a growth of willows or such species of shrubbery or trees as will grow most promptly in the location. When willow brush can be obtained in a living condition and so placed as to be in contact with a moist soil, they may be expected to grow, and as they ascend out of the depths of the ravine, to not only hold soil but to constantly rise above it, by growth.

On most farms there are found a greater or less quantity of old rails. These placed lengthwise in the ravines, and held in place by stones thrown over them, often answer a good purpose.

How to prevent soil washing. This is of infinitely more importance than how to repair damages. It is more than doubtful whether as a people we are in a proper frame of mind to profit by the experience of other nations. It is unfortunately true that we shall probably go through the most costly process of gathering our own knowledge.

There are several principles involved in presentation of soil washing. It would at first appear impossible that the hardest, most compact soils are those in which destructive, deep washing occurs. This, however, becomes clear when one remembers that on such surfaces the water flows on top, with but little to arrest its speed, and consequently with little to diminish its destructive power. On the other hand, if the soil be loose and porous, and especially if it contains much vegetable matter, it has a large capacity for absorbing water, which slowly percolates away beneath the surface. The underlying principle here, then, is to secure a porous soil, and all the better if that porosity is gained by the roots of living plants, which produce also a strong cohesion in the mass of earth.

When ground much given to washing is plowed for the purpose of cropping, straw is often placed in the furrows, to be covered at the next round of the plow. This is a simple, time-honored method of singular efficiency.

Underdraining by the removal of surplus water increases the capacity, in times of heavy rainfall, of the soil for absorbing and holding water. This again diminishes, or often almost wholly prevents, destructive surface wash. It is well known that soils which are well limed are less apt to wash than those which are not.

There are times when these methods of preventing soil washing are, alone, wholly ineffectual and must be abandoned or used in connection with other methods. Among which are:

(a) Furrows or barriers which run over the field, as nearly as possible, horizontally. This slackens the speed of the water, diminishing its erosive power on the one hand and allowing increased chance of absorption (of the water) on the other hand.

(b) The formation of terraces, whose sloping surfaces (at least) may be in a dense sod, and whose flat parts may be cultivated or not, as happens.

(c) Planting belts of trees in the horizontal direction along a hill-side. This allows a chance for the formation of an absorbing layer of humus and of leaves, which will aid the roots in changing the surface flow to one of underground character.

(d) Most important of all—giving up to growth of trees all such soil as is likely to wash or to involve considerable expense in pre-

venting it. The successful application of this principle sometimes involves considerable skill and thought. The land to be forested may be in the condition least suited for such work. It may be poor, dry and sun-scorched. It may even be that no tree of value could at first be induced to grow on it. We may even be glad to secure a luxuriant growth of weeds as the first product at such a place. Nevertheless, all such places can be reforested, if one is careful first in the selection of his seed, and second in doing every step of his work thoroughly.

How shall we proceed? First of all, select an area no larger than you can properly prepare and care for. It is quite possible that if the seeds to be sowed were placed on the ground when the frost is coming out, that the alternate freezing and thawing of the surface would bring them into close contact with the soil, as is the case with clover seed, and that many of them would grow. This method, however, is but an apology for what should be done. The ground should be broken up, if possible. If it cannot be done with the ordinary plow then it should be done with the primitive shovel plow. A good subsequent harrowing will tend to even up the surface and to further reduce the clods. Bear in mind what we are now seeking is the first tree covering, something which will afford protection to such trees as we desire ultimately to plant for their useful properties. We must, therefore, be willing to sow what will grow. Locust is always a valuable timber. It flourishes on almost any kind of soil and is much less apt to be bothered by the borer when planted in clumps or in quantity, than when it stands as an isolated tree, or row of trees, by the roadside. The ill-odored *Ailantus*, while in small demand now, promises in the future to have a value as furnishing wood for the cabinet maker. It has the supreme merit of thriving under neglect and of growing on almost any soil. The *Catalpa* tree (either the Eastern or the Western form) grows vigorously on a certain class of soils. It is, however, not adapted to every location. If the soil is fertile and moist there is but little doubt of its success. If, on the other hand, it is sowed in a clay soil over a limestone rock, the chances are not in its favor. Still it is so easily obtained that it may be well to include it in the present list. The wood is valuable for fence posts.

These seeds may all be planted in early spring—the locust after having received a good preliminary soaking in hot water to soften the outer shell, and the *Ailantus* and the *Catalpa* after having been dampened over night to waken them up. The introduced white poplar has the habit of growing on almost any soil. Moreover, when once started, its tendency to self multiplication is wonderful. This tree produces its seed in early spring, and even if not in time to plant with the seed, already indicated, would have a fair chance of success

in at least a moderate degree if sown broadcast on the ground subsequently. Its seeds are light, and provided with a silky down which enables the wind to carry them to great distances. It is suggested that mixing these over night with damp sand and sowing the whole (sand and seeds) together broadcast, would obviate the danger of the seeds being carried off the ground by wind.

How shall they be sowed? That depends. First of all, in large quantity. Your immediate object is to secure shade and leaf litter and a penetration of the earth by the roots. These conditions having been acquired, the rest is easy. If sowed broadcast, as would be desirable on the soil we are now considering, a subsequent harrowing would cover the seed and increase its chances.

Such a plantation, once started, would require thinning out very soon, else it would develop into the thicket condition, which so far as prevention of surface wash was concerned, would be effectual enough, but it would not give the best promise of a crop of valuable timber. It should not be necessary to suggest that browsing animals should not be allowed access to such grounds. Their presence would be fatal to any successful forestry operations. Fire of course would be disastrous. The method just described is simply a slight improvement of the natural plan by which we so often see old, abandoned fields covered with a fresh forest growth. It has, however, this advantage that the growth is more likely to be prompt, dense and desirable. It is to be understood that the chief use of such a forest is to serve as a protection to more desirable trees, which may be introduced by methods already well understood.

There is another class of land, which, though no longer remunerative under ordinary agriculture, is still better than that we have just described, and which it may be desirable to cover as speedily as possible with a forest growth. The preparation of the soil here may be more thorough. And while the same broadcast methods of sowing may still be resorted to, it is by no means certain that they should be. Having some choice in the matter, it may be wise to secure a more orderly arrangement of the trees, not only because greater protection against wash is thus obtained, but because a better quality and a larger quantity of timber is secured. Indeed, it may be a question for the landowner to decide whether he will sow the whole surface by seed, or whether he will raise his seedlings in a nursery and then transplant them in the soil he desires to reforest. Such soil also admits of a larger list of seed which may be sown with fair promise of success: Elm, two or three species of ash and red maple may be added to the list already named for covering the ground speedily. And as the season's growth is more likely to be vigorous, the sowing may be longer delayed, or done, indeed, when the seeds ripen—from June to October. It may be suggested that in company with these

seeds there can also be a light sowing of such leguminous plants as will not only give protection to the tender trees, but will at the same time rapidly add nitrogen to the soil; i. e., field peas, and, certainly for the southern half of Pennsylvania, crimson clover. It should be stated that the locust tree is a nitrogen gatherer, and therefore adds to the fertility of the soil.

The other alternative to sowing is by placing the seeds in rows. This is probably on the whole better adapted to the weightier seeds—the nuts and acorns for example.

The methods to be employed for each kind of seed have been fully discussed in the report of this department for 1895. It will, therefore, be unnecessary to repeat them here.

If trees are raised in a nursery and transplanted the task is much less formidable than supposed. Three men, or two men and a boy, can plant by means of a "dibble" from three to four thousand such young trees in a day. The same instrument may be used in planting cuttings, or such seeds as require a considerable covering of earth.

To recapitulate, the two sovereign remedies against "wash" on a farm are, first, a dense, well-matted sward, which should be kept in good condition by frequent top dressing, or if this fails, a prompt restoration of land rendered unproductive to a forest condition.



WALNUT TREE

Producing Fruit Externally Resembling the Hickory Nut.

A WALNUT FREAK.

In the winter of 1895, my attention was called by Mr. William H. Groninger, clerk to the commissioners of Juniata county, to a remarkable fruit produced by a walnut tree near Pleasant View post-office, in the county above named. The statement made in connection with the tree was that it was a walnut tree which produced hickory nuts.

Mr. Groninger handed me the fruit for inspection. Naturally enough I was cautious about expressing an opinion concerning so remarkable a production as the one held in my hand. It was apparently a black walnut, which retained its outer hull, or husk, in a wrinkled or weathered condition. I noticed that its free or upper end showed signs of splitting into valves, after the manner of the ordinary hickory nut. The other end, on which the point of attachment to the branch was still visible, had the texture, color and odor of the walnut, and of that only. The nut itself was unmistakably a walnut.

On April 16th, 1896, Mr. M. S. Esh was kind enough to take me to see the tree. It stands within a few minutes' walk of the railroad station known as Warble, on top of a low ridge, or hill, and within half a mile of the mountains on the southern side of the Tuscarora valley. The tree was about forty feet high. The trunk was two feet seven inches in diameter at four feet from the ground. The illustration will show that it had in earlier days received severe injury. On the one side, toward the west, was a scar much more than a foot wide above, tapering down several feet to a point. It seemed as though one of the largest limbs had been torn off there by a storm. On the side toward the south, apparently an earlier and more extensive injury had overtaken the tree. The illustration will show that it extends in one limb from above where the primary branches arise to the ground, and that it involves the entire heart of the trunk. The general belief is in the neighborhood that it is the result of a stroke of lightning. This I am not inclined to doubt. The tree is old and seems to grow but little. The statement of Mr. W. D. Beale, a middle-aged man, who grew up (I am informed) on the farm, was that the tree seemed to have changed but little in appearance or size as long as he can remember it. At the time of my visit (April,

1895) the ground was abundantly strewn with the weathered fruit of the previous season. This fruit was probably half of the usual normal character, and presented no apparent difference from the ordinary black walnut, either in its outer husk, or in the nut and kernel. The other half of the fruit which lay on the ground presented in a more or less marked degree on its outer husk the split character of the hickory nut. The valves sometimes were barely indicated at the tip. At others they were clearly marked to the middle of the fruit or even lower still, but never quite to the base. The nut itself in every instance was a genuine walnut.

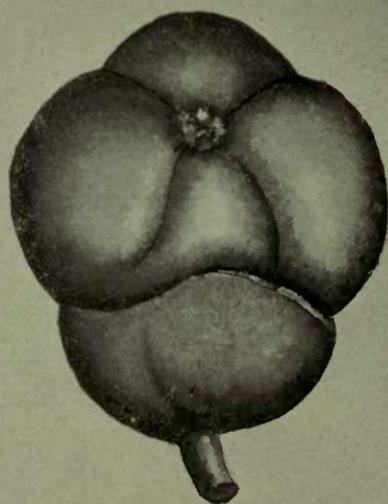
On leaving this freak my first thought was that it must be a hybrid. This, however, cannot be the case, because the tree bears fruit of no constant character. Part is normal and the remainder is of the character indicated. There remains now to be stated that, which to my mind, is the most singular fact of all in connection with the history of the tree; i. e., its fruit not only varies on the tree in the same year, but one year's product appears to be no certain sign of the character of the fruit on the following year. For example, the fruit of 1895 was, as has been stated, about evenly divided between the normal character and the sport. The fruit of the season of 1896 was almost, if not quite, wholly normal. At least I failed to find any pronounced instances of the sport in the fruit when I visited the tree in October of this year. There was at the time an abundant crop of fruit lying on the ground, and the only indication I was able to observe of any departure from the normal state were two fruits which bore faint longitudinal ridges toward their apex.

So far as I am aware, no demonstrable solution of this singular biological problem is to be had. Still there are certain facts which point to a possible explanation.

It is clear that a tree so maimed as this one cannot be regarded as in a healthy condition. Leaving out of sight the fact that it is practically a mere shell, there remains also the still more important fact that one-half of that shell is destroyed, and that if the limbs above receive full nourishment it must be through a much diminished surface of cambium and young wood. That nutrition is seriously impaired might probably be inferred from the remark of Mr. Beale, that he has known the tree all his life, and that it has changed but little, if any, during that time. Its growth is, therefore, exceedingly slow. There is another fact to be considered as pointing toward though not proving the explanation about to be offered; i. e., the season of 1895 was one of phenomenal drought, and the abnormal fruit formed about fifty per cent. of the yield of that season. The summer of 1896 was more favorable, and there was but little shortage in the rainfall. During this season the fruit was practically wholly normal. May it not be a case of arrested development due to impaired nutrition?



TRUNK OF WALNUT TREE
Which Produces Fruit Externally Resembling the Hickory Nut.



Margaretta Wedgwood

If this is true, it would probably also lead to the conclusion that the typical black walnut (*Juglans nigra*) is biologically higher than any of the species of hickory (*Carya*) and that the former may be considered as a development from the latter.

An effort was made to ascertain when the tree was injured and whether any connection could be traced between the injury and the appearance of the abnormal fruit. No information of positive character upon that point seems to be obtainable.

The leaves do not seem to differ in any essential from those ordinarily found on the walnut tree.

PARTIAL ABSTRACT STATEMENT OF TIMBER CUT DURING THE YEAR 1896 IN PENNSYLVANIA.

To Hon. Thos. J. Edge, Secretary of Agriculture:

Dear Sir: It is by law made the duty of the Secretary of Agriculture, "as far as practicable, to procure statistics of the amount of timber cut during each year, the purposes for which it is used and the amount of land thus cleared as compared with the amount of land newly brought under timber cultivation."

I have, under your direction, instituted such inquiries as were possible, to comply with the above requirement.

About fourteen hundred circulars were sent out to the lumbermen of the State. Replies have been received from about half of them. It is unfortunate that some of the largest operators are conspicuous by absence of statistics from this report. We can only say that these figures represent in brief the information which we have received up to December 1st, 1896, and that a very large proportion of the timber cut remains unreported to us. This is the more worthy of regret, because it prevents such a showing to the public as would without injury to anyone, probably hasten legal relief and protection in which the lumbermen themselves have the largest financial interest.

The brief period elapsing between the close of the year and the appearance of your report makes it impossible to secure all the information desired. It is therefore suggested that our reports hereafter be considered as extending from June 1st of one year to the same date of the following year.

It is proper that I should add, I am indebted to Mr. Robert S. Cenklin, clerk of the Forestry Division, for collection and preparation of the statistics used in the following table. It has been no slight task, and his zeal and fidelity are worthy of commendation.

There still remains a large body of information in our hands upon this subject which would be well worth publishing later in some popular form.

It is with regret that we announce there is as yet, so far as we are informed, no determined, practical, intelligent effort at timber restoration on a large scale in this State, except by the directors of the Philadelphia Trusts, who have instituted a measure of rational

forestry on the lands in their care located in Schuylkill and Centre counties.

There are some other examples of careful forest protection, in the face of great danger, from forest fires. As a conspicuous instance we may point to the land owned and managed by General Paul Oliver, in Luzerne county.

It is in vain to expect any extensive tree planting or true forestry until the State will offer the owner some real protection against forest fires, or, in other words, until it is made by law as heinous an offense to fire a forest as it is to fire a barn.

I am, sir, with great respect,

J. T. ROTHROCK,
Commissioner of Forestry.

PARTIAL SUMMARY OF TIMBER CUT, BY COUNTIES.

County.	Acres cut over.	Kinds of Timber Cut, in Feet, Board Measure.			Bark peeled, cords.
		Pine.	Hemlock.	Other woods.	
Allegheny,	606			883,000	
Armstrong,	525	244,000	650,000	1,740,000	547
Beaver,	159			140,000	
Bedford,	684	175,200	12,000	1,102,300	330
Berks,	231			831,000	312
Blair,	1,480	80,000	625,000	1,325,000	14
Bradford,	1,470	720,000	7,027,000	1,765,000	2,618
Bucks,	219			1,495,000	165
Butler,	280			1,023,000	
Cambria,	3,925	100,000	16,345,000	2,070,000	6,150
Cameron,	2,558	150,000	27,317,844	100,000	15,760
Carbon,	65	80,000	335,000	340,000	75
Centre,	5,093	11,736,000	3,210,000	3,394,000	8,575
Chester,	104			1,124,000	200
Clarion,	1,639	11,035,000	3,504,000	1,928,000	912
Clearfield,	14,785	10,974,000	94,080,000	8,166,000	34,513
Clinton,	2,734	6,978,000	6,285,000	4,466,000	5,823
Columbia,	350	885,287	170,000	391,000	480
Crawford,	519	10,000	2,335,000	4,289,000	945
Cumberland,	196	50,000		900,000	250
Dauphin,	270	260,000		3,468,000	213
Delaware,				33,000	
Elk,	24,768	2,855,000	310,560,842	4,290,000	168,402
Erie,	285		1,510,000	1,302,000	254
Fayette,	2,518			14,640,000	325
Forest,	10,092	12,668,270	119,491,694	3,453,714	66,296
Franklin,	867	162,000		1,880,000	725
Fulton,	660	440,000		110,000	
Greene,	13			52,000	
Huntingdon,	1,055	525,000		901,000	264
Indiana,	1,042	5,206,822	10,794,000	7,056,724	8,530
Jefferson,	5,105	17,822,000	68,425,000	3,465,000	26,890
Juniata,	680	200,000	400,000	675,000	330
Lackawanna,	455	60,000	730,000	660,000	270
Lancaster,	2			120,000	
Lawrence,	242			2,134,000	
Lebanon,	200	1,000,000	1,800,000	100,000	40
Lehigh,	102			935,000	245
Luzerne,	840	800,000	498,000	817,000	462
Lycoming,	3,185	3,005,000	24,880,000	2,099,000	14,351
McKean,	5,240		40,200,000	7,470,000	23,798
Mercer,	316			3,164,511	
Mifflin,	1,765	395,000	300,000	1,750,000	1,190
Montgomery,	90			750,000	
Monroe,	200	1,000,000		2,180,000	100
Montour,	100	50,000		150,000	50
Northampton,	70			150,000	100
Northumberland,	81	11,200	200,000	215,100	120
Perry,	1,747	440,000	120,000	1,965,000	957
Pike,	11,110	760,000	55,000	1,414,000	130
Potter,	6,304	1,225,000	220,805,000	4,485,000	36,640
Schuylkill,	370	670,000	1,300,000	630,000	385
Snyder,	2,147	5,970,000	12,000	978,000	3,083
Somerset,	4,249	914,500	2,550,000	15,620,000	3,348
Sullivan,	3,120	384,000	45,351,500	3,866,000	19,259
Susquehanna,	675	100,000	4,365,000	745,000	1,980
Tioga,	3,857	505,000	26,621,000	1,110,000	17,551
Union,	1,060	2,925,000	230,000	1,402,000	865
Venango,	360	300,000	1,100,000	1,060,000	455
Warren,	3,100	8,820,000	18,039,000	7,970,000	6,647
Washington,	110			1,124,000	
Wayne,	686	260,000	985,000	4,200,000	906
Westmoreland,	2,387		200,000	2,513,000	3,149
Wyoming,	849	1,030,000	3,708,500	2,900,000	3,149
York,	155	20,800		920,000	330
Totals,	140,150	113,921,279	1,062,762,380	153,742,349	486,339

CHESTNUT POSSIBILITIES IN PENNSYLVANIA.

In the year 1803 Malthus published a work which inculcated the idea that it was necessary a considerable portion of mankind should die prematurely in order to keep the human population within the limits which the earth could sustain. It may be true that in the distant future such a doleful condition will be regarded as the natural and necessary one, but it is in the very distant future. The fact is, we are barely on the edge of our agricultural possibilities. By far the largest yields of the earth in the way of food supply await increasing knowledge and necessity.

To illustrate—it is fair to estimate that there are upon this globe not far from one hundred and fifty thousand species of flowering plants. On the one hand, the human family uses for food out of this vast host not over four hundred kinds. On the other hand, we know that but a small proportion of the remainder contains any poisonous or noxious properties.

It is fortunate that upon so important a question we are not left to conjecture. There are positive facts we can draw upon to support the statement that we are only on the edge of our possible food resources. For example, the island of Jamaica is probably no exception to the majority of tropical islands in its fertility. It would, if reduced to a square, be only about seventy miles each way. Yet, after feeding its own population, it sends into the markets of the world about nine million dollars' worth of fruit annually. A speedy and regular ocean service has made this fruit so common and so cheap in this country that we are fast coming to regard it as food rather than as a luxury. Now, with all the capacity for food production in that island, we must remember that of all the food products which Jamaica to-day exports, the great bulk comes from plants which are not native to the island, but are introduced there. Its native flora furnished the greater part of the means of support to the large aboriginal population prior to the period of discovery, but is almost wholly unutilized now. I might say it is forgotten. It awaits rediscovery.

Again, it is a fact which history will confirm that civilized man, so far as he has derived his food from the land, has done so almost entirely from the more fertile areas—at least deserts, with rare exception, do not, or have not, supported a dense population. It must, however, be remembered that there are plants with wholesome, abundant farinaceous seeds which are especially adapted to thrive on

just such abandoned areas. The family of plants to which the weed known as "lamb's quarters" belongs is of this character and some of the seed products have been utilized by the Indians from "time out of mind." We have, furthermore, every reason to think that those plants are capable of as much and as speedy improvement in quantity and in quality of fruit as any of our other grains.

There is a most important practical application of these statements. With these facts before us, with the real food-producing power of a host of plants, native and foreign, absolutely unknown, what right have we to confine ourselves to a few standard grains, and then failing to derive the old time revenues from them, give up with the despairing cry that "farming don't pay?" There are many things, once done at a profit, that don't pay now. The successful man in such an emergency seeks for something in his line of work that will pay: If a farmer, he looks about him for a new crop. It is to this point that we have been leading.

A walk through our cities during the autumn and early winter will show that large quantities of chestnuts are roasted and sold on the important corners. It will be observed that all of these, or nearly all, are of the large kinds which we collectively call Spanish chestnuts. It is impossible to give an exact estimate as to the quantity which are so sold. The suggestive fact is that most of them are imported. Is there any reason why they should be? Rather, is there not every reason why they should not be? Already a well-established market exists for more than we produce. There is every reason to think that the demand for fine chestnuts would increase as it has for fine grapes, fine oranges and fine mushrooms. It is the invariable law that increase in demand comes with improvement in quality. The mere fact that prices fall to such an extent that what at first is considered as a luxury becomes later to be regarded as a food, enlarges and steadies the demand and usually removes the product from an extravagant to a business basis.

These remarks are suggested by a recent visit to the "chestnut orchard" of Mr. Henry M. Engle. The hillside, which, from across the Susquehanna, fronts the town of Marietta, is the scene of his operations. It will probably be admitted by those who notice the place from a distance that any ordinary agricultural operations there are out of the question. It certainly will be allowed by those who climb the rocky slope that its only natural production is the growth of timber. Mr. Engle found it covered with a growth of thrifty chestnut trees. These he cut down and allowed sprouts to arise from the stump. When the sprouts were a year old, into the best of them, he placed grafts from the Paragon chestnut. His object being to graft a whole head of the sprout at one time. Of course this implied as a subsequent operation keeping down all lateral

branches below the graft, which was usually inserted at about two to four feet from the ground. Mr. Engle has, I believe, employed both whip and cleft grafting, but prefers the former. His methods involve no departure from rules well known and long practiced, except perhaps a little more care. The percentage of successful grafts will probably be somewhat smaller than on the ordinary fruit trees.

The rapidity of growth of a graft on a sprout from a well established root is simply amazing. Fuller, in "The Nut Culturist," page 79, speaks of such a graft (under his observation) which made during the first season a length of sixty-five feet when the main stem and the lateral branches were counted. It all came from a single bud.

A diameter of four inches is no unusual thickness for a paragon graft of as many years, on a thrifty sprout. In that time it may be expected to be in good bearing. Professor Heiges reports that when he visited the chestnut orchard of Mr. Engle, "trees grafted two years had as high as 35 buds, averaging three chestnuts per bur. Trees grafted four years had upward of 500 burs, by actual count." It is to be remembered that this was on ground capable of producing no other crop. This seems to be the proper place to say that when the chestnut timber has been cut and the sprouts started which are to produce such a crop of nuts, that if notice be given to the county commissioners within one year of the date of clearing of an intention to reforest the land, that the owner is entitled to a small State bounty for each acre, by act of June 1st, 1887. (See Pamphlet Laws, page 287; see also Report of Department of Agriculture, Part II, 1895, Forestry, page 28.)

The price of such nuts as the Paragon chestnut will of course vary for each season. This year, in November, the writer paid for half a bushel at the rate of seven and one-half dollars a bushel.

It may be fairly doubted whether it is best to attempt growing chestnuts for market on this plan—that is on the forestry basis. Will one not obtain a larger yield of large, sound fruit if the trees be isolated (or at least not in close clumps) and the ground beneath them kept clear of leaves and underbrush? This inquiry is suggested by the fact that such trees are less infested by fruit-destroying insects than those in forests, and furthermore, that where the ground can be kept clean and clear of underbrush, one has a better chance of destroying a large percentage of worms which would become the insect parents of the following year's worms.

Whether or not we could hope for an effectual protection against these pests if all diseased chestnuts were promptly collected and burned is yet a question; but there can be no doubt that such systematic destruction of the infested fruit would speedily decrease the quantity of fruit injured. There are early and late broods of chest-

nut worms. It would probably be wise to gather the fruit as soon as possible after it is ripe and keep it in a damp, cool place, whence all worms and diseased fruit could be removed and promptly destroyed.

It is unfortunate that as described above, land otherwise worthless, can be made to produce a valuable crop of chestnuts after we have realized one profit on the timber. It would, however, be very unfortunate if it were supposed that such land only should be used for chestnut culture. The fact is that it might be made even more profitable to raise chestnut trees from the seed and graft them with the variety we desire to raise, and allow these trees to stand where they had room to spread and where they could be under our immediate care. The yield of some such mature trees is fabulous. I have in mind one tree, about seventy years old, still in its prime, with many years apparently ahead of it, which in one season bore thirty-six dollars' worth of fruit, besides what was used by the family of the owner.

The relative hardiness of the Paragon stock as compared with the native wild chestnut may yet be probably regarded as not wholly settled. It seems necessary to repeat most positively the well known truth that no one should plant Paragon or other large variety under the impression that the resultant trees will produce fruit of a like size. If such happens it will be unusual. Grafting is the only method of certainly securing the special quality of fruit desired. Though it is to be remembered that even failure to raise trees which will produce fruit like that from which the trees came may occasionally, rarely indeed, produce an even better fruit. Hence trees grown (ungrafted) from the nut should be carefully studied. They may become the parents of valuable varieties. On the whole, it might be considered a promising venture for one to plant our native chestnuts where you desire them to stand, on cleared but waste land, and subsequently graft them with such a variety as the Ridgely or the Paragon. The Scott chestnut is said to have great merit. Among its good points it is claimed to be early bearing and to have a remarkable freedom from insect attacks.

There is one point especially worthy of mention; i. e., that occasionally a variety with new and sterling qualities springs from our common wild chestnut. There are some such instances which are well known, for example, where the fruit was of exceptionally large size and matured very early. Such a combination of qualities would be sure to find a sale, especially if added to them were the characteristic of hardiness.

How to keep chestnuts safely over winter for spring planting is by no means so easy as some would have us believe. It requires judgment, and I had almost said skill, even when it is remembered that when the essential conditions of success are to keep the nuts

from moulding in the autumn or early winter, to keep them damp, but not wet, and to keep them cold, avoiding sudden changes of temperature as much as possible. Mr. Fuller gives in his book on nut culture very exact directions. Take only sound nuts. Provide a box with a bottom pierced with small holes, which are to be covered with a bit of pottery. Put a layer of chestnuts on a layer of "moist, sharp sand" which is an inch deep. Then another layer of sand, and on top of this another layer of chestnuts, and so on. Then cover with sand two inches deep to allow for settling. Cover box with wire netting or strips of board to keep the mice out. Bury the box in some well-drained place in the ground, covering it with a foot of leaves. Some friends of mine scrape away leaves from under a tree, place the nuts on top of the ground and cover them with leaves and leave them until spring.

I am of the opinion, however, that if one wants to plant but a hundred or two chestnuts that he will have no cause to regret it if he prepares his bed in the autumn, makes a shallow furrow, places his chestnuts in it, covering them loosely with leaves an inch deep and then gives them a covering of half an inch of loose, rich soil. Making allowances for failures from animals, etc., I have about eighty per cent. of the nuts so planted to grow. Never allow a seed chestnut to become dry.

TWO WEEDS.

We seldom recognize a plant as a weed until it has become so common as to threaten some industry. In other words, it has already become a common nuisance before any war is commenced against it.

It may seem like a contradiction in terms, but it may fairly be stated that the proper time to fight a weed is before it becomes a weed.

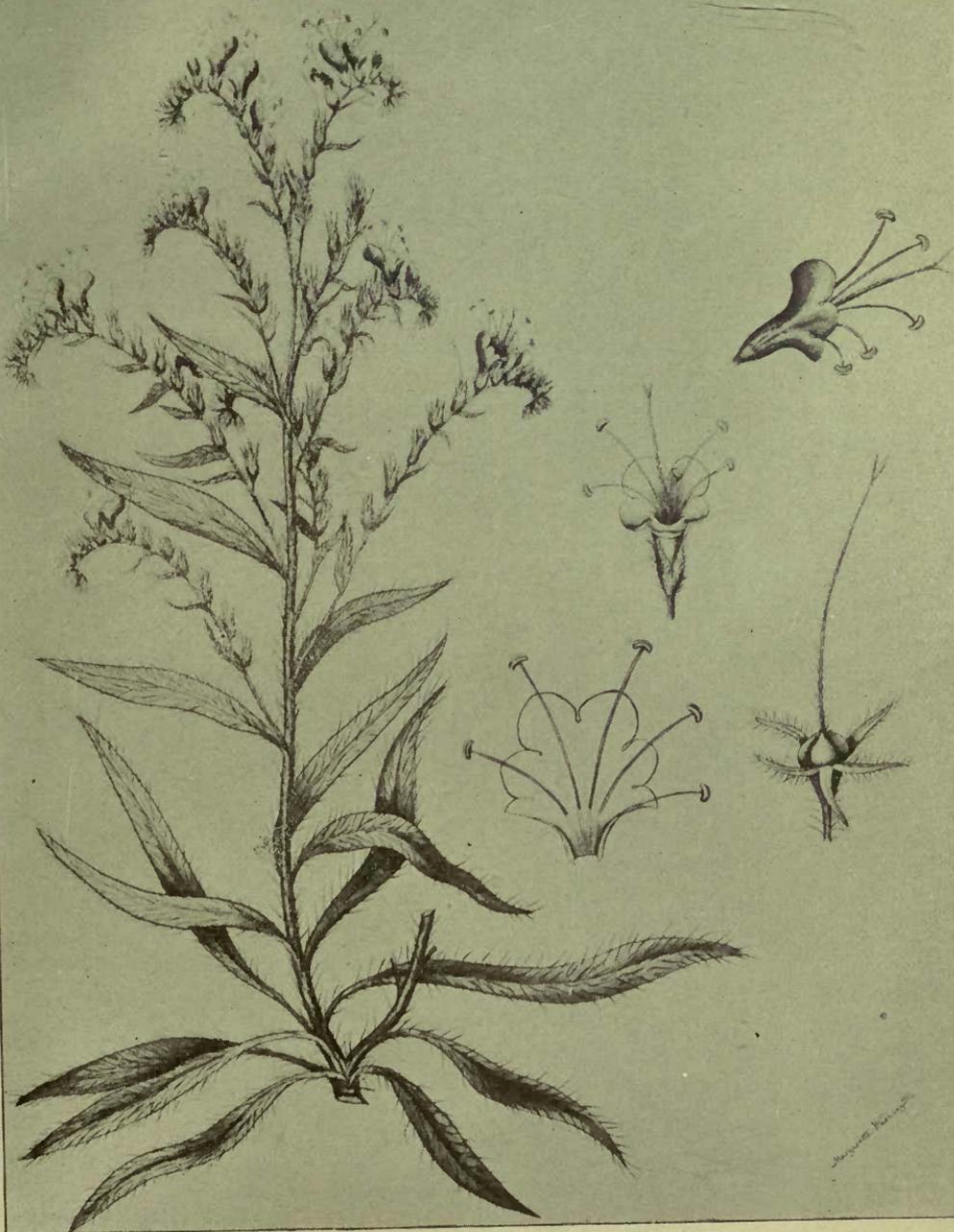
Such a chance occurs now. From our Southern border a plant has invaded the State. Originally it came from Europe. It is exceedingly common in portions of Virginia, especially in the Shenandoah valley, and is there known as blue thistle, or occasionally is expressively named blue devils. To botanists it is known as *Echium vulgare*. The illustration accompanying is taken from life, and is a very satisfactory representation of the plant.

The blue thistle shows a marked preference for soils associated with limestone rocks, and of such soils it is not unlikely to take complete possession, unless they are frequently under cultivation.

It is true that up to this time it has not become a serious nuisance in this State. It is equally true that it will probably become such unless its increase is promptly prevented. Thus far it does not appear to have advanced more than seventy-five miles north of our southern border, and possibly its further advance will be slow, because it must adapt itself to the more rigorous conditions of a Northern climate. Under any view of the case, now is the time to extirpate the plant, before each of the thousands of seeds becomes the parent of another thousand.

The plant is biennial; that is, its principal function during the first season is to produce a strong root, well stored with nourishing matter. From this root a vigorous flowering and fruiting stem will be developed during the second summer.

The remedies are, frequent plowing and thick seeding, if the plant has already obtained a considerable hold on the farm. Or if it is just making an appearance, it may be headed off early in the second season by cutting the stem from the roots by a spud or pick-axe inserted just below the surface of the ground. It would doubtless also be possible to destroy it by repeated cutting or pulling, if these were commenced before the plant blossomed.



BLUE THISTLE.
Echium Vulgare.

The blue thistle may be briefly described thus: Herb, one to two feet high, one or more stalks from same root; rough, bristly-hairy; leaves narrowly lance-shaped, without footstalks; flowers, blue at first, then more or less pink, funnel-shaped, with a somewhat irregular, lobed margin, from half to three-quarters of an inch long, somewhat crowded on branches which are often coiled at the tip; four small roughened seeds in the bottom of the flower; blooms from June to September, or even later.

The second weed to which attention is called is popularly known in Pennsylvania as yellow daisy, brown betty, wild sun-flower. Botanically it is called *Rudbeckia hirta*. This plant is said to have been brought from the Mississippi valley to the East in clover seed. It also grows naturally in Western New York, and hence may be said to prefer a climate somewhat cooler than that of this State. Its increase here has been so slow and its advance so insidious that our farmers apparently have failed to recognize its dangerous character. But it is each year becoming better adapted to our conditions of soil and climate, and as it matures a large number of seeds, it is merely a question of time before its presence will be severely felt.

Of all the weeds which of recent years have invaded our State, this is the one for whose continued existence there is the least excuse. It is so conspicuous that it compels notice, and its multiplication has been thus far so slow that there can be no reason for allowing it to become a source of trouble. Yet its real character and power for harm are evident when it is noted that in the states north and east of us it is so abundant, just before the season of hay making, that it literally colors whole fields of grass yellow.

I do not remember to have seen a field of grass in this State from which it could not have been readily removed by pulling or digging. Its eradication seems to be a question of now or never. I make this statement in view of the fact that it continues to increase, and that it has already become a nuisance in Ohio and New York.

It may be described thus: Biennial herb, one to two and a-half feet high, rough-hairy, leaves narrowly oblong, without footstalks, lower ones more or less distinctly three-ribbed; flowers from an inch and a-half to four inches across, yellow, with a dark brown, convex or conical centre. (Like a small sun-flower and having its circumference composed of about fourteen yellow leaves.) If cut too early in the season it is likely to grow again and still produce a crop of flowers and seeds. It is becoming very popular with flower gatherers, who should by all means be encouraged to pull it. It blooms from June to August.

LOSSES BY FIRES IN PENNSYLVANIA IN THE YEAR 1896, SO FAR AS HEARD FROM.

By the burning of the Capitol building on February 2d, the mass of material which we had collected, at no little expense and labor, bearing upon forest fires, as well as upon the quantity and kinds of timber cut during the year 1896, were destroyed. But a few hours before the fire Mr. Conklin and I had completed our estimates upon data at hand. These lay on my table and were rescued. I make the following very brief statement:

Number of acres burned over in 1896,.....	178,982
Quantity of timber burned, feet board measure,....	121,752,322
Quantity of manufactured lumber burned, feet board measure,.....	7,391,080
Cords of bark burned,.....	30,764
Cost of suppressing forest fires,.....	\$21,269 00
Total money value of actual property burned,.....	\$557,056 00

I desire to add that these figures are clearly below the actual facts; because: First—There was on the part of those who answered our inquiries a very remarkable absence of anything which looked like exaggeration. Second—Many of those furnishing information made no estimate of the value of the time spent by themselves and their neighbors in extinguishing fires. Third—In many instances there was no estimate of the money lost by burning of young timber. Fourth—Because from many regions in which it is known there were serious fires we were unable to obtain any replies to our inquiries. This is the more a matter of regret because the information sought was wholly in the interest of the sufferers.

In the above estimate we have not included the destruction of leaf mould and actual soil. These, as a matter of fact, exceed in value the timber destroyed, because its restoration is exceedingly slow, and without its reproduction of valuable timber often becomes very slow and in some instances impossible.

The state forests of New York, under fire warden protection, had burned over in 1895 (a much drier season than 1896) one acre out of 347½, whereas Pennsylvania in 1896, without fire wardens, had in its woodland areas one acre out of 51 burned over.

The second annual report of the Commissioners of Fisheries, Game

and Forests (1896) for New York (page 67) is very explicit, and declares that "ten years' experience in the matter has demonstrated that the present law relating to the protection of our woodlands from fire is a practical one. We have reason to believe that the widespread and disastrous fires which threatened the existence of our forests at one time will not recur. We expect that small burnings on private lands will continue to occur, and so there remains the difficult task of regulating the use of fire by land owners on their own property. In this work we are assisted by public sentiment in the forest towns, due to the law which provides that each town must pay half the expense of fighting and extinguishing woodland fires. There has, accordingly, arisen in each town a sort of censorship on the part of the citizens and taxpayers which acts as a deterrent in the careless use of fire by the thoughtless and ignorant members of the community."

It may help to the comprehension of this State's actual loss by fire if I were to add that the area burned over in 1896 was equal to a strip of land one mile wide and 280 miles long, and that it would require a wagon train of 112 miles in length to haul the bark so destroyed. If the bark were ranked up four feet wide and four feet high it would form a line almost 47 miles long.



Walter Mulford

PENNSYLVANIA LAWS

9

RELATING TO THE

DEPARTMENT OF FORESTRY,

FORESTRY RESERVATIONS, TIMBER LANDS, ROADSIDE TREES, &C.

PUBLISHED BY THE DEPARTMENT OF FORESTRY.

1901.

WM. STANLEY RAY,
STATE PRINTER OF PENNSYLVANIA.
1901.

MISSISSIPPI

1850

DEPARTMENT OF FORESTRY

MISSISSIPPI FORESTRY



Walter Mulford

PENNSYLVANIA LAWS RELATING TO FORESTRY, &C.

Title VIII. Offenses Against Real Property, and Malicious Mischief.

Section 140. If any person shall wilfully set on fire, or cause to be set on fire, any woods, lands, or marshes within this Commonwealth, so as thereby to occasion loss, damage or injury to any other person, he or she shall be guilty of a misdemeanor, and on conviction, be sentenced to pay a fine not exceeding one hundred dollars, and to undergo an imprisonment not exceeding twelve months.

Section 152. If any person shall cut down or fell any timber tree or trees, knowing the same to be growing or standing upon the lands of another person, without the consent of the owner, or if any person shall purchase or receive any timber tree or trees, knowing the same to have been cut or removed from the lands of another, without the consent of the owner thereof, or who shall purchase or receive any planks, boards, staves, shingles or other lumber made from such timber tree or trees, so as aforesaid cut or removed, knowing the same to have been so made, the person so offending shall be guilty of a misdemeanor, and being thereof convicted, shall be sentenced to pay such fine, not exceeding one thousand dollars, or to such imprisonment, not exceeding one year, as the court in their discretion, may think proper to impose.

Section 153. If any person shall knowingly and maliciously cut, fell, alter or remove any certain bounded tree, or other allowed land mark, to the wrong of his neighbor, or any other person, he shall be guilty of a misdemeanor, and on conviction, be sentenced to pay a fine not exceeding five hundred dollars, and to undergo an imprisonment not exceeding one year.

Approved—March 31st, A. D. 1860.

WM. F. PACKER.

AN ACT

To prevent the firing of mountain and other wild lands in the county of Union.

Whereas, There being certain mountain and other wild lands in the county of Union which are fired from year to year, thereby destroying the young timber and causing the land to be worthless for the purpose of timber: And whereas, Should such young timber not be destroyed it would add to the value of the land, in the course of twenty years, from fifty to one hundred dollars per acre, thus increasing the wealth of the county thousands of dollars, therefore

Section 1. Be it enacted, etc., That any person or persons who shall intentionally set fire said lands shall forfeit and pay a sum not exceeding five hundred dollars nor less than fifty dollars, or shall be confined in the county prison for a term not exceeding one year nor less than thirty days, or both, at the discretion of the court, on conviction at any of the courts of this Commonwealth; one-half of said fine to be paid to the person or persons who make the information and the other half to be paid into the county treasury.

Approved—The 9th day of April, A. D. 1869.

JOHN W. GEARY.

The act of June 2, 1870 (P. L. 1316), extends the provisions of this act to the counties of Schuylkill, Lehigh, Berks, Lycoming, Centre, Snyder and Luzerne.

The act of May 19, 1871 (P. L. 950), exempts Lycoming county from the provisions of this act.

AN ACT

To prevent tenants in common of timber lands from cutting or removing trees without the consent of all of their co-tenants.

Section 1. Be it enacted, &c., That from and after this date it shall be unlawful for any owner or owners of any undivided interest in timber land within this Commonwealth, to cut or to remove, or to cause to be cut or removed, from the said land, any timber trees, without first obtaining the written consent of all co-tenants in said premises.

Section 2. That no sale of any timber cut or removed from such un-

divided lands, before or without such consent, shall pass any title thereto; and the parties injured shall have every remedy in law and equity for the recovery of the said timber trees, and of all square timber, boards, lumber, ties, shingles and other articles whatsoever manufactured therefrom; and also for the recovery of damages for the cutting or removing of the same, which they now have against an entire stranger to the title.

Section 3. Upon the violation of the provisions of the first section of this act, it shall be lawful for any of the parties in interest to sue out a writ of estrepement, to prevent any further cutting thereon, or the removal of any timber then already cut, or both; which said writ shall be of force until the interests of the parties shall be set out in severality, or the writs dissolved by the court, or the action of partition in reference to said land finally ended; and the said writ of estrepement shall be obtained by affidavit, and allowed in the same manner and with like proceedings as to its service and dissolution as are now by law allowed and authorized in cases of estrepement issued pending actions of ejectment for real estate.

Approved—May 4th, A. D. 1869.

JOHN W. GEARY.

AN ACT

To prevent the burning of the woods in any of the counties of this Commonwealth.

Section 1. Be it enacted, &c., That any person or persons who shall wantonly and wilfully kindle any fire on the lands of another, so as to set on fire any wood lands, barrens or moors, within the limits of this Commonwealth, shall be guilty of a misdemeanor, and on conviction thereof shall be sentenced to pay a fine not exceeding three hundred dollars, and undergo an imprisonment not exceeding twelve months, or either or both, at the discretion of the court; and prosecutions for such offenses may be commenced at any time within two years from the commission thereof.

Section 2. Upon the conviction of any person or persons for any of the offenses aforesaid, the commissioners of the county in which such conviction is had, shall pay to the prosecutor in every such case the sum of fifty dollars out of the county treasury as a reward for the apprehension and conviction of the offender, and the defendant or defendants shall pay the same, with the costs as in other cases, into

the hands of the sheriff for the use of the county, and nothing herein contained shall prevent the prosecutor from being a competent witness in the prosecution aforesaid.

Approved—The 11th day of June, A. D. 1879.

HENRY M. HOYT.

AN ACT

Requiring the several assessors of this Commonwealth to make return of timber lands.

Section 1. Be it enacted, &c., That it shall be the duty of the several assessors of this Commonwealth, in their return of real estate to the commissioners of the proper county, at the next triennial assessment, and at each triennial assessment thereafter, to make return of all the timber land in their proper district by specifying in separate columns, how many acres each tract contains of cleared land, and how many in timber.

Approved—The 13th day of June, A. D. 1883.

ROBERT E. PATTISON.

AN ACT

For the encouragement of forest culture, and providing penalties for the injury and destruction of forests.

Section 1. Be it enacted, &c., That in consideration of the public benefit to be derived from the planting and cultivation of forest or timber trees, the owner or owners of any land in this Commonwealth planted with forest or timber trees in number not less than twelve hundred to the acre, shall on making due proof thereof, be entitled to receive annually from the commissioners of their respective counties, during the period that the said trees are maintained in sound condition upon the said land, the following sums of money:

For a period of ten years after the land has been so planted a sum equal to ninety per centum of all the taxes annually assessed and paid upon the said land, or so much of the ninety per centum as shall not exceed the sum of forty-five cents per acre.

For a second period of ten years, a sum equal to eighty per centum of the said taxes, or so much of the eighty per centum as shall not exceed the sum of forty cents per acre.

For a third and final period of ten years, a sum equal to fifty per centum of the said taxes, or so much of the said fifty per centum as shall not exceed the sum of twenty-five cents per acre.

Provided, That it shall be lawful for the owner or owners of the said land, after the same has been so planted for at least ten years, to thin out and reduce the number of trees growing thereon to not less than six hundred to the acre, so long as no portion of the said land shall be absolutely cleared of the said trees;

And provided also, That the benefits of this act shall not be extended to nurserymen or others growing trees for sale for future planting.

*Section 2. The owner or owners of forest or timber land in this Commonwealth, which has been cleared of merchantable timber, who shall at any period after the said land has been so cleared, and who shall maintain upon the said land young forest or timber trees in sound condition, in number at least twelve hundred to the acre, shall, on making due proof thereof, be entitled to receive annually from the commissioners of their respective counties the sums of money mentioned in the first section of this act: Provided, That the first period of ten years shall be counted from the time that the said land has been cleared of merchantable timber, and, that after the said first period of ten years, the number of trees upon the said land may be reduced as in the first section is provided.

Section 3. Any person or persons who shall wilfully or carelessly cut bark from, or otherwise cut, burn or injure any tree, plant, shrub or sprout planted, growing or being on any land in this Commonwealth, without the consent of the owner or owners thereof first had, obtained, or who without such consent, shall kindle, or cause to be kindled, a fire on any forest or timber land in this Commonwealth, or who shall carry into or over any forest or timber land any lighted candle, lamp or torch, or other fire, without having the same secured in a lantern or other closed vessel, or who shall discharge or set off fire works of any kind on said land or among the trees thereon, or who shall wilfully or carelessly burn or fire upon his or their own land, or that of others, any tree, brush, stubble or other combustible material whereby fire shall be communicated to the leaves, brush or timber upon any forest or timber lands belonging to other parties, shall be subject to a penalty †not exceeding one hundred dollars for each offense committed, with costs of suit: Provided, That if the defendant or defendants neglect or refuse to pay at once the penalty imposed and costs, or shall not enter sufficient bail for the payment of the same within ten days, he or they shall be committed to the common jail of said county for a period of not less than one day for each dollar of the penalty imposed: And pro-

*Act of March 22d, 1901, amended this section as it appears here.

†Act of May 14th, 1891, amends by providing this penalty of \$100 instead of \$50.

vided, When the penalty imposed is above five dollars, the defendant or defendants may enter into a recognizance, with good security, to answer said complaint on a charge of misdemeanor, before the court of quarter sessions of the peace of the county in which the offense is committed, which court, on conviction of the defendant or defendants of the offense so charged and failure to pay the penalty imposed by this act, with costs, shall commit said defendant or defendants to the common jail of the county for a period of not less than one day for each dollar of penalty imposed.

Section 4. Any justice of the peace or alderman, upon information or complaint made before him by the affidavit of one or more persons of the violation of this act, by any person or persons shall issue his warrant to any constable or police officer to cause such person or persons to be arrested and brought before the said justice of the peace or alderman, who shall hear and determine the guilt or innocence of the person or persons so charged, who, if convicted of the said offense, shall be sentenced to pay the penalty aforesaid.

Section 5. The commissioners of each county shall, within one month after the passage of this act, cause the same to be published one or more times, in one newspaper of general circulation in their respective counties.

Approved—The 1st day of June, A. D. 1887.

JAMES A. BEAVER.

AN ACT

Providing for the recovery of damage to trees along the public highways, by telegraph, telephone and electric light companies.

Section 1. Be it enacted, &c., That from and after the passage of this act, it shall be lawful, whenever any telegraph, telephone or electric light company shall have erected its poles and lines along any turnpike, public road, street, lane, alley or highway in this Commonwealth, for the owner or owners of land adjoining said turnpike or public road, who may claim to be damaged by the erection or maintenance of said lines by reason of the cutting of trees, whether planted in the said turnpike, public road, street, lane, alley or highway, or on enclosed or unenclosed land adjoining the same, to petition the court of common pleas of the county in which said damage shall be alleged to have been committed, whereupon the said court shall appoint three impartial men, citizens of the county in which said damages shall be alleged, as viewers, who shall, after having been duly sworn or affirmed to the faithful performance of their

duties, assess the damages done, if any, to the petitioner, and shall report the same to the court, at the first week of the next regular term thereof after the said appointment, which report shall, upon its presentation as aforesaid, be confirmed nisi; and if no appeal be entered to the same on or before ten days from the Saturday of the week in which the same is presented, it shall then be confirmed absolutely and judgment entered by the prothonotary of the said court upon the same against the said company.

Section 2. The compensation of the viewers provided for by the first section of this act shall be the same as is now provided for road viewers, and shall be paid by the defendant company, where damages are awarded, otherwise by the petitioner: Provided, That the provisions of this act shall not apply to the police patrol or fire department telegraph lines.

Section 3. All laws in so far as they conflict with this act are hereby repealed.

Approved—The 2d day of June, A. D. 1891.

ROBERT E. PATTISON.

AN ACT

Authorizing the purchase by the Commonwealth of unseated lands for the non-payment of taxes for the purpose of creating a State Forest Reservation.

Section 1. Be it enacted, &c., That from and after the first day of January; A. D. 1898, whenever any unseated lands within this Commonwealth shall, under existing laws, become liable to sale by the respective county treasurers or the county commissioners for non-payment of taxes, it shall be the duty of such treasurers and commissioners to publish a notice once a week for six successive weeks in at least two newspapers of general circulation within the county in which the lands lie, and if two newspapers be not published in said county, then in one newspaper in or nearest to the same, which notice shall contain the names of the owners when known, the warrant numbers, names of warrantees when known, the number of acres contained in each tract, the township in which the same is located, and the sums due upon each tract for taxes; and further to mail to the Secretary of Agriculture and the Commissioner of Forestry each, ten copies of such printed advertisement immediately upon the publication thereof.

Section 2. It shall be the duty of the Commissioner of Forestry to

inquire into and examine the location and character of unseated lands advertised by the respective county treasurers and the county commissioners of this Commonwealth for sale for the non-payment of taxes, and if in his judgment the same are so located and are of such a character as to make them desirable for the Commonwealth for the purpose of creating and maintaining a Forestry Reservation, he shall have power, at his discretion, to purchase any such lands for and in behalf of the Commonwealth at such tax sales, subject to the right of redemption under existing laws: Provided however, That the bid made and the price paid for said lands, shall in no case exceed the amount of taxes for the non-payment of which the same are being sold, and the costs. For all purchases so made in behalf of the Commonwealth, the Auditor General shall draw his warrant upon the State Treasurer to the order of the county treasurer, upon certificate filed by the Commissioner of Forestry with the said Auditor General: Provided further, That the Commissioner of Forestry shall have power to purchase unseated lands other than such as are advertised for sale for the non-payment of taxes, upon such terms and conditions as may be agreed upon with the owners of such land: Provided, That such purchase shall be approved by the Governor and the Board of Property, consisting of the Attorney General, Secretary of the Commonwealth and Secretary of Internal Affairs. And provided further, That in no case shall the price paid for such unseated land exceed the assessed value of the same. For all purchases so made in behalf of the Commonwealth the Auditor General shall draw his warrant upon the State Treasurer to the order of the grantor, upon certificate filed by the Commissioner of Forestry, with approval as aforesaid: Provided, That in no case shall the amount paid for any tract of land purchased under the provisions of this act exceed the sum of five dollars per acre.*

Section 3. In the event of redemption of said lands, the redemption money paid shall be remitted to the State Treasurer by the county treasurer, with a statement describing the tract of land so redeemed.

Section 4. The title to all lands so purchased, and not redeemed after the expiration of the time limited for redemption, shall be taken as vested in the Commonwealth to the same extent, and with like effect as though such purchase had been made by an individual at such sale, and the county treasurer shall certify to the Secretary of Agriculture, lists of all lands purchased in behalf of the Commonwealth and not redeemed within the time limited for such redemption, with a description of each tract as required by section one of this act, and thereafter such lands shall not be subject to further

*Section 2, as amended by act of April 28, A. D. 1899.

taxation while the same are owned by the Commonwealth. It shall be the duty of the Secretary of Agriculture to keep a record in a book, to be especially provided for that purpose, of all the lands so acquired by the Commonwealth, with full description of each tract, the character of the same, the date of purchase, the price paid, when the title became absolute, or if redeemed, the date of redemption.

Section 5. The lands so acquired by the Commonwealth shall be under the control and management of the Department of Agriculture, but assigned to the care of the Division of Forestry, and shall become part of a forestry reservation system, having in view the preservation of the water supply at the sources of the rivers of the State, and for the protection of the people of the Commonwealth and their property from destructive floods.

Section 6. All acts and parts of acts inconsistent herewith are hereby repealed.

Approved—The 30th day of March, A. D. 1897.

DANIEL H. HASTINGS.

AN ACT

Making constables of townships ex-officio fire wardens for the extinction of forest fires, and for reporting to the court of quarter sessions violations of the laws for the protection of forests from fire, prescribing the duties of such fire wardens and their punishment for failure to perform the same, and empowering them to require, under penalty, the assistance of other persons in the extinction of such fires.

Section 1. Be it enacted, &c., That on and after the first day of Janaury, A. D. 1898, the constables of the various townships of the Commonwealth shall be ex-officio fire wardens, whose duty it shall be, when fire is discovered in the forests within their respective townships, immediately to take such measures as are necessary for its extinction, and to this end to have authority to call upon any person or persons within their respective townships for assistance; the said fire wardens to receive fifteen (15) cents per hour, and the persons so assisting twelve (12) cents per hour, as compensation for their services; the expense thereof shall be paid, one-half out of the treasury of the respective county, and the remaining half of said expense shall be paid by the State Treasurer into the treasury of said county, out of moneys not otherwise appropriated, upon warrant from the Auditor General, but no such warrant shall be drawn

until the respective county commissioners shall have first furnished, under oath or affirmation, to the Auditor General, a written itemized statement of such expense, and until the same is approved by the Auditor General: Provided, That no county shall be liable to pay for this purpose, in any one year, an amount exceeding five hundred dollars.

Section 2. Any person who being called upon by the fire warden of his township to furnish assistance in extinguishing forest fires, as provided in section one, shall, without reasonable cause, refuse to render such assistance, upon conviction thereof shall pay a fine not exceeding ten dollars, or undergo imprisonment not exceeding thirty days, or both, at the discretion of the court.

Section 3. The fire wardens of each township throughout the Commonwealth shall, in the first week of each term of the court of quarter sessions of their respective counties, make returns to said court, under oath or affirmation, of all violations occurring within their respective townships, which may come or be brought to their notice, of any of the provisions of any law now enacted, or hereafter to be enacted, for the purpose of protecting forests from fire, and it shall be the special duty of the judge of said court to see these returns are faithfully made; and on failure of any fire warden to comply with this provision, or if it be found upon examination or inquiry by said court that any fire warden has either wilfully or negligently omitted to report all such violation occurring within his township, or having failed to perform his duty as set forth in section one of this act, such fire warden or constable shall be deemed guilty of wilfully or negligently making a false return, or neglect of duty, and the court shall suspend him from office and direct the district attorney to indict and try him, and if found guilty, he shall be fined in a sum not exceeding fifty dollars, and undergo an imprisonment not exceeding three months, both or either, at the discretion of the court.

Section 4. The term forest herein used shall not, for the purposes of this bill, be held to include an area of timber land or brush land of less than fifty acres in extent, unless such said area shall, by proximity to other timber land, be liable to convey fire to an area of brush land or timber land containing at least fifty acres.

Approved—The 30th day of March, A. D. 1897.

DANIEL H. HASTINGS.

AN ACT

To authorize constables and other peace officers, without first procuring a warrant, to arrest persons reasonably suspected by them of offending against the laws protecting timber lands.

Section 1. Be it enacted, &c., That if any person or persons shall be detected by any constable or other peace officer, in the act of trespassing upon any forest or timber land within this Commonwealth, under such circumstances as to warrant the reasonable suspicion that such person or persons have committed, are committing, or are about to commit, some offence or offences against any of the laws now enacted or hereafter to be enacted for the protection of forests and timber land, such constable or other peace officer shall have authority at once, without first procuring a warrant therefor, to arrest on view such person or persons, with like effect as though such warrant had first been procured.

Section 2. That all acts or parts of acts inconsistent herewith be and the same are hereby repealed.

Approved—The 29th day of April, A. D. 1897.

DANIEL H. HASTINGS.

AN ACT

To secure State Forestry Reservations, and providing for the expenses thereof.

Section 1. Be it enacted, &c., That a commission, to be composed of the Commissioner of Forestry, the chairman of the State Board of Health, the Deputy Secretary of Internal Affairs, and two other persons, one of whom shall be a lawyer or conveyancer of at least ten years professional experience and the other one a practical surveyor, to be appointed by the Governor, be hereby created.

Section 2. The said Commission shall, after examination, locate and report to the Governor, or to the Legislature if it be in session, the following forestry reservations:

(1). One of not less than forty thousand acres upon waters which drain mainly into the Delaware river.

(2). One of not less than forty thousand acres upon waters which drain mainly in the Susquehanna river.

(3). One or not less than forty thousand acres upon waters which drain mainly into the Ohio river:

Provided, That each of these reservations shall be in one continuous area so far as the same is practicable.

Section 3. That the lands selected shall be of a character better suited to the growth of trees than to mining or agriculture, and that at least fifty per centum of the area of each reservation shall have an average altitude of not less than six hundred feet above the level of the sea.

Section 4. That the said commission shall have full power to take by right of eminent domain and condemn the lands it has selected for the purposes aforesaid as State reservations for the use and behoof of the Commonwealth, and wherever it shall be necessary to have a recourse to a jury to assess the damages for any property to be taken as aforesaid, the said jury shall consist of such number and shall proceed and their award shall be reviewed and enforced in the same manner as now provided by law for the taking of land for the opening of roads in the respective counties in which said property is situated. And all the lands acquired by the State for public reservations by the action of said Commission shall be paid for by the State Treasurer, upon a warrant drawn by the Auditor General of the Commonwealth, after approval by the Governor.

Section 5. The Commissioners appointed under this act shall serve without compensation, except so far as the officials designated hereby are compensated by the continuance of their salaries as such officials while serving as Commissioners, but the necessary expenses of travel and all other necessary expenses incurred under the provisions of this act shall be paid by the State Treasurer, on the warrant of the Auditor General, after due certification.

Section 6. Provided, That nothing herein contained shall authorize the taking, for the purpose of this act, of any land held by any corporation created for the purpose of the preservation of forests.

Approved—The 25th day of May, A. D. 1897.

DANIEL H. HASTINGS.

[The provisions of the above act have mainly become inoperative by the passage of the act of February 25, 1901.]

AN ACT

To amend the first section of an act, entitled "An act to protect timber lands from fire," approved the second day of June, A. D. 1870, providing for a penalty in case of the failure of county commissioners to comply with the terms of said act, after demand made upon them by the Commissioner of Forestry, and providing for the Commonwealth bearing part of the expenses incurred under said act.

Section 1. Be it enacted, &c., That the first section of the act, entitled "An act to protect timber lands from fire," approved the 2d day of June, A. D. 1870, which reads as follows,:

"Section 1. That it shall be the duty of the commissioners of the several counties of this Commonwealth to appoint persons under oath, whose duty it shall be to ferret out and bring to punishment all persons who either wilfully or otherwise cause the burning of timber lands, and to take measures to have such fires extinguished where it can be done; the expenses thereof to be paid out of the county treasury, the unseated land tax to be the first applied to such expenses," shall be and the same is hereby amended to read as follows:

Section 1. That it shall be the duty of the commissioners of the several counties of this Commonwealth to appoint persons, under oath, whose duty it shall be to ferret out and bring to punishment all persons or corporations who either wilfully or otherwise cause the burning of timber lands within their respective counties, and to take measures to have such fires extinguished where it can be done; and on failure of the commissioners of any county, after demand made upon them by the Commissioner of Forestry of this Commonwealth, to comply with this provision, they shall be deemed guilty of a misdemeanor in office, and upon conviction thereof shall be fined in a sum not exceeding one hundred dollars, or suffer an imprisonment not exceeding two years, or both, at the discretion of the court. The expense incurred in the employment of the persons contemplated by this act, on and after the first day of January, A. D. 1898, shall be paid, one-half out of the treasury of the respective county, and the remaining half of said expense shall be paid by the State Treasurer upon warrant from the Auditor General; but no such warrant shall be drawn until the commissioners of the proper county shall have first furnished, under oath or affirmation, to the Auditor General, a written itemized statement of such expense, and until the same is approved by the Auditor General: Provided, That

in no case shall the expense to the Commonwealth growing out of this act exceed five hundred dollars for a single county in any one year.

Approved—The 15th day of July, A. D. 1897.

DANIEL H. HASTINGS.

AN ACT

Making constables of townships and boroughs ex-officio fire, game and fish wardens, prescribing their power and duties, fixing their fees as wardens, and prescribing their punishment for failure to perform their duties.

Section 1. Be it enacted, &c., That from and after the passage of the act the constables of the various wards, boroughs and townships of the Commonwealth shall be ex-officio fire, game and fish wardens.

Section 2. It shall be the duty of said fire, game and fish wardens to enforce all statutes of this State now in force, or that may hereafter be enacted, for the protection of forests and timber lands from fire, and for the protection and propagation of game, game birds, game mammals, song and insectivorous birds, and fish, and said constables or wardens shall have authority to arrest without warrant any person or persons caught by them in the act of violating any of the aforesaid laws for the protection of forests and timber lands, game, and food and game fish, and take such person or persons forthwith before a justice of the peace or other magistrate having jurisdiction, who shall proceed without delay to hear, try and determine the matter. Such arrests may be also made on Sunday, in which case the person or persons arrested shall be taken before the proper officer, and proceeded against as soon as may be on a week day following the arrest.

Section 3. Said constables or wardens shall have power without warrant to search and examine any boat, conveyance, vehicle, fish box, fish basket, game bag or game coat, or other receptacle for game or fish, when they have good reason to believe that any of the laws for the protection of forests and timber lands, game and fish, have been violated; and the said constables shall at any time seize and take possession of any and all birds, animals or fish, which have been caught, taken or killed at any time, in a manner or for a purpose, or had in possession or under control, have been shipped or are about to be shipped, contrary to any of the laws of this State. Any court having jurisdiction of the offense, upon receiving proof of probable

cause for believing in the concealment of any bird, animal or fish, caught, taken, killed, had in possession, under control or shipped, or about to be shipped, contrary to law, shall issue a search warrant and cause a search to be made in any place, and to that end may, after demand and refusal, cause any building, enclosure or car to be entered, and any apartment, chest, box, locker, crate, basket or package, to be broken open and the contents thereof examined by said constable. All birds, animals or fish, or nets, or fishing appliance, or apparatus, seized by any constable or warden, shall be disposed of in such manner as may be directed by the court before whom the offense is tried, and such constable or warden shall not be liable for damages on account of any such search, examination or seizure, or the destruction of any nets or fishing apparatus of any kind in accordance with the provision of this act.

Section 4. Any constable or warden, upon the arrest and prosecution of any offender to conviction under the provisions of this act, shall, in addition to the fees to which he may be entitled under existing laws, be paid for his services the sum of ten dollars on a warrant drawn by the county commissioners on the county treasurer, one-half of which shall be paid out of the treasury of the respective county, and the remaining half of said reward shall be paid by the State Treasurer into the treasury of said county, out of moneys not otherwise appropriated, upon warrant from the Auditor General, but no such warrant shall be drawn until the respective county commissioners shall have first furnished, under oath, to the Auditor General, a written itemized statement of such expense, and until the same is approved by the Auditor General: Provided, That no county shall be liable to pay for this purpose in any one year an amount exceeding five hundred dollars.

Section 5. Each of said constables or wardens shall, for the purpose of this act, have concurrent jurisdiction throughout his own proper county; and they shall in the first week in each term of the court of quarter sessions of their respective counties make special returns to said court, under oath, of all violations occurring in their respective townships, or which may come or be brought to their notice, of any of the provisions of any law now in force, or that may hereafter be enacted, for the protection of forests and timber lands, game and fish; and it shall be the duty of the judge of said court to see that such returns are faithfully made, and any constable or warden wilfully neglecting or refusing to make such returns, or to prosecute any offense under said laws of which he shall have personal knowledge, or of which he shall have notice in writing by any citizen, giving the name of the offender together with the names of the witnesses, shall be guilty of a misdemeanor, and upon conviction

thereof be sentenced to pay a fine of fifty dollars, or to undergo an imprisonment in the county jail of two months, both or either, at the discretion of the court.

Section 6. All sections, provisos, acts, or parts of acts inconsistent with this act, or any section of it, are hereby repealed.

Approved—The 22d day of March, A. D. 1899.

WILLIAM A. STONE.

AN ACT

To establish a Department of Forestry, to provide for its proper administration, to regulate the acquisition of land for the Commonwealth, and to provide for the control, protection and maintenance of Forestry Reservations by the Department of Forestry.

Section 1. Be it enacted, &c., That there be and is hereby established a Department of Forestry, to consist of the Commissioner of Forestry and four other citizens of the Commonwealth, who together shall constitute the State Forestry Reservation Commission; each of whom shall be appointed and commissioned by the Governor, by and with the advice and consent of the Senate; the Commissioner of Forestry for a term of four years, two of the said citizens for a term of two years, and two of said citizens for a term of four years; and thereafter all appointments shall be made by the Governor, by and with the advice and consent of the Senate, for a term of four years. The persons so appointed, before entering upon the discharge of their duties shall each take and subscribe to the oath of office prescribed by article seven of the Constitution of Pennsylvania. The Commissioner of Forestry and the Forestry Reservation Commission, so appointed, shall be clothed with all the powers heretofore conferred by law respectively upon the Commissioner of Forestry and the Forestry Reservation Commission, so far as the same are consistent with the provisions of this act, and in addition shall have full power, by and with the consent of the Governor, to purchase any suitable lands in any county of the Commonwealth that in the judgment of said Commission the State should possess for forest preservation: Provided, That in no case shall the amount paid for any tract of land, purchased under the provisions of this act, exceed the sum of five dollars per acre. Said commission shall also have full power to manage and control all the lands which it may purchase under the provisions of this act, as well as those that have heretofore been purchased and which are now owned by the State under existing laws. Said Commission is also empowered to estab-

lish such rules and regulations with reference to control, management and protection of forestry reservations, and all lands that may be acquired under the provisions of this act, as in its judgment will conserve the interests of the Commonwealth; and wherever it shall appear that the welfare of the Commonwealth, with reference to reforestation and the betterment of State Reservations, will be advanced by selling or disposing of any of the timber on forestry lands, the Commission is hereby empowered to sell such timber on terms most advantageous to the State; and said Commission is hereby empowered to make and execute contracts or leases, in the name of the Commonwealth, for the mining or removal of any valuable minerals that may be found in said forestry reservations, whenever it shall appear to the satisfaction of the Commission that it would be for the best interests of the State to make such disposition of said minerals; and provided, that such contracts or leases shall also be approved by the Governor of the Commonwealth after the proposed said contracts or leases shall have been duly advertised in at least three newspapers published nearest the reservation designated, for one month, in advance of said contract or lease, and the contracts or leases shall be awarded to the highest bidder, and he or they shall have given such bond as the commission shall designate for the performance of his or their part of the contract, and the said bond shall have been approved by the court of the county wherein the contracts or leases are made: Provided, however, that when, by virtue of leases or contracts for removal of minerals and sale of timber from any lands purchased by the State for Forestry Reservations, there comes a net revenue to the State, one-half of said net revenue derived from lands situate in any township shall be paid by the State Treasurer to the treasurer of such township, for application to township purposes and reduction of local tax levies in such township: Provided, That there shall not be paid to any one township, during any year, more than twice the amount of taxes that would be received by such township from said lands if they were owned by individuals.

Section 2. Any person or persons who shall kindle fires upon any of the forestry reservations of this Commonwealth, except in accordance with such rules and regulations as may be prescribed by the Forestry Reservation Commission, or who shall cut or remove any timber whatever, or who shall do or cause to be done any act that will damage forest lands or timber belonging to this Commonwealth, shall be guilty of a misdemeanor, and upon conviction thereof be subject to a penalty of not less than one hundred dollars nor more than five hundred dollars for each offence committed, with costs of suit, which penalty and costs of suit shall be collected in the same manner as is now provided by existing laws

for like offences committed on forest lands belonging to individuals; all fines and penalties when collected to be paid to the Commissioner of Forestry, who is hereby directed to pay the same over to the State Treasury; provided, that if the defendant or defendants neglect or refuse to pay at once the penalty and costs imposed, he or they shall be committed to the common jail of the county wherein the offence was committed until such penalty and costs are paid.

Section 3. That the Commissioner of Forestry shall be the president and executive officer of the Forestry Reservation Commission, and also Superintendent of the State Forestry Reservations, and shall have immediate control and management, under the direction of the Forestry Reservation Commission, of all forest lands already acquired or which may hereafter be acquired by the Commonwealth, but the power so conferred upon said Commissioner of Forestry shall not extend to the enforcement of the laws relating to public health or the protection of fish and game. It shall be the duty of the Commissioner of Forestry to encourage and promote the development of forestry, and to obtain and publish information respecting the extent and condition of forest lands in the State, and to execute all rules and regulations adopted by the Forestry Reservation Commission for the enforcement of all laws designated for the protection of forests from fire and depredation; and he is hereby empowered to employ such detective service, and such legal or other services, as may be necessary for the protection of the forestry reservations owned by the Commonwealth and for the apprehension and punishment of persons who may violate any of the forestry reservation laws or any of the rules and regulations, which, under the powers herein given, may be adopted by the Forestry Reservation Commission: Provided, That the services so employed and the expenses that may thereby be incurred shall be approved by said Forestry Reservation Commission and the Governor of the Commonwealth.

Section 4. The Commissioner of Forestry shall receive a salary of three thousand dollars per annum, and in addition thereto shall be reimbursed for all necessary expenses of travel which may be incurred in the discharge of the duties of his office; and the other members of the Forestry Reservation Commission shall serve without salary, but shall be reimbursed for all necessary expenses incurred by them in the performance of the duties of their office.

Section 5. The Commissioner of Forestry shall have an office at the State Capitol, and it shall be the duty of the Board of Commissioners of Public Grounds and Buildings to provide, from time to

time, the necessary rooms, furniture, apparatus and supplies, for the use of the Department of Forestry created under the provisions of this act.

Section 6. All moneys appropriated by the General Assembly in the general appropriation act of 1899 for the Division of Forestry of the State Department of Agriculture, as for salaries or contingent fund, which may remain unexpended at the time of the approval of this act, shall be transferred to and be vested in the Department of Forestry, hereby created; and the clerk of the Commissioner of Forestry, hitherto appointed under the law creating the Department of Agriculture, shall be transferred from the Department of Agriculture to the Department of Forestry, on the same salary that he now receives.

Section 7. The purchase money for lands acquired and all expenses that may be incurred, except the salaries of the Commissioner of Forestry and his clerk, shall be paid by the State Treasurer out of any moneys in the Treasury not otherwise appropriated, on warrant of the Auditor General, upon vouchers duly approved by resolution of the Forestry Reservation Commission and the Governor of the Commonwealth.

Section 8. The title of all lands acquired by the Commonwealth for forestry reservations shall be taken in the name of the Commonwealth and shall be held by the Commissioner of Forestry, and such lands shall not be subject to warrant, survey or patent, under the laws of the Commonwealth authorizing the conveyance of vacant or unappropriated lands, and all such forestry reservation lands shall be exempt from taxation from the time of their acquisition. In all cases where lands have been purchased, or may hereafter be purchased by the Forestry Reservation Commission for forest reservations, where there are public roads, regularly established, running into or through said lands, the Commissioner of Forestry, under such rules and regulations as the Forestry Reservation Commission is hereby authorized to adopt, may expend a sum not exceeding twenty-five dollars per mile in each year for the maintenance, repair or extension of any such roads, and on roads bordering on reservations one-half of this rate per mile may be expended. All expenses that may thus be incurred shall be subject to the approval of the Forestry Reservation Commission and the Governor of the Commonwealth, and shall be paid in the same manner as other expenses are provided for in this act.

Section 9. The Commissioner of Forestry shall receive the moneys to which the State may be entitled by virtue of the sale of any timber, or by virtue of any leases or contracts relating to the disposition of minerals, as hereinbefore provided, and he shall immediately

pay the same over to the State Treasurer as a part of the revenue of the Commonwealth. The said Commissioner of Forestry shall give his bond to the Commonwealth, with two sureties, to be approved by the Governor, in the sum of ten thousand dollars, for the faithful discharge of the duties imposed by this act and for the proper accounting of any moneys to the Commonwealth that may come into his hands by virtue of his position as Commissioner of Forestry.

Section 10. That all acts or parts of acts inconsistent with the provisions of this act be and the same are hereby repealed.

Approved—The 25th day of February, A. D. 1901.

WILLIAM A. STONE.

AN ACT

To encourage the preservation of forests by providing for a rebate of certain taxes levied thereon.

Section 1. Be it enacted, &c., That in consideration of the public benefit to be derived from the retention of forest or timber trees, the owner or owners of land in this Commonwealth, having on it forest or timber trees averaging not less than fifty trees to the acre, each of said trees to measure at least eight inches in diameter at a height of six feet above the surface of the ground, with no portion of the said land absolutely cleared of the said trees, shall, upon filing with the county treasurer of their respective counties and with the tax collectors of their respective townships or districts an affidavit made by said owner or owners, or by some one in his, her or their behalf, setting forth the number of acres of timber land within the requirements of this act, be entitled to receive annually, during the period that the said trees are maintained in good condition upon the said land, a rebate equal to eighty per centum of all taxes, local and county, annually assessed and paid upon said land, or so much of the eighty per centum as shall not exceed in all the sum of forty-five cents per acre, the said rebate to be deducted from said taxes, pro rata, and receipted for by the respective tax collectors or county treasurers: Provided, however, That no one property owner shall be entitled to receive said rebate on more than fifty acres.

Section 2. All acts or parts of acts inconsistent herewith are hereby repealed.

Approved—The 11th day of April, A. D. 1901.

WILLIAM A. STONE.

AN ACT

For the better protection of timber lands against fire, and providing for the expenses of the same, and directing what shall be done with the fines collected and costs paid.

Section 1. Be it enacted, &c., That when the commissioners of any county or counties fail to "appoint persons under oath, whose duty it shall be to ferret out and bring to punishment all persons or corporations who either wilfully or otherwise cause the burning of timber lands," within their respective counties, as is provided for by the act of July 15th, 1897, or when they have appointed inefficient persons to do the work aforesaid; the Commissioner of Forestry may, on the request of residents of a county in which such fires have been created, or on the request of the owner or owners of land which has been injured by the fires so created, appoint a detective or detectives, and employ an attorney or attorneys, to ferret out and bring to punishment, as aforesaid, those who cause the burning of timber lands; and all expenses incurred by the Commissioner of Forestry under the operation of this act shall be paid by the State Treasurer, on warrant drawn by the Auditor General, if the said bills shall be approved by the Governor and the Commissioner of Forestry; and all the fines collected shall be paid by the magistrate or by order of the court to the Commissioner of Forestry, and be paid by him to the Treasurer of the Commonwealth.

Section 2. When conviction is obtained, under the provisions of this act, of persons or corporations causing the burning of timber lands, then the Auditor General, on the request of the Commissioner of Forestry, may refuse to pay the State's share of the money due to the county for the services of the person or persons, appointed by the county commissioners, to ferret out and bring to punishment those who caused forest fires in the districts where such persons served as fire detectives, to make arrests and secure convictions, and for which conviction was obtained by the detectives appointed by the Commissioner of Forestry.

Approved—The 2d day of May, A. D. 1901.

WILLIAM A. STONE.

AN ACT

Authorizing boroughs of this Commonwealth to require the planting of shade-trees along the public streets thereof, by the owners of abutting property, in certain cases.

Section 1. Be it enacted, &c., That the burgess and council of any borough of this Commonwealth, upon the petition of a majority of the property owners upon any public street thereof, may by ordinance require the planting and replanting of suitable shade-trees along and upon either side of any such street, upon such alignment and at such points as may by such ordinance be designated, by the owner or owners of property abutting the street at the points designated; and on failure of any such owner or owners after reasonable notice, to comply with the terms of any such ordinances, the said authorities may cause such trees to be planted or replanted at the expense of the borough; and thereupon, in the name of the borough, collect such expense from the owner or owners in default, as debts of like amount are by law collectible: Provided, That the said authorities shall not require the planting or replanting of trees at any point or points which may interfere with the necessary or reasonable use of any street or abutting property, or interfere unreasonably with any business thereon conducted.

Approved—The 17th day of June, A. D. 1901.

WILLIAM A. STONE.

 AN ACT

To encourage the planting of trees along the roadsides of this Commonwealth, and providing a penalty for killing, removing or injuring the same; what disposition is to be made of moneys collected as penalties, and for keeping a record, by the supervisor of roads or boards of supervisors of roads, of the trees so planted and upon which a tax abatement has been granted.

Section 1. Be it enacted, &c., That any person liable to road tax, who shall transplant to the side of the public highway on his own premises any fruit, shade or forest trees, of suitable size, shall be allowed by the supervisor of roads or boards of supervisors of roads, where roads run through or adjoin cultivated fields, in abatement

of his road tax, one dollar for every two trees set out; but no row of elms shall be placed nearer than seventy feet; no row of maples or other forest trees nearer than fifty feet, except locust and Carolina poplar, which may be set thirty feet apart, and except fruit trees, which may be set forty feet apart; and no allowance as before mentioned shall be made unless such trees shall have been set out the year previous to the demand for such abatement of tax, and are living and well protected from domestic animals at the time of such demand.

Section 2. Any fruit, shade or forest trees growing naturally by the side of the public highway, where said public highway runs through cultivated lands, shall be allowed for in the same manner and on the same conditions as in the preceding section.

Section 3. Any trees transplanted by the side of the public highway, as aforesaid, in the place of trees that have died, shall be allowed for in the same manner and on the same conditions as in the first section of this act.

Section 4. No person shall be allowed an abatement, as aforesaid, of more than one-quarter of his said annual road tax.

Section 5. Any person who shall cut down, kill or injure any living tree, planted or growing naturally as aforesaid, or who negligently or carelessly suffers a horse or other domestic animal, driven by or for him to injure any trees hereinbefore mentioned, upon conviction thereof shall be subject to a penalty of not less than one dollar, nor more than five dollars, with costs of suit, for each and every tree so cut down, killed, removed or injured: Provided, That if the defendant or defendants neglect or refuse to pay at once the penalty so imposed and costs, or shall not enter sufficient bail for the payment of the same within ten days, he or they shall be committed to the common jail of the county in which the offense was committed, for a period of not less than one day for each dollar of penalty imposed and costs: Provided, however, That the owner of the land upon which the trees are growing and upon which said abatement has been granted, may remove such trees, on condition that he will immediately plant and maintain another tree, or trees, in the place or places of those removed by him or refund to township said abatement, originally allowed for said tree or trees.

Section 6. All moneys collected as a penalty in accordance with section five of this act, shall be paid to the supervisors of roads or boards of supervisors of roads, and form part of the road fund of the township in which the offense was committed.

Section 7. It shall be the duty of the supervisor of roads or the boards of supervisors of roads to keep a permanent record, in a book especially prepared for that purpose, and which book shall be the

property of the township, of all trees upon which the said abatement, as hereinbefore mentioned, has been granted; and when any tree or trees have been removed, with or without the consent of the supervisors of roads or boards of supervisors of roads, the date thereof shall be distinctly entered in the said book.

Section 8. The act approved the second day of May, A. D. 1879, entitled "An act to encourage the planting of trees along the roadsides in this Commonwealth," is hereby repealed.

Approved—The 2d day of July, A. D. 1901.

WILLIAM A. STONE.

Walter Hillebrand
PROPAGATION

10

OF

FOREST TREES

HAVING COMMERCIAL VALUE

AND

ADAPTED TO PENNSYLVANIA.

By GEORGE H. WIRT, *Forester.*

PUBLISHED BY THE

PENNSYLVANIA DEPARTMENT OF FORESTRY.

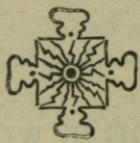
1902.

WM. STANLEY RAY,
STATE PRINTER OF PENNSYLVANIA.
1902.

FOREST TREES

HAVING COMMERCIAL VALUE

ADAPTED TO PENNSYLVANIA



PENNSYLVANIA DEPARTMENT OF FORESTRY

1903

H. W. SWEET, JR.
PHILADELPHIA, PENNSYLVANIA

Department of Forestry,
Harrisburg, Pa., February 2, 1902.

The frequent demands made upon this office for information as to the best methods of propagating forest trees induced me to request Mr. Wirt, our State Forester, to prepare this bulletin upon the subject. I believe it will be timely and useful.

J. T. ROTHROCK,
Commissioner of Forestry.



LETTER OF TRANSMITTAL.

To Hon. J. T. Rothrock, Commissioner of Forestry:

Dear Sir: I have the honor to submit herewith the following notes on the "Propagation of Forest Trees Adapted to Pennsylvania."

Recognizing the needs of our farmers, I have endeavored to present in a brief and clear way such facts and methods as will bring reasonable success to the inexperienced planter, without making necessary any large expenditure of money. The nurseryman or the forester may find nothing new and may even take exception to many statements.

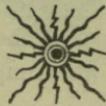
The botanical names of the trees and their order, for the greater part, is in accordance with Gray's "Manual of Botany," sixth edition. In addition I have added those given by Britton and Brown in their "Flora of North America and Canada," when differing from the nomenclature of Gray.

Very respectfully,

GEORGE H. WIRT,
Forester.

Harrisburg, Pa., February 1, 1902.

LETTER OF TRANSMITTAL



THE FOREST NURSERY.

Forestry work does not consist entirely of raising trees from seed and of planting them, although that is a very important part of it. Nor is all planting of trees forestry work. Forestry is a business and must be conducted on a financial basis. Planting individual trees is done mostly from an aesthetic standpoint and at a comparatively high expense. Planting for forestry purposes, under existing conditions, must be reduced to the least possible cost, but it must be understood that more may be lost in this operation from lack of care and attention to the young plants than by trying to save time and money along some other line of work. The methods of raising trees are as varied and as numerous as the trees themselves, the people who plant them and the localities in which they are planted. In other words, the conditions under which each planter has to work are so different that there can be no exact method laid down that will be applicable for all trees and all places. But there are certain laws of plant life in general, and facts in regard to particular trees that, being reinforced by observation of nature and by common sense, will undoubtedly lead to a measurable degree of success. For what follows there is no claim of originality. It is merely a sifted collection of notes taken from the most reliable sources at hand and from the observation of successful nursery work.

Nursery.

Location.—If many plants are to be raised and the planting is to extend over a number of years, a permanent nursery must be prepared. Its proximity to the house of the person in charge will afford the advantage of easy and quick accessibility. Time can be saved in going to and from it. A frequent inspection of its condition and requirements is more likely to occur, and work may be done at odd times. On the other hand, if the planting is to be done within one or two years the nursery might best be placed near the prospective plantation in order to save time in removing the young plants, and to decrease the danger of loss resulting from exposure of the roots to sun and wind. Less preparation is needed, perhaps, in this case, and less care, in some respects, but in either case the following hints are applicable.

Aspect.—The land should have a very gradual slope, and face towards the northeast to give the best results. Good drainage will be obtained; the direct rays of the sun during the growing season are avoided and in spring there is more gradual thaw, a condition that is very desirable, for it is the sudden changes that affect plants most. Other slopes may be used of course, but protection from wind and from the sun must be provided for. As watering will often be necessary, a stream or a spring should be close at hand.

Soil.—The soil should be, preferably, a sandy loam of moderate moisture—neither too wet nor too dry. Heavy soil should be avoided. Whatever land is used, ought to be worked up thoroughly, to a depth of at least $1\frac{1}{2}$ feet, in the fall and again in the spring. More especially should this be done on new land or on land that has not been worked for a long time. The top soil should be well and evenly fertilized. The more thoroughly the working is done the more oxygen for plant life there will be in the soil. The moisture will be better maintained. If the fertilizing is properly done, instead of raising seedlings with long, straggling roots, which cause more or less difficulty in transplanting, there will be produced strong plants with a compact system of root fibres, which is a better result for many reasons.

Beds.—The size of the nursery must be left entirely to the planter himself, but it may be a safe estimate to allow sixteen square feet of bed for every three hundred broad-leaved seedlings and for every six hundred conifers expected from a medium thickness of broadcast sowing.

If transplanting is to be done, fifteen to thirty square feet may be allowed for every one hundred conifers and thirty to sixty square feet for every one hundred broad-leaved seedlings. To prepare the beds stake out the paths or walks at right angles to each other. Shovel about six inches of soil from these and throw it on top of what will be the beds. These may be kept in better shape, then, if boards are placed around the sides, otherwise after each rain more or less soil is washed into the walks, often exposing the roots, or washing out entirely the plants along the edges. Long beds should be about four feet across so as to be worked easily from each side. Of course these are a saving in ground-space, but if there is much danger of damage from mice it is best to have small beds about five feet square. Or a ditch with perpendicular walls around the entire nursery will make it mouse-proof. For taprooted species of trees, such as oak, walnut, hickory, ash, etc., special beds might be made, so as to prevent the forming of long taproots, by placing on about a level with the walks a layer of boards or a very close layer of stones under the beds.

Moisture.—Moisture is one of the most necessary conditions of plant life, consequently the needs of the nursery in this direction

must be carefully attended to. Frequent working of the soil and weeding will make a fine, loose cover for the beds, preventing evaporation to a very great degree. If the soil becomes too dry, watering must be done. Very good results are obtained if the water is allowed to flow through the walks, and to reach the soil in the beds by capilarity. Another good method is to make small irrigation trenches on the beds, fill them and allow the water to soak into the ground. Sprinkling is likely to form a crust which will increase evaporation. After a rain the beds may be too moist. If so, proper conditions can be made by sprinkling some dry sand over the ground. Young seedlings are very likely, too, to have earth spattered over their stems. Especially is this so with conifers and they should be freed of this as soon as possible by running a stick gently over them.

Weeding.—The nursery beds should be kept clean of weeds at all times. If the seedlings have been planted in rows, or in the case of transplants, weeds may be kept out by small billets of wood or by a layer of moss, or of leaves placed between the rows. Weeding should not be done after the first of September at the latest.

Shade.—During the first season's growth, the young plants will be very sensitive and they should be given some protection from the sun. This can be done by making lath frames which will let through about half the sunlight, and by placing them from two to six feet above the beds. Or a frame may be made on which branches can be laid. Some prefer simply sticking conifer branches into the beds in such a way that they form a slight cover. Lath frames are, perhaps, the most convenient, for the shade ought to be removed on cloudy days and during gentle showers. These covers, as well as the billets to keep down weeds, will help to preserve the moisture in the beds.

Seeds.

Choice of Species.—In determining the species to be raised, it is well to observe what trees are growing in the locality, not only within wooded districts but also along fences and in fields. They will give an idea of the quality of the soil and of what may be expected in the future, although this is not always the case, for other better species may have been forced out by some cause. Find out when these trees will have a good crop of seeds and then have everything ready for work when it comes. Not all trees bear seeds every year, as in the case of some oaks and conifers the period varies from two to five years, or even longer. Nor do all seed years produce a full crop of good seeds, as in the case of the tulip-tree. Then some seeds ripen in early summer, however, those of most trees do not ripen till fall, or

even winter. From among these trees in the neighborhood, if they are the proper species, select the healthiest ones and gather their seeds as soon as ripe.

Time of Sowing.—Seeds of the poplars, soft maple, white elm, paper and river birch, and others maturing in summer should be sown at once. They lose their power of germination in a short time. Seeds of oaks, hickories, walnuts, conifers, and others which mature in fall may be sown at once. The freezing and thawing of winter will be beneficial to them, but the destruction by squirrels, mice, and birds that is likely to occur is sufficient reason for not planting until spring, if the seeds can be preserved properly. They should not be allowed to dry out before planting nor should they be exposed constantly to much moisture if they are to be kept for any length of time.

Thickness of Sowing.—By making tests, either by cutting seeds or by placing them between wet flannels in a warm room, so as to produce germination, or by some other method, the percentage of good seed is determined and from this the thickness of the sowing. It is very easy to sow too thick, and then the seedlings will be weak, but it is cheaper to thin out, and perhaps set the young plants in other ground, than to have to fill up blanks.

Depth of Sowing.—The difficulty, in too many cases, has been that instead of the seeds being planted, they are buried. As a general rule, for depth of cover, the diameter of the seed is sufficient, but if the ground is left very loose, or if there is danger from frost late in spring, a heavier covering should be given. It is well, after sowing, to roll the beds or to press the ground with a spade or a board. In fall sowing cover the beds with a layer of leaves. It will prevent the ground from heaving during the time of frost and in the spring will prevent the heavy rains from washing out the seeds. This may be done to advantage, too, after spring sowing. In both cases a careful watch must be kept and as soon as the seedlings appear the leaves should be raked off. Branches might then be spread thinly over them to keep the birds away, but these should not be left on too long so as to in any way interfere with the growth. Small seeds may be coated with red lead as a protection against birds.

Manner of Sowing.—As a usual thing the smaller seeds are sown broadcast in the nursery, especially those of the conifers, the ash, the birch, etc. The larger seeds, as those of the oaks, hickories, walnuts, etc., are usually sown in furrows, or rows, from six to twelve inches apart, on the nursery beds. The latter are often sown in rows where the plants will remain permanently. This may be advisable with with taprooted species. Broadcast sowing over a plantation is very expensive and is very seldom done.

Transplanting.

Age of Plants.—Most plants after they have remained in the seed beds for one season, may be set out where they are to stand finally, especially broad-leaved ones. The spruces and firs grow very slowly during the first four or five years and may best be left two years in the seed bed, then transplanted to other nursery beds and allowed to remain there two or three years. Small and weak seedlings of other species should be treated in the same way. Frequent transplanting is recommended for all species, when especially large and strong plants are needed. In all cases before setting out finally, whether on good or poor land, the object should be to grow and to use only the strongest and best plants. They will be able to resist enemies and hardships and to recover from injuries much better than weak ones.

Time.—Transplanting can be done either in fall or in spring. If done in fall, it should be after the growth has ripened or ceased. During winter the dirt will have a chance to settle about the roots, and by spring the loss of root fibre will be partly made up. On the other hand, frost may lift the plants out of the ground or storms may loosen them. Then, too, they will be exposed to damage from animals at a time when food is scarce. In spring the work should be done as early as possible, at least before the new growth begins. Spring is preferable for conifers.

Distance.—The distance at which plants should be placed finally depends upon the species, the age and the object in view. If fire-wood is the only object then perhaps more wood will be formed per tree by giving as much room and light as possible to the tops. Even in this case it is a question whether close planting is not better financially, if small wood can be used or sold at all. Where it is the purpose to get the soil covered quickly, to raise straight stems clean from branches, either for poles or posts, or later for timber, close planting must be done. For plantations of considerable size, to plant at regular distances and to do it in a systematic way is at all times cheapest. Cultivation may be done more quickly and easily. Blanks may be easily found and filled, and later management is facilitated. Of course mere filling of gaps in existing forests can be done only in a very irregular method.

Roots.—There are numerous methods of planting, but, in all, the most important thing is to take care of the roots. Perhaps more failures could be traced to lack of care of them than to any other cause. They are very sensitive to sun and wind and should never be exposed long enough to become dried out. When the plants are removed from the nursery, they should be taken from the beds as care-

fully as possible so that very few roots be broken. Wrap the roots in wet burlap or cover them with moist moss, or place them in thin mud. The plants may then be carried safely to the place of planting. If it is not done at once they should be "heeled in." In planting do not cramp the roots in any way and see that the growing ends are down, and not up. Place fine soil among the roots and pack it thoroughly. If sod has been taken out, turn it upside down on the ground close to the tree. Young plants are sensitive to being planted too deep and so should be no deeper than they were in the nursery. Of course with larger plants, when a great deal of dirt has been loosened, allowance must be made for some settling, but this will not be necessary if packing is well done. When larger roots have been broken or bruised they should be cut off smooth with a sharp knife. Planting can not be done too carefully.

Methods.—In loose and in sandy soil small plants may be set out quickly with the "dibble." This is simply a wooden peg or some iron instrument which will make a hole large enough to have the roots dropped into it. The hole should be made deeper than the roots are long. Place the plant in the hole as far as convenient and then raise it to the proper planting depth. In this way the roots will be in a natural position and not turned up, or to one side. The hole is closed by running the dibble into the ground near the hole and forcing the soil against the roots. This method may be used to good advantage within a forest to fill up blanks if the soil is deep enough.

The most common method, and that applicable under more conditions than any other, is planting in holes that have had to be dug in some manner, as with a spade or hoe. It is necessary for large plants. It is the best method for small plants in heavy soils and in stony places. In fact it may be used anywhere but in the very wet soils. It is well to have the holes dug in fall and allowed to lie open during the winter for spring planting. Humus, rich ground or manure may be used in planting, and if so, should be well placed among the roots, the poorer soil being placed on top. Each plant should be made firm.

On hillsides where a plow can be used terraces may be formed by laying rows of stones along the hill side, or if more time can be taken, by putting in stakes and placing small branches on the uphill side. Run a furrow above this in autumn and during winter the ground will be more or less broken up, facilitating spring planting a great deal. Where a plow can not be used on a slope the only resource is to dig holes just wherever possible and put in strong plants.

In wet soils, swamps or marshes, mound planting may best be used. This is very similar to hole planting, except that the plant is put into the ground thrown out of the hole instead of placing it in the hole itself as in the other cases. If sod has been lifted, split it and

place the plant in the crevice. Here, too, the ground must be thoroughly packed around the roots of the plant. When balls of dirt are taken out with the plants, holes must be dug somewhat larger than the size of the ball on the plant. When this is done the plants may be moved at any time of year and to any place. If the plants are crooked or branchy after planting, cut them off about an inch and a half above ground.

A few trees, such as willows and poplars, may be propagated by cuttings. It is recommended that the cuttings be gathered in fall from last year's shoots and buried during winter. They should be planted in spring while the ground is still moist. They will do well if not gathered till spring, but before the new growth begins, and planted at once. When planting leave one good bud above ground. The others may be rubbed off. Layers or root suckers may be used in a few instances but as a general rule, willows and poplars being an exception, it is better to raise trees from seed.

CUCUMBER TREE, MOUNTAIN MAGNOLIA.

Magnolia acuminata, L.

This tree is nowhere common in Pennsylvania. It is, however, a tree that is worthy of being cultivated because of the peculiar fitness of its wood for pump stocks, watering troughs, etc.

The fruit is a cylindrical mass resembling the cucumber, whence the tree's name. This becomes red in autumn and it is then time to watch for seeds, in order that they may be gathered as soon as ripe. About the last of September, or the first of October, when fully mature, scarlet seeds may be seen suspended from the fruit by delicate white threads. Owing to an oil in the pulp that encloses each seed they become rancid and lose their power of germination as soon as the pulp decays. They should be placed at once in water of 70 degrees to 80 degrees Fahrenheit and macerated for about a week, when the seeds can be thoroughly washed. These should then be fixed in a box in alternate layers of sand and seeds, and kept in a cellar where they will not freeze. As soon as the ground is warm in spring, about the middle of May, they may be sown in furrows from six to eight inches apart, on well prepared seed beds and covered lightly. If any fertilizing is done a small quantity of wood ashes or of bone dust is best. It is said that manure should not be used. The seedlings, after remaining in the seed beds for two years, should be ready for being set out where they are to remain. If intended for lawn planting they may be transplanted every two or three years until wanted.

The tree is found naturally in valleys or coves of mountainous regions, and along rocky streams, preferring deep, rich soil. To do well they must be planted in conditions as near as possible to those under which they do best naturally. Plant in rows from two to five feet apart and from eighteen to twenty-four inches in the row. Close planting will prevent early branching.

SWEET BAY, SWAMP SASSAFRAS, BEAVER TREE.

Magnolia glauca, L.

Magnolia Virginiana, L. See Britton & Brown, Vol. II, p. 48.

The tree never reaches a very great size in this State and is of very little importance except as an ornamental tree. Its flowers appearing in June and continuing for several weeks are very beautiful and fragrant. It prefers moist or swampy soils in a sheltered position. Propagation from seed is the same as that for the cucumber tree, but it may be easily propagated from layers which, it is said, require two years to root. It is frequently grafted upon a root of the cucumber tree and seems to grow better there than on its own roots.

UMBRELLA TREE, ELK WOOD.

Magnolia Umbrella, Lam.

Magnolia tripetala, L. See Britton & Brown, Vol. II, p. 48.

Very seldom found in Pennsylvania, nor does it attain a great size here. Professor Sargent says that it is hardy in cultivation as far north as New England. The branches are very irregular, with leaves at the ends giving the appearance of an umbrella. Large white flowers appear about May, making a very attractive tree. Its propagation is similar to that of the cucumber tree.

TULIP-TREE, TULIP POPLAR, YELLOW POPLAR.

Liriodendron Tulipifera, L.

The tulip-tree is one of the most magnificent of the forest trees and its wood is valuable for many purposes. It is a fairly rapid grower and as it is becoming very scarce its propagation should be encouraged.

The fruit has a cone-like appearance, being made up of a number of scales, on a common axis, from which they fall during winter. Very few of these scales contain seeds and only about ten per cent. of the seeds formed are good. Loudon said that the best cones are found on the higher branches of aged trees. In autumn, as the seeds mature, the fruit turns to a brownish color. The cones should be gathered in October after the first few scales have dropped. Drying them in an ordinary living room for a short time ought to be sufficient to free the seeds from the scales. The seeds may be sown broadcast, or in shallow furrows, in fall, or they may be kept in a dry room until spring. Roll the beds after giving the seeds a slight cover. Soft mold or wood and leaf ashes are good fertilizers for them. In summer do not allow the beds to become too dry and give the young plants some protection from the sun. The plants may remain in the seed beds for two years, to develop a good root system before being planted permanently, or if they are wanted for ornamental purposes they may be transplanted and left two or more years. After transplanting first time it is better to cut the stem off a couple of inches above the ground, allowing a new stem to be formed.

Rich soil of coves and of cool slopes is its preference. It is known to come up in old fields after an advance growth of sassafras or locust, or with locust. Seedlings are plentiful in the forest near old trees after a winter or spring fire has burned the layer of leaves on the ground. It may be set out as the cucumber tree, with locust or with walnut, or with both. Trees are said to be raised easily from cuttings.

BASSWOOD, AMERICAN LINDEN, LIME TREE, LIN.

Tilia Americana, L.

The linden has a one-seeded fruit which when it is matured in September is hard, hairy, gray and about the size of a pea. They should be sown at once in the seed beds, or if kept over winter, should be stratified with moist sand in a box which can be placed in well drained ground. In either case a good percentage will come up the first year, but if they have been kept dry over winter they are likely to wait until the second year before germinating. They are very slow growers from the seed and will have to remain in the nursery for two, three, or four years, and perhaps more, before they will be large enough to set out permanently. They may be then planted with oak, sugar maple, white ash, etc. As with other trees, if the

plants are crooked, or too branchy, cut them off just above the ground and allow a shoot to form. More rapid growth is obtained from layers, so it is customary to cut off an old tree close to the ground, and when a number of shoots have come up, to throw dirt among them that they may take root for themselves. In one or two years they may be cut off and used as plants. Transplanting with balls of dirt is recommended. It prefers a moist situation but will grow on dry soil. As a shade tree it is probably not surpassed.

WHITE BASSWOOD.

Tilia heterophylla, Vent.

The white basswood is more of a mountain tree than the *Tilia Americana*. It is commonly found growing on the moist soil bordering mountain streams, however, it will thrive upon limestone soil, or dry, gravelly and sandy soil, if moderately rich. The wood of this tree is not unlike that of the other species of basswood and is sold as such. It can be propagated the same as the basswood above, either from seed or from cuttings, the latter being, perhaps, preferable.

AMERICAN HOLLY.

Ilex opaca, Ait.

While the holly, under favorable conditions, becomes a tree of good size, and is then valuable, it is not likely that, in this State at least, it will ever be raised for other than ornamental purposes. The fruit is a small red berry, maturing in autumn and remaining on the tree all winter. The berries may be gathered in December and at once macerated in water. After the seeds have been thoroughly washed, they should be spread on a cloth and dried, and then mixed with sand and kept dry until needed for sowing in spring. Sow in furrows ten to twelve inches apart. Cover seeds lightly with fine earth and roll it. A layer of leaves may then cover the bed which will perhaps hasten germination. The seeds are slow to germinate and may not come up until the second year. The plants should be carefully transplanted every two years until set out finally. It seems to prefer the edge of streams or swamps, under other trees, but it will grow on higher ground. It makes a close hedge and requires little care when once started. It is also propagated by cuttings.

OHIO BUCKEYE, FETID BUCKEYE.

Aesculus glabra, Willd.

The wood of this tree is used for pulp wood and for the manufacture of light wooden articles. Although there are other rapid growers, the wood of which is better in quality and may take the place of the buckeye, yet the facility with which it can be raised from seed together with its rapid growth may recommend it.

The fruit resembles the common horse-chestnut but is prickly when young. It matures in autumn and the seeds may be gathered from under the old tree after the first frost. They should be planted at once, either where they are to remain, say two or three feet apart each way, or they may be planted in seed beds, in rows eighteen to twenty-four inches apart and twelve to fourteen inches in the row. Cover a little more than the thickness of the seed, unless the beds are rolled. In one year the plants may be set out. They prefer moist soil, as along the banks of rivers, but will do well in soil that it is not exceedingly dry.

SWEET BUCKEYE.

Aesculus flava, Ait.

Aesculus octandra, Marsh. See Britton & Brown, Vol. II, p. 401.

The tree has a smooth fruit, has the same uses as the Ohio buckeye and may be propagated in the same manner. Either may be used as a shade tree, although the European horse-chestnut is superior and more frequently used for that purpose.

SUGAR MAPLE.

Acer saccharinum, Wang.

Acer Saccharum, Marsh. See Britton & Brown, Vol. II, p. 398.

In the Forestry Report for this State issued in 1895, it is stated that this is one of the largest and perhaps one of the commonest trees in the State. It is apparent therefore that conditions here are favorable to its growth. It is a valuable tree and will grow in almost any locality.

The seeds, in samaras or keys about an inch long, are matured in September. They may be picked from the tree, or a little later swept together under the tree, as they are usually very plentiful. They are very sensitive to being dried out and therefore should be sown at once. The rows should be about eight inches apart and the seeds six inches apart in the rows. A very light cover of earth is sufficient, but put a layer of leaves over the beds for the winter. The seeds may be kept over winter if stratified with sand just slightly moistened, then sown early in spring. During the first season the young plants will need shade. They may remain in the seed beds two years and then be set out permanently at three, four or five foot distances. Prune off any branches that may have formed. The sugar maple has been planted in pure plantations and also in mixture with white ash, walnut, oak, birch and others. It is among the best of the trees suitable for street planting.

What is known as black sugar maple is a variety of *Acer saccharinum* and is propagated in the same manner.

The striped maple (*Acer Pennsylvanicum*, L.), so called from the striped appearance of its bark, is of little importance except as an ornamental tree. Its seeds ripen in September and may be raised as the above. It is found in cool ravines and endures considerable shade.

SILVER MAPLE, WHITE OR SOFT MAPLE.

Acer dasycarpum, Ehrh.

Acer saccharinum, L. See Britton & Brown, Vol. II, p. 397.

This is perhaps the most rapid grower among the maples, and it is adapted to any soil, but it is of very little value. The keys are large, veiny and diverging. The seeds ripen early in summer, in May or June. They may be swept up under the trees and should be sown at once. If planted in moist beds and given a light cover of earth it will not be long before the young plants put in an appearance. Sow the seeds in rows about twelve inches apart and in distances of eight inches in the row. If started in good soil one year will be sufficient time in the nursery, but if in poor soil they will take two years to grow to a size suitable for planting. These plants are apt to branch young, so when planting, if they are branchy or crooked, cut them off just above the ground. The sprout that will be formed will make up for the growth that has been lost.

RED MAPLE, SWAMP MAPLE.

Acer rubrum, L.

The red maple is a more valuable tree than the soft maple and as it thrives in swamps (although not confined to them) which are rarely of any use, there is no reason why it should not be raised. The seeds ripen in May or June and perhaps can best be picked from the tree. They should be planted at once in moist soil, as with the soft maple. The first year they grow slowly and may have to remain in the seed bed two years. Pruning with these, too, may be necessary. Where the soil is good it makes a beautiful shade tree.

BOX ELDER, ASH-LEAVED MAPLE.

Negundo aceroides, Moench.*Acer Negundo*, L. See Britton & Brown, Vol. II, p. 400.

In wooded sections of the country this tree is of little value, but in the plains it serves as a splendid "nurse tree" to other more useful species. It is a rapid grower and will thrive on any soil, hence, where a quick protection to the soil, or a quick shade is wanted, there is nothing better; for instance, for the protection of white pine seedlings on a dry southern slope. It is short lived and when planted with other trees affords an early return in the way of fire wood. The seeds are ripe in September and should be sown at once. In one year the seedlings can be planted out. With conifers, box elder may be planted in every other row at four foot distances, the rows being three feet apart. With broad-leaved species every third row would be sufficient.

STAGHORN SUMACH.

Rhus typhina, L.*Rhus hirta*, (L.) Sudw. See Britton & Brown, Vol. II, p. 386.

Mostly a shrub but at times reaches the dimensions of a small tree. The wood has a beautiful grain and will take a polish, making it suitable for panels, etc. The fruit (small, hard, strong seeds) is compacted into an irregular, brown or scarlet mass. The seeds mature

about October, after which they may be gathered and sown at once, or kept in a dry, cold place until spring. The sumach is found in thickets, both on the borders of streams and on dry hill sides; it seems to grow more rapidly, however, on the moist soil and usually produces there a stem more or less free of branches.

LOCUST TREE, BLACK LOCUST, YELLOW LOCUST.

Robinia Pseudacacia, L.

The locust has many qualities that recommend it to the tree planter. The foliage and blossoms make it suitable for a shade tree, especially along country roads. It is a rapid grower and can be reproduced easily from seeds or from root suckers. It will grow on any soil that is not wet, and, like all leguminous plants, it improves the soil on which it grows. Moreover the wood is strong and of great durability. Yellow locust wood is supposed to be more valuable than white locust wood, but both come from this species.

The fruit, a pod enclosing several seeds, is matured in September and may be gathered from the tree any time after that, for frequently they remain on the tree all winter. The seeds may be threshed out with a flail and cleansed by running them through a winnowing machine. Field mice are fond of them, consequently it is best to keep them for spring planting, which is easily done if they are kept in a cool, dry atmosphere. Before planting, put them into scalding water and remove them as soon as they swell up. Repeat the operation until all are ready, then plant at once in the seed bed, about six inches apart each way. The young plants may remain in the beds one or two years when they may be set out permanently at four foot distances. At first sight of the borer's work cut off the branch or the whole stem and burn it. If branchy when transplanted pruning will be necessary. It may be planted by itself or mixed with other species, as yellow poplar, catalpa, walnut, etc.

JUDAS TREE, RED BUD.

Cercis Canadensis, L.

Hardly more than a shrub. Its wood is seldom if ever used. In spring the bush is aflame with red flowers, making it worthy of a place on the lawn. The fruit is a legume, or pod, ripening in autumn.

These may be gathered and kept until spring, the seeds to be sown early. It does not seem to be particular as to soil and may be planted under other trees or shrubs. In growth it is fairly rapid.

KENTUCKY COFFEE TREE, COFFEE NUT.

Gymnocladus Canadensis, Lam.

Gymnocladus dioica, (L.) Koch. See Britton & Brown, Vol. II, p. 261.

Very similar to the locust in qualities and requirements. Like all other broad-leaved species it reaches its best development on moist, rich soil. The seeds mature in October and may be taken from the pods readily after a severe frost, or the pods may be gathered and macerated in warm water. Dry the seeds and treat as locust seeds. The growth is rapid, so close sowing is not necessary, neither is the tree so apt to branch as the locust.

HONEY-LOCUST.

Gleditschia triacanthos, L.

This tree as yet has very little value other than as an ornamental tree. It requires rich soil. The pods may be gathered in September or October and macerated in water until the seeds can be washed clean. They can be treated then as those of the locust and coffee tree. The taproot should be cut off before transplanting.

WILD CHERRY, WILD BLACK CHERRY.

Prunus serotina, Ehrh.

A neglected but valuable tree. It is a fairly rapid grower, not particular in regard to soil, and furnishes a fine wood for the manufacture of furniture. The fruit is matured in August. It can then be gathered from the tree and macerated in water until the stones can be cleaned. These may be sown at once, but it is well to preserve them until spring by mixing them with sand and placing the box either in a dry, cool cellar or in the ground where the stones can be

frozen. They must not be allowed to become moist. Sow in furrows six to eight inches apart and two or three inches in a furrow. They will be of sufficient size in two years to be moved safely. They may then be mixed with seedlings of ash, elm, oak, pine, spruce, etc., at four foot distances.

Prunus Pennsylvaniaca, L. fil., or the fire cherry, is of little value other than as a nurse tree to better and weaker species. It may be used as the box elder. Propagation is the same as for the black cherry. The fruit is ripe in July.

AMERICAN CRAB-APPLE.

Pyrus coronaria, L.

Malus coronaria, (L.) Mill. See Britton & Brown, Vol. II, p. 235.

The tree never reaches a very great size and its wood is of little value except for tool handles or turnery work. As an ornamental tree, however, it is worth some consideration. Its flowers are numerous, fragrant and of delicate tints. The fruit matures late in fall, when it may be gathered and macerated in water in order to obtain the seeds. Several years in the nursery may be required before the seedlings will be large enough to be planted out with safety. Pruning may be necessary in order to avoid a straggling form. It is usually found in rather moist soil.

MOUNTAIN ASH.

Pyrus Americana, DC.

Sorbus Americanus, Marsh. See Britton & Brown, Vol. II, p. 233.

Of no value other than as an ornamental tree. It grows both on highlands and on lowlands. The berry-like fruit grows in clusters and matures about October. The seeds may be obtained by maceration, and after being dried on a cloth should be kept in a dry, cool place for spring planting. Frequent transplanting before setting out permanently will no doubt secure the best results for ornamental use.

COCKSPUR THORN.

Crataegus Crus-galli, L.

Except for hedges the cockspur thorn is little used. It is occasionally found as a lawn tree because of its white flowers, which appear in June. The fruit matures in October. The seeds may be obtained by maceration and can be sown at once or kept for spring sowing.

JUNE BERRY, SHAD BUSH, SERVICE BERRY.

Amelanchier Canadensis, T. & G.

Another tree, more often a shrub, which is more ornamental than useful. It is among the first of our trees to bloom in spring and is very attractive because of its many white flowers. The fruit matures in June or July and is then edible. The seeds are obtained by maceration and should be sown at once. It has been found on soil varying from dry "barrens" to the wet borders of swamps.

GUM, SWEET-GUM, BILSTED.

Liquidambar Styraciflua, L.

A tree that grows to large size and furnishes a fine grained lumber suitable for veneer and interior finishing. The fruit, a ball with rough projections, matures in autumn, when the seeds drop out. They may be gathered in September or October and sown at once in the seed beds, either scattered thinly broadcast, or in furrows four to six inches apart. Give them a light cover of soil and as with other seeds sown in fall, spread leaves over the beds to protect them during the winter. Two years may be required to allow the seedlings to become of sufficient size to transplant. They may be set in almost any soil, but because of their tendency to branch set the plants not more than three feet apart each way. It presents a beautiful appearance in autumn and is suitable for a lawn tree.

DOGWOOD, FLOWERING DOGWOOD, BOXWOOD.

Cornus florida, L.

As the name implies the tree is conspicuous for its flowers. Its autumn colors are just as attractive, hence as an ornamental tree it is well worth consideration. In order to secure a straight trunk, and a regular shape, plant the young tree, then when it has a year to "root itself" fairly, cut the stem off (in spring or early summer) close to the ground. It will then produce several shoots. Select the one

you prefer and remove the rest. As this retained shoot grows and makes its branches, keep cutting off the lower ones until the stem is as high as you desire, after which it may be trusted to care for itself. It rarely attains great size but the wood is valuable for tool handles, mallets, etc., where it will undergo hard usage. As a forest tree it is scarcely better than a weed, permitting no other species to get a start beneath its shade. The fruit is a small, red berry maturing in September. The berries may be picked from the tree and macerated until the pulp can be removed from the seeds. Mix these with damp sand and place in well drained ground over winter. Plant early in spring. During summer protect from the hot sun. After two years the plants may be set out, either in the open or under the shade of other trees.

The alternate-leaved dogwood, having a "blue-black" berry, is of little value even as an ornamental tree.

TUPELO, PEPPERIDGE, BLACK OR SOUR GUM.

Nyssa sylvatica, Marsh.

Black gum, in favored localities, often grows to a large size. It prefers damp, rich soils but will grow in dry situations. It may be used for landscape work. The wood is hard to split and is used where such characteristic is needed. The fruit ripens in September and may be picked from the tree. Macerate in warm water until the seed or stone is clean. Mix with damp sand and place in ground well protected from moisture. In spring sow about two inches apart in rows. Keep the beds moist. In two years the plants may be moved and should be set two to three feet apart. They are, otherwise, likely to branch.

LAUREL, MOUNTAIN LAUREL, CALICO-BUSH.

Kalmia latifolia, L.

RHODODENDRON, ROSE-BAY, GREAT LAUREL.

Rhododendron maximun, L.

These two shrubs are of little value other than for ornamental use. They are comparatively easy to transplant from the woods. The young plants should be taken up in early spring with considerable dirt to the roots. After transplanting pack a thick layer of leaves about the foot of the shrub and keep them moist until a good growth is evident. Propagation from seed is said to be difficult and expensive. For planting in open grounds it is best to secure specimens which have grown in open grounds.

PERSIMMON.

Diospyros Virginiana, L.

This tree is more valuable for its fruit than for any other purpose. The heartwood, which takes almost a century to form, is very dark. The wood's "capacity for enduring friction is phenomenal." The fruit is mature in autumn and may be picked from the ground under the trees after several frosts. Remove the pulp from the seeds, mix them with moist sand and preserve in a cool cellar. Sow in rows in spring and, as with all slow growing species especially, cultivate well. In two years they may be removed from the seed bed. It grows on light, sandy soil or in bottom land. Occasionally it is found growing on high dry ground. In parts of the United States persimmon culture has become quite common and several improved varieties of the fruit are already produced.

WHITE ASH.

Fraxinus Americana, L.

A magnificent and valuable forest tree. Its wood is extensively used in the manufacture of furniture, wagons, farming implements and oars. It does not seem to be particular as to location, but if the wood of the more rapid growing trees is best, then moderately rich soil where the roots can get plenty of moisture is preferred, as along streams. The fruit is winged and matures in August or September. It should be sown broadcast at once in well raked beds. During the first summer provide shade for it and, if necessary, moisture. The seedlings may be removed when one year old. If the taproot has not been retarded it is better to cut it off than to run the risk of turning the growing end up when planting. It may be mixed with walnut, oak, maple, hickory, etc., at three or four foot distances.

The green ash and red ash are somewhat inferior to the white ash in respect to their timber qualities. If cultivated at all, they may be propagated in the same manner as the white ash.

BLACK ASH, HOOP ASH.

Fraxinus sambucifolia, Lam.

Fraxinus nigra, Marsh. See Britton & Brown, Vol. II, p. 602.

The black ash, growing in wet and swampy soils, although capable of growing on dry soils, is used very much for hoops, basket weaving and interior finishing. Its seeds ripen several weeks later than those of the white ash but are treated in a like manner.

CATALPA, BEAN TREE, INDIAN BEAN, CIGAR TREE.

Catalpa bignonioides, Walt.*Catalpa Catalpa*, (L.) Karst. See Britton & Brown, Vol. II, p. 199.

A tree to which a great deal of attention has been called of late. It is a rapid grower on almost any soil, producing, in a very short time, stems large enough for railroad ties or even telegraph or telephone poles. The fruit is a pod enclosing numerous small winged seeds. These pods remain on the trees during winter and may be gathered any time after October. Remove the seeds and keep in a cool, dry atmosphere until the ground can be worked in spring. Sow the seeds broadcast and cover with fine dirt. By the next spring the seedlings can be set out in rows. If by themselves, three or four foot squares will make proper distances for planting. They may be planted with locust, maple, ash, pine, etc. It has been recommended to plant them in alternate rows with field corn. This will afford some cultivation after the plants have been set out. White pine might then be set along the corn rows after one or two crops have been removed. If any damage comes to the young plant, cut it off at the ground, for as long as the root is healthy a sprout will soon come up which will probably produce a better tree than the seedling stems. This indeed, is the best way to secure a trunk long enough and straight enough for a telegraph pole. Cuttings may be used for propagation. The wood, whilst it resists decay in the ground, appears to lack strength sufficient for a good railroad tie.

WESTERN CATALPA.

Catalpa speciosa, Warder.

It is said that the wood of this species is more durable in contact with the ground than that of the *Catalpa* above mentioned. As a rule it produces straighter stems and is freer from branches. The growth is rapid in almost any soil, producing a good crop of telephone poles, etc., in twenty-five years, or less. It can be propagated as the above, either from seed, or from cuttings. Its value for railroad ties has been greatly overestimated.

SASSAFRAS.

Sassafras officinale, Nees.*Sassafras Sassafras*, (L.) Karst. See Britton & Brown, Vol. II, p. 97.

Although a rapid grower, the tree will hardly be planted much in Pennsylvania because of its timber qualities. It is very frequently

found in old fields, preparing the soil for a more valuable species and acting as a nurse to it. As such it may be used to advantage. The fruit matures in September. The pulp must be washed from the stone, which should be planted at once in rich, moist soil. Two years will not be too long for the seedlings to remain under nursery care. After they have had a start in the plantation, yellow poplar, sugar maple, white pine and perhaps hemlock might be mixed with it in alternate rows. It sprouts readily and may be raised from suckers or from bits of root.

SLIPPERY ELM, RED ELM, MOOSE ELM.

Ulmus fulva, Michx.

A tree which is suitable to plant in wet locations, although it is sometimes found on the hillsides. By some the wood is said to be superior to that of the white elm. The fruit is mature in June. It may be gathered from under the tree and sown at once in the nursery beds. If they are dry, moisture should be applied to the beds artificially. Give protection during summer from the sun. If the moisture has been sufficient, the plants may be set out that fall, but it may be best to allow them to remain for another year. Fall transplanting is preferred. It may be mixed with beech, oak, ash, or sugar maple.

WHITE ELM, WATER ELM, AMERICAN ELM.

Ulmus Americana, L.

The white elm rivals the sugar maple in size. Its wood is very hard to split and is used where such resistance is necessary. It, too, prefers moist, rich soil, but will grow in other situations. The fruit is mature in June and should be treated as that of the slippery elm. It may be mixed with birch, beech or maple.

HACKBERRY, SUGAR BERRY.

Celtis occidentalis, L.

Although this tree reaches a fair size, its wood is of no practical importance. The fruit is a small drupe, maturing in autumn. The

seeds may be obtained by maceration and should be sown in moderately moist beds at once. Two years are often required for the seeds to germinate. The young seedlings should have some protection from the sun for several seasons and their roots kept moist. They may be propagated by cuttings.

OSAGE ORANGE, BOW WOOD, BOIS d' ARC.

Maclura aurantiaca, Nutt.

Toxylon pomiferum, Raf. See Britton & Brown, Vol. I, p. 529.

Another valuable but neglected tree. It is a rapid grower and not particular in choice of soil. Its wood has been found to be very valuable in the manufacture of wagon wheels, and has also been used with good success as railroad ties. The fruit matures in October but as it is frequently seedless, and as the tree is readily propagated from cuttings, it may be cheapest to use the latter method. If seeds are obtained after macerating the fruit, they should be kept in a cool, dry atmosphere and sown in spring. The tree is frequently used for hedges, when it needs considerable pruning. In plantations it should be planted closely. It is not a native of Pennsylvania, but is introduced from the southwest.

RED MULBERRY.

Morus rubra, L.

The fruit, resembling an elongated blackberry, is mature in July. It should be picked from the tree and macerated in water, the seeds cleaned and then kept in a cool, dry atmosphere until spring. Sow thinly over the beds and cover with fine dirt. Keep the beds moist and protect the young plants from the sun. After two seasons growth they can safely be placed in the plantation. They endure some shade so may be set among other trees. It prefers low, rich soils.

BUTTONWOOD, SYCAMORE.

Platanus occidentalis, L.

A rapid grower, often reaching a very large size, and not particular as to location. The wood, however, is of very little value, except in

the manufacture of tobacco boxes. The common "button balls" are made up of a number of seeds which mature about October. Sow them as soon as ripe, and cover lightly, or keep them dry over winter and plant early in spring. The seedlings may be planted when one year old.

BLACK WALNUT.

Juglans nigra, L.

A tree valuable both for its wood and its fruit. That it is almost exterminated in Pennsylvania is well known and yet it is a fairly rapid grower and readily propagated from seed. The nuts mature in fall and after a slight frost may be picked up from under the old trees in quantities. Where there is no serious danger from mice and squirrels the nuts may be planted at once (after slightly bruising the hull) in rows about a foot apart, and from four to six inches apart in the row, for they branch early. To prevent the taproot from becoming too long a close layer of stone may be laid before the nursery beds are formed, or the plants may be started in boxes about six inches deep, having holes in the bottom and sides to allow proper drainage. Transplant when one year old. To keep the nuts over winter, remove the "hull" and mix them with moist sand and bury in the ground. Plant as soon as taken up in the spring. If desired, the nuts can be planted at once where the tree is intended to remain. Locust, maple, beech, or catalpa could be mixed with it in the plantation. It might be raised with field corn.

The white walnut or butternut, having an oblong, pointed nut, may be raised in the same manner. It will grow on both high and low ground, whereas the black walnut rarely does well in a dry situation.

SHELL-BARK, SHAG-BARK HICKORY.

Carya alba, Nutt.

Hicoria ovata, (Mill.) Britton. See Britton & Brown, Vol. I, p. 485.

There are said to be nine species of hickory on the continent, but there are only three that are of any importance to us. The shag-bark, so called from the appearance of its bark, prefers rich, damp soil and in such is a rapid grower. The fruit matures in October and may then be gathered from under the trees. They should be placed in moist sand and kept for spring planting. Because of the

taproot it may be best to plant at once permanently, and if possible raise some field crop with the young plants. Make furrows about three feet apart and drop the nuts about every half-foot. Weeds will have to be kept down. If raised in a nursery, care will have to be taken in transplanting, because of the long taproot. Cut off any bruised or broken roots.

WHITE-HEART HICKORY, HICKORY, KING NUT, MOCKER NUT.

Carya tomentosa, Nutt.

Hicoria alba, (L.) Britton. See Britton & Brown, Vol. I, p. 486.

The young shoots of this tree are hairy; the nut angular and pointed. It may be found more frequently and is perhaps the best of the family from the standpoint of forestry because of its choosing the poorer soils, although its slow growth is against it. It is raised as the shag-bark hickory.

PIG NUT, BROOM HICKORY, SWITCH BUD HICKORY.

Carya porcina, Nutt.

Hicoria glabra, (Mill.) Britton. See Britton & Brown, Vol. I, p. 487.

The bark is furrowed on older trees; the fruit is thin shelled. The wood rivals that of the shag-bark, said by some even to surpass it. It will grow both in high and low situations, but in Pennsylvania at least it prefers moist soil. It is also treated as the shag-bark hickory.

BIRCHES.

Betula, L.

Of the five birches commonly found in this State all are more or less valuable or worthy of cultivation. The fruit of the red or river birch and of the canoe birch matures in summer, about June. The small seeds should be removed from the cone-like fruit and sown broadcast at once in moist beds. Of course the plants must be

shaded, at least during the first season's growth. They had better remain in the seed beds for two years. The fruit of the three other birches, black, yellow and white, matures in fall. Their seeds should be kept in damp sand until spring. Sow as early as possible and keep the beds moist during the summer, also shade the plants. In one year these may be removed. Most of the birches will grow on poor soil and may be used as nurse trees for more valuable broad-leaved species. Conifers suffer from having their tender shoots whipped off in a strong wind by the action of the slender stems of these trees and consequently should not be planted with them.

SMOOTH ALDER.

Alnus serrulata, Willd.

Alnus rugosa, (Du Roi) K. Koch. See Britton & Brown, Vol. I, p. 512.

Seldom if ever more than a shrub, but of value, especially for holding soil on banks of streams. The seeds should be picked in October and sown broadcast at once on fresh, sandy soil and covered lightly. Roll the beds and give a covering of leaves for the winter. The seeds are frequently sown upon the snow. If seeds are preserved until spring, when they must be sown very early, keep them in damp sand and in a cold place. Shade the beds during the summer.

IRON WOOD, HOP-HORNBEAM.

Ostrya Virginica, Willd.

A slow growing tree of the poorer soils. It is usually found in the shade of oaks, maples and the larger trees. The fruit resembles the hop. It matures in September. The nut-like seeds should be sown at once and even then may not sprout until the year following. It may be used to plant up blanks, or open places on rocky slopes.

WATER BEECH, HORN BEAM.

Carpinus Caroliniana, Walt.

Usually nothing more than a shrub, though sometimes becoming a tree 25 feet high and a foot in diameter, growing along streams in rich soil. The wood, similar to that of iron wood, is used for levers and turnery work. The fruit matures in autumn and the nut-like seeds should be sown at once in moist, sandy soil. Usually they will not come up until the second year.

OAKS.

Quercus, L.

The oaks may be divided into two general classes, namely the white and the black oaks. The white oaks are those having leaves with round lobes, not being bristle-pointed. The acorns ripen in one year and are sweet to the taste. The black oaks are those the leaves of which have bristle-pointed lobes. The acorns mature in the second year and are bitter to the taste.

Of the first class there are in Pennsylvania, worthy of being cultivated, the following:

White Oak. *Quercus alba*, L.

Post Oak. *Quercus stellata*, Wang. *Quercus minor*, (Marsh.)
Sarg. See Britton & Brown, Vol. I, p. 520.

Bur Oak. *Quercus macrocarpa*, Michx.

Swamp White Oak. *Quercus bicolor*, Willd. *Quercus platanoidea*, (Lam.) Sudw. See Britton & Brown, Vol. I, p. 521.

Chestnut Oak. *Quercus Prinus*, L.

Yellow Oak. *Quercus Muhlenbergii*, Engelm. *Quercus acuminata*. (Michx.) Sarg. See Britton & Brown, Vol. I, p. 522.

Those of the black oaks are:

Red Oak. *Quercus rubra*, L.

Scarlet Oak. *Quercus coccinea*, Wang.

Black Oak. *Quercus tinctoria*, Bartram. *Quercus velutina*, Lam.
See Britton & Brown, Vol. I, p. 517.

Pin Oak. *Quercus palustris*, Du Roi.

Spanish Oak. *Quercus falcata*, Michx. *Quercus digitata*, (Marsh.)
Sudw. See Britton & Brown, Vol. I, p. 518.

All of the oaks will grow on poor soil, but since rapid growth of oak produces better wood the better part of soil allotted to forest should be given to them. The acorns mature in fall and may easily be gathered from under the old trees. Those of the black oak class may be sown at once, because of their bulkiness for keeping and because there is no danger from rodents. Those of the white oaks, while they lose their power of germination very soon, but because of the danger from rodents, should be kept until spring in damp sand and in a cool room, or buried with sand in a well drained place. The plants have long taproots and some suggest that the acorns be sown at once in the plantation where the seedlings are to remain. If so done, plough shallow furrows every three feet apart and drop the acorns at a distance of every two or three inches in the furrow. For

several years the seedlings may be cultivated as convenient. If sown in beds scatter from three to four hundred acorns on a bed four feet each way. In one year the plants may be removed and set one foot apart in rows three feet from each other.

CHESTNUT.

Castanea sativa, Mill., var. *Americana*, Watts. & Coult.

Castanea dentata, (Marsh.) Borkh. See Britton & Brown, Vol. I, p. 515.

In the Forestry Report issued by this State in 1895 the following reasons are given for the cultivation of chestnut:

"1. It will grow on almost any kind of soil, from a river flat to a mountain top, although it is not at its best on limestone soils.

"2. It grows with great rapidity.

"3. When cut it reproduces a valuable coppice growth in a few years.

"4. Its product, wood and fruit, will always be in demand.

"5. There will be an increasing demand for it in the future because of the tannin which it contains."

The fruit matures in October, being released from the burs by the first frost. The chestnuts may be sown at once, which is preferable, or they may be mixed in moist sand and buried until spring. Have the soil well prepared. Some sand mixed in the beds will be good. Shade the seedlings during summer. Set out as the oaks, in rows three feet apart and at a distance of one foot from each other in the row. Alternate rows may be set with white pine, or in order to afford cultivation corn might be planted in alternate rows.

BEECH.

Fagus ferruginea, Ait.

Fagus Americana, Sweet. See Britton & Brown, Vol. I, p. 514.

The beech is a tree which should be planted in soil where its roots can get plenty of moisture. The fruit is mature in October and may be gathered from under the old trees. Sow in furrows six inches

apart, the seeds touching each other in the furrows. Shade well. If possible sow the seeds broadcast within an open pine woods, after having raked off the needles. Cover the seeds lightly. The plants may be set out at from two to five years old. It endures shade and may be set under oak, pine, etc.

WILLOWS.

Salix, L.

All of the willows are so easily propagated from cuttings that it is not necessary to waste time by trying to raise them from seed. Last year's shoots can be cut and buried over winter. In spring take an iron bar and make a hole large enough for the cutting to go in. Leave one bud above ground and pack the soil firmly about the remaining part of the cutting.

ASPEN, QUAKING ASP.

Populus tremuloides, Michx.

The poplars are rapid growers. They are found usually along banks of streams, but also on higher ground. In the west the aspen is found coming up on land that has been cleared of other trees, either by "slashings" or by fires. There it prepares the soil for better species, as for instance white pine, and it protects the young plants. The fruit ripens in May or June. The seed is small and "cottony." It should be sown at once in a cool situation and covered lightly. When one or two years old set out in a plantation, as close as convenient. It may branch when young but permits pruning. It may be raised easily from cuttings.

COTTONWOOD, CAROLINA POPLAR.

Populus monilifera, Ait.

Populus deltoides, Marsh. See Britton & Brown, Vol. I, p. 493.

A tree whose wood is being extensively used for paper pulp. It is a rapid grower and adapts itself easily to almost any soil. The most vigorous growth, however, is found on rather moist soil. Thirty

cords of pulp wood to the acre, under average circumstances, might be expected after fifteen or twenty-five years. The tree is frequently found here as a shade tree. The seeds mature in July and should be sown at once. The seed beds should be kept moist. By the next fall seedlings could be set out in the plantation at four or five foot distances from each other. It will make a good nurse tree for white pine, if mixed with it. The quickest and cheapest method of propagation is from cuttings.

WHITE PINE.

Pinus Strobus, L.

It is not necessary to state the uses of this tree nor should it be necessary to state that it ought to be cultivated extensively. It is a rapid grower and prefers poor soil, yields early returns and is very valuable when mature—what more is wanted? The seeds mature in fall of second year and as soon as the cones become pitchy (in August or September) pick them and keep in ordinary living room or some other dry place during winter in bags or on a slat frame, having something to catch the seeds as they fall from the cones. Seventy-five degrees Fahrenheit is sufficient heat to open the cones that the seeds may drop out. Sow broadcast early in spring. Cover lightly and roll the beds. They must be protected from the sun in summer. If the beds become very wet sprinkle dry sand over them as soon as possible. "Damping off" is said to be prevented in this way. If one year old plants are not used in the plantation they had better be transplanted to nursery rows, the rows six inches apart and plants about two inches apart in the rows. During the winter cover with leaves and transplant in spring. Two year old plants may be used safely. If possible have some nurse tree two or three years in advance of the pine, or a rapid grower, set in alternate rows, or two rows of pine to one of the other. Three feet in the row is sufficient. It is worthy of a place as an ornamental tree.

PITCH PINE, YELLOW PINE, JACK PINE.

Pinus rigida, Miller.

This pine has needles in threes. The cones take two or three years to mature. They should be gathered and treated as white

pine. With all pines the seeds must be kept dry during the winter. The oil in them will preserve them so there is very little danger of their losing the power of germination for several years if they are not exposed to moisture. Sow the seeds broadcast in sandy beds in spring. Seedlings can be set out in spring when two years old. They are very sensitive to being transplanted so their roots should be carefully protected. It grows where the soil is extremely poor, but slowly.

SPRUCE PINE, YELLOW PINE.

Pinus mitis, Michx.

Pinus echinata, Mill. See Britton & Brown, Vol. I, p. 52.

Leaves usually in pairs. The cones are somewhat longer than those of the pitch pine but not so large in diameter, proportionally. They mature in one season. Formerly there was considerable yellow pine in this State but it has become very scarce. The tree reaches a large size and its wood is valuable. It is not hard to raise from seeds, which should be treated as those of the other pines. It is a fairly rapid grower and is adapted to dry, sandy soil and to poor slopes.

The red or Norway pine (*Pinus resinosa*) may be propagated as easily from seed as the other pines.

RED SPRUCE.

Picea nigra, var. *rubra*, Engelm.

Picea rubra, (Lamb.) Link. See Britton & Brown, Vol. I, p. 55.

A tree of the highest ridges and cool northern slopes. The cones are small and unusually plentiful. They may be gathered any time after October. By heating the cones some, the seeds will readily fall from the scales. They should be sown in early spring in soil somewhat sandy. Cover the seeds lightly and roll the beds. Shade the seedlings well and do not let the beds become too dry. The plants may be put in the plantation when two years old or they may be transplanted to nursery rows and set out when four years old. They have shallow roots and may be used on rocky slopes. In regular plantations three feet is the proper distance at which the plants should stand from each other.

BLACK SPRUCE.

Picea nigra, Link.*Picea mariana*, (Mill.) B. S. P. See Britton & Brown, Vol. I, p. 55.

Somewhat smaller than the red spruce. It prefers "sphagnum-covered swamps." Propagation is same as for the red spruce.

HEMLOCK, HEMLOCK-SPRUCE.

Tsuga Canadensis, Carr.

The cones of the hemlock mature in one year. They are small and egg-shaped, drooping from little foot stalks when ripe. Gather in October. After the seeds have been removed from the cones, keep them in a dry, cool room until spring. Sow broadcast in well prepared beds. Rotten wood mixed with the soil will no doubt insure better success. Moisture and shade are necessary for the young plants. In two years they may be set out finally or transplanted and set out when four years old. While the tree is found in moist and cool places it seems to do well in other situations. The hemlock is, when young, perhaps the slowest grower of all our forest trees and will be the hardest to perpetuate as a forest tree.

BALSAM FIR, BALM OF GILEAD FIR.

Abies balsamea, Miller.

Frequently found in the northern and colder parts of the State. It makes a fairly rapid growth in well drained soil and can be used for planting along roads or walks. The cones may be gathered in autumn and dried slightly. The scales of the cones will have to be separated from the seeds. They can then be treated as those of the black spruce.

LARCH, TAMARACK, HACKMATAK.

Larix Americana, Michx.*Larix laricina*, (Du Roi) Koch. See Britton & Brown, Vol. I, p. 54.

The tamarack is a northern tree and is found only in the cooler parts of the State. While it may be grown on dry soil it prefers and

is usually found in cool swamps. It is a valuable tree and is said to be raised easily from seeds. The small cones mature in September and may then be gathered from the trees. Drying the cones will release the seeds which may be kept in a cool dry place until spring. Sow thinly over the beds and press the seeds into the ground, giving them a slight cover. Protect well during summer. The next fall they may be easily planted out at about five foot distances. Their growth is fairly rapid.

ARBOR VITAE.

Thuja occidentalis, L.

A tree that is of more value perhaps as an ornament than as a tree for forestry purposes, in this State. The stems are used for poles and posts. The cones mature in September or October. It is grown easily from seeds if treated as the other conifers. Two years in the nursery beds is sufficient for the young plants. They may then be placed in the plantation. It occurs naturally, but sparingly in this State.

CEDAR, RED CEDAR, SAVIN.

Juniperus Virginiana, L.

Very common throughout the State, but never reaching a very large size. It is a slow grower. The fruit is a berry made up of several fleshy scales enclosing two or three seeds. The berries may be gathered in November. They should be macerated in warm water or put in strong lye made from wood ashes for several days until the seeds can be washed clean. Keep the seeds dry and cool and sow early in spring. Cover the beds with leaves as it is likely that the plants will not come up until the next year. They may be set out after two years, or transplanted when four or five years old. Set at three feet from each other. This tree is very valuable for fence posts.

Walter Mulford

11

SOME ASPECTS OF THE FORESTRY PROBLEM.

DR. J. T. ROTHROCK, HARRISBURG, PA.

Gentlemen of the Connecticut Board of Agriculture: The dictionaries in one sense mark the growth of ideas. They seldom if ever coin a word until the need for it is apparent, or give a clearer definition of an existing term than its ordinary use warrants.

If we were to turn to a German dictionary a century old we would discover that forestry had already taken its place as a well-established art, and that the forester was one who was charged with every detail of the forest crop, both in maintenance and in restoration.

If, on the other hand, we take a Webster's unabridged dictionary, which is but half a century old, we shall find that the word forestry is not given, though we are told that a forester in England "is an officer appointed to watch a forest, preserve the game, and institute suits for trespasses." In other words, he was merely a policeman, and there is no indication that he ever received a technical education or knew one tree or its use from another. So far as the United States were concerned neither forestry nor foresters were found here half a century ago.

I find that Worcester, of much later date, gives essentially the same definition of the word forester, though he has advanced a short step by defining forestry as the art of forming or cultivating forests, and gives the Saturday Magazine as his authority.

No one who is up to date would now be content with any definition of the word forestry unless it included every element in the production, protection, felling, marketing, and restoration of forests. The definition would convey the idea that the forester was a man of liberal education and of special mental attainments.

These statements are, of course, of no interest except in so far as they indicate that a change has taken place here, that a new idea has been introduced into our civilization, and starts us to inquiring what causes have led to this change.

Perhaps it would not be premature here to indicate what steps have already been taken in the new direction in this country. 1st. The general government has already set apart 46,828,449 acres of the public domain as forest reservations. 2d. The State of New York is already in possession of more than 1,000,000 acres as a forest reserve, and hopes to add at least two million acres more to that which it already possesses.

3d. Pennsylvania has purchased nearly 150,000 acres during the past three years, and will probably not stop until at least 2,000,000 acres have been converted into a well-timbered forestry reservation.

4th. The states of Michigan, Wisconsin, and Minnesota, seeing the disappearance of their forests, are now actively striving after some plan by which their lumbering industries may be perpetuated.

5th. Maine, too, and Massachusetts have in one way or another sought the restoration of their forests, on such ground as is not better adapted to other crops.

Clearly then there is some force at work which has introduced this change in our ideas about forests. This is the very first generation of native born citizens that entertained any ideas concerning perpetuation of our timbered areas. All who came before them were concerned mainly with converting timbered into cleared land, nor can we wonder at it, because whatever came afterwards, the daily bread was produced upon the farm, and not in the forest.

It is hard to say with certainty to what this change is mainly due. Probably to several causes, rather than to a single cause.

It was easy enough, back in the seventies, to recognize that, as a whole, over the entire land, forests were being cut faster than they were being reproduced. But this alarmed almost no one, for we had such boundless faith in the resources of the country that no anxiety was felt. Then there came statements more or less clearly made and substantiated that removal of the forests was diminishing the rainfall of the country. After years of attention to this statement the worst that can be said of it is that it is not proved that the presence or absence of forests increases or diminishes the rainfall of any region. It was charged later that as we removed the forests we invited the tornadoes which were so frequent in the treeless regions of the West. This, too, proved to be a

false alarm. But whatever else was uncertain there was one thing to which practical men had pinned their faith, namely, that from some cause or another there was a change in the water power, and that it was associated with removing the forest cover from the land. They could trace it from where never-failing springs became wet weather springs only, down the channels of the streams to where in late summer and early autumn the wheels of mills and factories that, in former days, ran throughout the year, now halted and waited because there was not water enough to turn them. This was all true enough, but we were still far from the full solution of the problem. It was quite sure that the rainfall was as great as ever, but it remained to be shown that the quantity of water which ran off through these channels, when we considered the whole year, was probably as great as when the entire country was timbered. At least such seems to be the verdict of the most recent investigators. The whole truth boiled down seemed to be this. Forests conserve what rain does fall, and by preventing excessive freshets through increasing the absorbing power of the earth's surface they distribute the water more evenly throughout the year. What subsequent modifications this truth may receive, it is probably substantially correct as stated.

But this brings with it a train of events which is of immense importance. So long as water remains in the soil there is a reserve power upon which we may count in time of need.

When it becomes aqueous vapor and flies to the sky its usefulness to us is in doubt, and when it rushes out of the country in a flood not only is its usefulness uncertain, but its destructiveness is sure. In other words, forests enable us to retain the rainfall in a useful condition for gradual distribution throughout the entire year. Not only do they lead the rainfall into the earth where it is safe against immediate run-off and evaporation, but they do more than this: they actually, out of the surplus which they have saved, return more aqueous vapor to the atmosphere during the growing season than a like area of cleared ground in any ordinary farm crop could do. How important this vapor is does not appear at first sight. It is well known that, coming from above, the heat of the sun can, in a great measure, penetrate through the moisture in the air, and reach the earth to be absorbed by it. On the other hand this same heat when radiated back during the night can-

not fly off into space if a cloud intervenes. Hence, then, the watery vapor becomes, during the early autumn months when our crops are maturing, a sort of blanket for the earth. The larger the area from which this evaporation can occur the larger will be, other things being equal, the amount of watery vapor in the air. The less we have of this vapor the greater will be the chances of early and destructive frosts, and the more likely will our crops be wilted, because the thirsty atmosphere will, so far as it can, take the moisture from the plants themselves, and from the soil on which they grow. Whatever, then, tends to preserve the areas of evaporation tends to that extent to preserve our crops. The quantity of water evaporated in a summer month from a mile square of water surface is enormous. It has been estimated to be in our climate 3,339,304 gallons. To make a practical application of this statement: sum up the area which, in your State, should normally be covered by water. Reduce it to miles, then multiply the number of gallons which I have given you above, for the month of July, by the number of miles of water surface which your State represents. You will be astounded at the result. If you have fifty square miles of such surface you would have the atmosphere receiving in a single month 166,965,200 gallons of water.

Suppose we change the picture and imagine, what is not improbable, that just at the season when your crops most require water vapor in the atmosphere that your evaporating surface has been reduced one-half because of the low stage of water; that would mean that the atmosphere over your State had been deprived of 83,482,600 gallons of water in a single month. I am as fully aware as you that it is still an open question whether or not the moisture which comes as dew upon the plants can be absorbed by them. That is a purely scientific question. You and I know, however, that corn leaves which were hanging limp, or were curled up to reduce their evaporating surface, when the sun's rays were pouring down upon them, will be refreshed after a night of heavy dew. During a prolonged drought you may endeavor to maintain capillary attraction from the depths of the earth by keeping the soil well tilled. The stubborn fact remains that there is only a given quantity of moisture there, and that while cultivation may render more moisture available to the plants for a time, it is

also enabling the air overhead to carry off the more from the soil when other evaporating areas are reduced in size.

I spend most of my time in the woods in connection with my official duties. From November 20th to the 27th I was in camp at an altitude of 2,000 feet above tide on one of our State Reservations. When we entered the woods, springs which had almost never been dry had ceased to flow. Stream beds were dry, and the whole country showed signs of suffering from want of water. Never in the history of my State, certainly not for a generation, had the agricultural interests in the central parts of Pennsylvania suffered so severely from lack of water as during the last summer. In the great city of Williamsport, where prosperity had been built upon the lumbering industry, the mills had long been "shut down," because there had not been enough of water in the Susquehanna to bring the logs into their boom. It rained on us most of the time during six out of the seven days we were out, and every night the heavens were opened, and the floods descended upon us.

Yet it was not until the fields were pouring their water into the channels that the "run off" from the woods became manifest. Most of the water which fell on the litter of leaves during the first four or five days went into the earth. This observation led to another. As we were going out of the woods we found that the water which soaked into the forest floor had already started the springs to flowing, but when we reached the open country the springs were not flowing so vigorously as those we had left in the woods, because most of the rain, running off of the surface of the fields, had failed to reach the subterranean channels. This observation, too, effectively disposed of a statement made but a short time ago by an "eminent authority," namely, that it was the snows, and not the rains which maintained and restored our springs.

It is true that meteorological observations upon the relations of forests to climate are unsatisfactory, because too meager. But it does not follow that we are, therefore, to reject certain conclusions which our unaided senses bring us. There was much weather wisdom before this science of meteorology was born, and some of that wisdom was as reliable as the weather forecasts we receive to-day. And by this statement I mean no discourtesy to those patient, trained ob-

servers who are trying to reduce to order the laws of meteorology of this great country. The work is of lasting benefit.

But it is true that Columbus was denied the privilege he asked of entering the harbor of San Domingo, which he had opened, to ride out a storm which he foresaw, when Spain's treasure fleet ignorantly put to sea only to be dashed to pieces. I remember as a boy a statement which was so universally considered true that it passed into a proverb, "the green woods won't burn." I have lived to see the air in the green woods so dry that a match dropped among them would ignite the leaves in them as if they were straw in your fields. I remember when the forests of Pennsylvania stretched away mile after mile — and you might travel an entire day without seeing more than a single house. At that time when a lumber camp was opened in the wilderness it was almost impossible to dry the wash of the week as it hung upon the line, because from April to October, during most years, the woods reeked moisture. But as the cleared areas of evaporation increased in extent, the tree-shaded areas of moisture-retention decreased in extent. To-day the dry atmosphere makes cleanliness and godliness possible anywhere in Pennsylvania. These statements may appear trifling, but they are important in helping us to conclusions while our meteorological friends are bringing up their data. When they are prepared to substitute something more exact and accurate, I pray that they may have a speedy delivery.

I have been asked repeatedly during the past season, why is it that, ninety-eight years ago, when the country was covered with forests, that a stone in the Susquehanna River at Harrisburg was bared by the low water and marked, and that never until this season has it been seen again uncovered. The question is apropos of the forestry agitation, but it is easy to answer. Presence or absence of forests has not been shown to increase or to diminish rainfall. There is everything to lead us to believe that there always have been and always will be years of exceptional drouth. All that we claim is that in a forested region a given rainfall will produce more lasting results for good than in an open country. For aught we know to the contrary, the greatest drouth that has ever fallen upon this land may have been before its discovery by the whites.

There are certain inquiries with which it seems almost a waste of time to concern ourselves. For example, the

question whether or not removal of our forests will permanently injure our atmosphere and render it less fit for animal use than it now is. We look about us, and up into space, and are struck by the small room which we mortals require, and we learn that so rapid is the atmospheric diffusion that but little if any difference can be detected between the air of a forest, or of the desert of Sahara, or the air over a vast city, and our fears are allayed.

But, on the other hand, it is said that a no less distinguished scientist than Lord Kelvin has seriously raised this very question. He points to the fact that the oxygen of the air seems to be a fixed quantity, and that plant life is, if not the only producer of oxygen, at least the most active one. He leaves the conclusion where I will, to you.

These are some of the outlying considerations of forestry.

Would it be wise to give our cleared fields over again to forests? Not at all. Forestry is nothing if not practical. The reason why I have devoted twenty years of my life to this work in my native State is because I have seen one-sixth of its area changed by removal of the timber, from a productive to an unproductive condition, and I desire to see it made productive again. If your acres pay you in farm or garden crops better than they would in any other crop, then you would be most unwise to make any change. But, perhaps, your land may vary in quality, and some of it may compensate you for your agricultural operations, and some of it may not; what are you to do with that which does not pay you to farm? Clearly, it ought to produce something in return, at least, for the taxes which you pay upon it.

I admit that the most valuable timber is of slow growth, and that if you depend upon this it must be as a legacy to your children. We have in Pennsylvania two laws which, however, turn such land into an immediate source of profit if planted in timber. They are as follows:

An Act for the encouragement of forest culture, and providing penalties for the injury and destruction of forests.

Section 1. Be it enacted, etc., that in consideration of the public benefit to be derived from the planting and cultivation of forest or timber trees, the owner or owners of any land in this commonwealth planted with forest or timber trees in number not less than twelve hundred to the acre, shall, on making

due proof thereof, be entitled to receive annually from the commissioners of their respective counties, during the period that the said trees are maintained in sound condition upon the said land, the following sums of money:

For the period of ten years after the land has been so planted a sum equal to ninety per centum of all the taxes annually assessed and paid upon the said land, or so much of the ninety per centum as shall not exceed the sum of forty-five cents per acre.

For a second period of ten years, a sum equal to eight per centum of the said taxes, or so much of the eighty per centum as shall not exceed the sum of forty cents per acre.

For the third period of ten years, a sum equal to fifty per centum of the said taxes, or so much of the said fifty per centum as shall not exceed the sum of twenty-five cents per acre.

Provided, that it shall be lawful for the owner or owners of the said land, after the same has been planted for at least ten years, to thin out and reduce the number of trees growing thereon to not less than six hundred to the acre, so long as no portion of the said land shall be absolutely cleared of the said trees;

And provided also, That the benefits of this act shall not be extended to nurserymen or others growing trees for sale for future planting.

Sec. 2. The owner or owners of forest or timber land in this Commonwealth, which has been cleared of merchantable timber, who shall, within one year after the said land has been so cleared, have given notice to the commissioners of their respective counties that the said land is to be maintained in timber, and who shall maintain upon the said land young forest or timber trees in sound condition, in number at least twelve hundred to the acre, shall, on making due proof thereof, be entitled to receive annually from the commissioners of their respective counties the sum of money mentioned in the first section of this act: Provided that the first period of ten years shall be counted from the time that the said land has been cleared of merchantable timber, and, that after the said first period of ten years, the number of trees upon the said land may be reduced as in the first section is provided. This act was approved the first day of June, A. D. 1887.

An Act for the preservation of forests and partially relieving forest lands from taxation.

Section 1. Be it enacted, etc., that in consideration of the public benefit to be derived from the retention of forest or timber trees, the owner or owners of land in this Commonwealth, having on it forest or timber trees of not less than fifty trees to the acre, and each of said trees to measure at least eight inches in diameter at a height of six feet above the surface of the ground, with no portion of the said land absolutely cleared of the said trees, shall, on making due proof thereof, be entitled to receive annually from the commissioners of their respective counties during the period that the said trees are maintained in sound condition upon the said land, a sum equal to eighty per centum of all taxes annually assessed and paid upon the said land, or so much of the said eighty per centum as shall not exceed the sum of forty-five cents per acre: Provided, however, that no one property-owner shall be entitled to receive said sum on more than fifty acres.

Sec. 2. All acts or parts of acts inconsistent herewith are hereby repealed.

This act was approved the 25th day of May, A. D. 1887.

Either of these laws may be considered in the light of a bounty on timber culture, even though it is "not so nominated in the bond."

Is such a law just? If forests are equalizers of water-flow, leaving all other alleged benefits out of the question, then they are clearly an advantage to the entire State. So long as the owner does not cut and remove them he is receiving but little more advantage from them than his neighbors. It seems hardly fair, in this view of the case, that he should be asked to pay all of the tax. The tax rebate allowed under our laws is simply an acknowledgment which the State or the community makes of the public service trees are rendering. It is what the public allows as its share in the taxes the owner has paid for the trees.

You may consider this from another standpoint.

You allege that this timber is growing into increased value which the owner shares with no one, and therefore you contend that no one should share the payment of tax with him. This statement is true, considered in itself, but the fact remains

that every day these trees stand they are earning, from the public, the right to grow by the public benefits which they confer.

If, however, you still insist upon payment of full taxes for timber land, then it would be equity to defer payment until the owner converts his timber into cash by turning it into lumber. It would then come in the shape of an income tax, which is not wholly unknown in this country, and would be paid when the owner had lost his claim upon the public by removing the trees which earned the right to grow untaxed so long as they stood.

These considerations come upon us as we consider the question from a legal and a commercial standpoint. There is, however, still another aspect of the case which may in the near future confer value upon even your young growing forests. We will suppose you own a body of land which is unfit for agriculture, and is yielding you nothing. I do not know of anything which could be worse than this, unless it should be an actual expense to you. Suppose you plant that land in white pine. It will be a century before any return will be yielded. It is easy to conceive of a class of investments which will yield a safe return of interest and principal only after a long term of years. Yet because of the certainty of a return these investments would have a value which increases in proportion as the period of maturity approaches. If there is any timber in the world which has a value beyond a doubt it is white pine, because it fills a place which is peculiarly its own. There is no more danger that the market will ever have a surplus of white pine than there is that the world will ever have too much virtue. The supply of either will never equal the demand. It is my opinion that there are thousands of acres of land in this State which might be planted in white pine to advantage.

But if its maturity is too far in the future, suppose we consider another tree: the Carolina poplar, for example. Taking its average growth on all soils, I do not know of another tree adapted to our eastern slope which grows so rapidly.

You may put it into almost any soil that I know of as a cutting a foot long, and in three years you will have a rooted tree six feet high. From that period on for twenty years on soil of average quality it will increase rapidly in height, and add an inch to its diameter annually. But a few years ago it

had almost no value except as a second-rate shade tree. But our pulp makers have ransacked the continent for suitable wood for their mills, and they have decided that the Carolina poplar has a value in their work, and that by the soda process it will make a fair quality of paper. One company informs me that it proposes to use forty thousand cords of it this year, if it can get so much. Our Pennsylvania wood pulp makers are already planting it for their use.

It would seem wise, therefore, for us to consider some of the possibilities of the Carolina poplar, as it appears to be adapted to your climate. There may be planted of it say 400 trees to the acre. This would allow each tree about ten feet of space in which to grow. Planting them closely would cause them to make straight, tall stems. In from fifteen to twenty years each tree should make four lengths of pulpwood, that is, a cut twenty feet long having a diameter of one foot at the base and nine inches at the top. The cubic contents of this would be, allowing for removed bark, over thirty-four cords of wood to the acre. I have given here what I conceive to be the lowest average yield. The chances are that the yield would be a fourth larger. Now, mark, this is to come from land which is incapable of producing any farm crop. There is another method of producing Carolina poplar. I mean as road-side shade trees, when, after they had served their purpose, or a younger set was coming on, the older trees could be removed. The aggregate of money which this State could thus produce to advantage would be very large. All that I have said of the poplar is true of its near relation — the willow, except that the latter requires rather moister ground. It was my intention to have the merits of the white willow tested as a producer of pulp wood when I discovered that it was already being used successfully by one of the paper mills of my State.

In addition to the trees already enumerated, willow culture for basket making appears to have a future. If this be so the return will be speedy. I am not fully informed upon this subject, but would say so far as I can learn those who have gone into it in Pennsylvania seem to be satisfied with the results.

I have said nothing thus far upon the question of State ownership of lands. Whether or not this is desirable would, I suppose, depend somewhat upon the waste land which any State possessed. In Pennsylvania there happen to be several

millions of acres which most men of common sense recognize is good for nothing but the production of timber.

If it were to be given over to a kind of trees which require half a century or more to mature, it would in time be a valuable investment to the State, but forestry there, as here, is a comparatively new idea. Men lacked enough faith to go into it as a business.

The State saw its opportunity, and within a year has purchased about 120,000 acres at a cost of \$1.35 per acre. This is but a nucleus. We are contemplating forestry reservations which, in the near future, will contain about two million acres. There is one thing about the movement in Pennsylvania which is somewhat remarkable, though it is eminently satisfactory to those who have been doing pioneer work in favor of forestry. It is, instead of having to lead public sentiment up to acquiring larger reservations, public sentiment is urging the forestry commission on.

I do not know what proportion of Connecticut could be classified as waste land, probably less than in Pennsylvania. But, nevertheless, I am persuaded that there are areas within your limits which it would be well for Connecticut to own. We have three methods of obtaining land for the State.

1st. The commissioner of forestry is authorized to purchase land which is sold for non-payment of taxes, at a price not to exceed taxes and cost. In this way we have secured sixteen thousand acres at an average cost of about thirteen cents an acre. It was land which was worth much more, but it so happened that we secured it. For example, one tract of 4,175 acres cost us fifteen cents an acre. Yet we have on that very tract a flagstone quarry which we could sell for more than we paid for the tract.

2d. The commissioner of forestry may, with the consent of the governor and board of property, purchase land other than that sold for taxes at a cost not in excess of its assessed value, but in no case to pay more than five dollars an acre.

3d. We have a commission of five members whose duty it is to locate three State forestry reservations of not less than 40,000 acres in each, one to be upon the heads of each of the three river systems of the State.

This commission is not limited to any price per acre. It has the right of eminent domain, and may take any land for State purposes upon payment of a reasonable price. Thus

far this right has never been exercised, because it has not been necessary.

There is one feature of our reservation system which is worthy of note. It is the interest the public have in it for other than mere practical reasons.

Hitherto no State appears to have recognized the right of its citizens to a holding which was the common property of all, except in or near large cities. This idea has with us gradually assumed an importance in the forestry movement. Nothing has done more to make land purchases popular in Pennsylvania than the fact that our notices posted on State lands plainly indicate that lawful hunting and fishing are allowed.

This means more than appears on the surface, for no one can lawfully, in our woods, kill a song or insectivorous bird, and within less than a year means will be provided to punish those who do. This idea of public ownership has brought to the side of forestry 40,000 members of the State Sportsmen's Association. For that body is not organized simply to ensure a full game bag; but to perpetuate the game of the State by limiting the period during which those species, which are properly game, may be killed, and to protect all the other useful denizens of the woods during twelve months of the year. Game never, during the past twenty years, has been so plenty in my State as now. Hundreds of our citizens now take their annual vacation during November, and go to the woods for it. I saw recently ten deer and a bear hung up in a space of less than two miles in our Clinton County woods. Thus, by our reservation we are providing protection and shelter for the birds which are the natural enemies of the insects which prey upon our crops, and we are providing an outing ground and a sanitarium for our citizens. The governor of Pennsylvania recently stated in conversation with State officials that it was his desire to have something of a forestry reservation in each county in the State. I do not know how this may strike you as an element of the forestry problem, but I assure you it has become with us so much of a popularizer of the movement that I frequently hear the remark made by our citizens, this or that piece of woodland ought to belong to the State.

Apart from all the minor considerations to which I have alluded and to which I have alluded because they are so

seldom considered, there remain two facts upon which most of the interest of forestry will depend.

First, that the country must have wood, and our supply is becoming scarcer as our population is becoming larger.

Second, if we are obliged to buy wood we expend money. If we sell wood we make money, and if the wood is raised upon soil which is otherwise unproductive, it is so much clear gain.

One point more is worthy of a moment's consideration. The pulpwood is of growing importance, because in the first place the demand for woodpulp is increasing and the supply can be more speedily produced than we can produce lumber, and because while the lumbering industry gives employment to labor but part of the year the pulp industry affords employment all the year, and because a cord of wood manufactured into paper may be worth forty dollars, and a cord of wood in the form of lumber would be worth but about seven dollars.

It should be added that sprouts from stumps of such species of oak as produce tannin in paying quantity should be protected especially against grazing cattle, because they may grow into value in from fifteen to thirty years, and the demand for this must surely increase. It is well known, too, that the best bark, producing the most tannin with the least loss, comes from young, and not from old bark.

I thank you for your attention.

Secretary GOLD. There is now an opportunity for any question or for discussion on this topic which we have had so finely presented by Dr. Rothrock.

Professor BREWER. I would like to say a word on this matter. It is not an entirely new subject to me. I have talked to our farmers before about woods and woodlands of this State. Some twenty years or more ago I spoke at one of our Agricultural Conventions upon this subject, and at that time gave the legal definition of forestry as it was formerly understood. In the olden time in England forestry was a very important subject, and it is well to understand what a forest then was in a legal sense. It was not merely a woodland, but included also pastures and open grounds; it was a place for wild animals to live in, a hunting ground for the

privileged classes. All through the old times it was primarily a game preserve, or essentially, a hunting ground. Much of the literature of forestry may be found in the literature pertaining to horses and dogs, because of the relation of those two animals to hunting. There has been a change in the meaning of the term, and it has been well shown by Dr. Rothrock what people in this country have come to understand by the term, a woodland, kept either for commercial or other economic purposes, and not merely as a game preserve or pleasure ground. I think this matter of forestry we want to have brought prominently before the farmers of this State. If this is done it cannot fail to be productive of much good in covering with forests the waste places in our State where the original trees have been cut off and the ground is unsuited for profitable farming.

Some twelve years ago this State wisely chose to have a topographical survey made, and the surveyors, as they went over the ground, marked as carefully as they could the acres of woodland, and from this data a woodland map of the State was made, showing in colors on the topographical map those portions of the State covered by woodlands. A careful estimate was made of the area then classed as woodland, and it amounted to $38\frac{1}{2}$ per cent. which is more than one-third of the State. The area of woodland is increasing, for the simple reason that formerly lands had to be farmed that do not now pay. This was a relatively populous State in the early history of the country. Then most of the food had to be grown within twenty miles of where it was consumed. There were not the facilities for quick transportation we now have, and during those times the people of Connecticut had to depend upon their own soil for nearly everything. Then forests were cleared from poor and hilly land which does not now pay to cultivate. Much land that is now covered with mere brush or with new forest had then to be used for crops. This is no longer necessary, and the old use of hill farms needs be

changed. In these modern days when we compete in the production of food with the fertile prairies of the west, such land does not pay to farm in the old way. There is a large amount of that old land which will not now be used for farming, and which can be profitably turned into forests. As a matter of fact, many evidences of natural reforestation are to be seen actually going on. There are many places in this State where you can go through a forest and see the old lines of corn rows and potato hills on land that is now covered with trees that have come in naturally.

Forestry, unfortunately, has been misunderstood by many, perhaps most, of our people. There has always been in this State an interest in the growing of ornamental and shade trees; this has extensively been called forestry, but it is not forestry. There have been a large number of Connecticut people who have planted ornamental trees, and even some associations which have fostered the idea of tree planting, and have done good work in the planting of trees and shrubbery by the roadsides and about houses for ornamental purposes, and who have called that "forestry." Commendable as that work is, it is not forestry in the true sense, and I wish the term to be correctly understood by farmers. It is a good practice in its way, but it is not "forestry." Forestry is the conservation, care, and profitable use of the woodlands and forests. It is time that there was a change of sentiment in the country at large in regard to this care. The forest lands have been ruthlessly cut off in many parts of the country, and no effort made to reproduce trees to take the place of those that formerly grew there, and the country is poorer because of the neglect. That is the chief reason why lumber is so rapidly increasing in price. The practice has been to go into timbered districts and cut off the wood and then to desert the place: I have visited lands in several states that have been treated in just that way. Moreover, our lumbering has been done in a most wasteful way. In those states that have had

the most wonderful wealth of forest lands, they have paid the least attention to forestry as a science until comparatively recently. In our own State anybody who goes from New Haven to Hartford will see regions that were once covered with pine forests and now are comparatively naked. That is but a sample of what can be seen in many sections. It should not be so, and our farming population needs to be awakened to the fact that something should be done to re-cover those sections of our State with trees. Now we want to have it brought home to you, and brought home in every possible way, that forestry consists in preserving our woodlands for the owner's profit and for the public good. There should be some systematic effort to help the farmers to see that their woodlands may be made profitable pieces of ground and sources of income, as well as their tilled fields. There are certainly lands that can be made profitable as woodlands that are now nearly worthless. There are many kinds of trees that are indigenous to the soil of Connecticut, that may be profitable to raise and care for. In this State we now utilize for manufacturing purposes many kinds of woods which in former days were scarcely utilized at all. For instance, the white birch is now used for spools and other articles. It was once considered worthless, but now has been very extensively cut off and is even growing scarce. So, too, the dogwood, that beautiful tree, is becoming scarce in many parts of the State because of its high price for use in the manufacture of shuttles. Many other kinds of trees are becoming relatively scarce, some more than others, and what we want to do is to disseminate among the people of this State an understanding of how to manage woodlands, how to care for them, and how to harvest the crop of wood and timber to the best advantage, and without destroying the forest. We want the farmers to learn that there is a practical side to this subject, and that forestry proper is not a modern sentimental fad. I do not want to see the interest in tree culture stop with the efforts to set out shade

trees and ornamental trees. That must be continued, but it is not forestry. You might as well say that the cultivation of a little flower bed was agriculture.

More than a third of our state is already covered with woodland. This is in scattered patches, not large forests. Of the 25,000 farms in this state probably there is a piece of woodland on more than 24,000 of them, and probably 20,000 of those woodlands can be made to pay the owners more than they do now. We have started a school of forestry here at Yale University, but that is not going to reach the older farmers directly so largely as it will indirectly. Dr. Jenkins, now the Director of the Experiment Station, has planned a way to reach the farmers in this connection, and we are taking steps at the present time for experiment. It is hoped that the farmers will take advantage of it. There are many problems to solve which they cannot well do for themselves, but which the Experiment Station and Forestry School can aid in. We have already two pieces of ground, and they are being put into shape for practical experiment.

In 1876 I happened to be a member of the group of judges at the Centennial Exhibition at Philadelphia, and had to pass upon various forest products, among which were nuts. One of the things which surprised me greatly was the very important part that nuts play in the income of farmers and landed proprietors over much of the continent of Europe, more particularly in the central and southern countries. Walnuts, chestnuts, and filberts are grown in enormous quantities both for home use and for export. You can hardly find a grocery store in our cities that is not selling nuts from Europe. The walnut has there been cultivated from time immemorial, and is a source of much revenue. I made a collection of nuts for my own curiosity, of the various kinds coming from several countries, and in the study of the question met with some interesting facts. It was a revelation to me. Here nuts are luxuries; there both a luxury and a food. There is not time now to

go into detail. There are many different varieties of edible nuts which could be cultivated at a profit in this country if the subject was brought practically to the attention of our farmers. Our chestnuts are among the finest flavored in the world; but what farmer is there in the state that would think of planting chestnut trees for the purpose of raising a crop, the same as he would of other farm products? I want to see the time when the farmers shall understand the raising of chestnut trees as well as they now do apple trees. The Experiment Station is experimenting in this matter, and I am hopeful that the object lessons which are being brought out by that work will be of great benefit in the future. Dr. Britton is doing good work in these experiments. We hope to show that the farmers can do something in that line, and that they will try to turn our work to account.

I have said more than I intended when I rose, but out of the abundance of the heart the mouth speaketh. I have had this subject on my mind so long that I feel that I ought to be indulged a little in talking about it.

Mr. NETTLETON. I notice in all grocery stores bags of charcoal, and I find they come from Pennsylvania. We do not have any such product as that here, and I would like to ask Dr. Rothrock how that is produced.

Dr. ROTHROCK. I know very little about that, although I know that it is being put up in the way you suggest. The cheaper grades or waste wood are burnt and prepared in that way.

One thing which was suggested I would like to refer to you, and that is the relative difference between the natural growth of forest and a forest that had had proper care. We have been somewhat in the habit of believing that the natural growth of a forest is about the best that can be done. Now, there is no greater fallacy than that. There are plenty of acres of what you might say are cultivated forest lands in Germany which are known to yield 100,000 feet of lumber.

There is not an acre of that sort of land on the Atlantic coast to-day.

Now, the matter of cultivating chestnuts has been referred to. We have had a remarkable illustration of what can be done in that line. Down in the neighborhood of Harrisburg a gentleman by the name of Engle went out into the hillsides and took up some rough, rocky ground and began raising a crop. He cut off the chestnut trees and allowed them to sprout up, and then at first grafted chestnuts into them. There are only a few acres of it, but he has had, considering the short time, remarkable success. Unfortunately the last year the whole thing was killed by a forest fire. Now, you go into southern Europe, into Germany, and you will be surprised to find how largely the chestnut enters into the diet of the people. We call to mind the statement of Malthus and his prediction relative to the over-population of the world, and that it could not support its population. That prediction was made years ago, but even now, though the population has largely increased, we are only on the edge of our resources that can be used for the support of the people. We have been living on the best ground and have been dependent to a large extent on the spontaneous bounty of nature. By the close care and cultivation that is given in some populous countries there are men who are getting more income, I should say, from half an acre of ground, or that are getting a bigger financial return, than a larger number of the farmers in our State get from their farms, and are doing it at almost no expense. There is a market for all the good chestnuts that can be raised. There are dealers in New York who are glad to get them. There is a dealer in New York who takes almost all of these chestnuts which this man I referred to has for sale. So far as I am aware, you might just as well raise them here.

A MEMBER. I would like to ask the doctor a question. He said Mr. Engle had his trees destroyed by a fire. It seems

to me that that is just the trouble. It is so discouraging I do not think very many will take up the business. I should judge that that would apply also to setting out forests. There would be great danger from fire, and not much encouragement for anybody to go into it.

Dr. ROTHROCK. There are a good many in Pennsylvania who are taking it up on a very extensive scale. We have many lumbermen that have got young forests that they are protecting, ten, fifteen, and twenty years old, and they are protecting it by fire breaks running around the tracts so that the fire cannot spread from one tract to another. We propose to have a force of forest guards and we are going to make an attempt on the line of what I believe the United States has done. When you think of it in this country, for the past one hundred years, many men have believed that they had a divine right to burn forests, and it is hardly ever that men have been punished for it. Under such circumstances what can you expect? The fact is such men have got to be apprehended and tried, and then the evil will stop; that is all that is needed. They have got to be given to understand that they have no such divine right. They have got to be made to feel the hand of the law upon them. There has been too much of that sort of thing, too much for the public good. I am myself \$5,000 poorer because of a forest fire on my own lands. Until the public sentiment is aroused so that it will not stand that sort of thing any longer, it is difficult to abate it. But that is a part of my work. I propose to take every opportunity to arouse public sentiment. In this case where my property was burned I went to the county commissioners and told them that I paid taxes for protection, and requested them to bring the culprit to justice, but they told me that they could not find the man. I went around the lumber camps and paid detectives, and did it myself because our county officers do not wish to incur the hostility of these pests of our country. I have had some interesting experiences in this line, and pro-

pose to do my utmost to see that this lawless element in the mountain regions of Pennsylvania and among our forests is crushed out.

Mr. HINMAN. There are some times when a forest seems to take from the ground more than it returns, or, at any rate, certain trees do. I have a meadow that has been in my family for a great many years and in that meadow there was a spring. When I was a little boy my uncle owned the meadow, and I used to go up there and sit around that spring. We used to take cucumbers and throw them into the water, it was so clear and cold, and it was an elegant place to eat dinner under the shade of that tree by that spring. In process of time, before I bought the farm, there came up a maple tree. It made elegant shade. It grew and grew, and when it got about so big it took every bit of water. Its roots absorbed it, diverted it so that the tree spoiled that valuable spring. I was obliged to cut the tree down to get my spring back, because I wanted it for my cattle and could only have it by doing away with the tree.

Secretary GOLD. Did you get your spring back?

Mr. HINMAN. I did. The spring is there to-day. That tree, growing larger as it did, with its roots spread out all over the ground, took that water right up and the whole spring was gone. In the summer time, when the leaves were on the trees, that was particularly so. There was an instance where one single tree spoiled a living spring for years. When I cut the tree down, the spring came back, and is there to-day.

The PRESIDENT. Now, let me make a little inquiry in regard to something on my own farm, a farm which I bought some forty years ago. There was an inland spring of water on it; no visible outlet or no visible inlet to it; only from the bottom of this little pond there seemed to be feeding springs. I never found them and never saw them. Right near by were four very large oak trees which cast their shade over it. It was just about the size of an ordinary farmer's garden. There

was always water there, water there for my stock summer and winter without fail, but somehow or other the lightning seemed to have some spite against those trees and struck nearly every one of them in the course of six years. I don't know why they should have been there for a century and not been struck, but all at once they were destroyed and died. In the same locality not far from the stumps there sprung up other little shrubs and bushes like, and for a time the water there nearly dried up. It dried up almost wholly for several summers, so that, in a dry season especially, the cattle could not drink there. There would be a little in the bottom, but no real supply of water. Those trees have grown and they are fine oak trees. This last season there has been plenty of water, and it has been a very dry season. The water has returned and the trees have grown. I cannot understand it. I wish some of you would explain it. That doesn't correspond with Mr. Hinman's experience.

Secretary GOLD. I want to introduce to the audience Professor Toumey of the School of Forestry in Yale University. We will be glad to have him come forward and either explain some of the work that he proposes to do, or you can ask him questions.

Professor TOUMEY. Mr. President, ladies and gentlemen: I am very sorry that Professor Graves, who is at the head of the School of Forestry, was called away to Washington to attend a meeting of the American Forestry Association, and that he is not here to-day to speak to you at some length regarding the new School of Forestry at Yale. However, I can say a few things regarding the scope of the work that we propose to do. Professor Brewer has told you something of the conception that a great many people have regarding forestry. That conception has arisen from various so-called forestry associations throughout the country, the members of which have received the idea that forestry consists in planting shade trees and in planting trees for decorative purposes. Now,

forestry, if anything, is a business proposition. I think I can say regarding the School of Forestry, that the purpose of the school is to make it a business matter, for if forestry cannot be carried on in a business way we have no right to carry it on at all. We know forestry can be carried on in a business-like way. Now, the work of the School of Forestry consists not simply in recitation, it is not simply book work, but a large part of it is field work, and the work which we are doing now in the school consists in some measure in getting out into the woods and making measurements and in doing other field work of similar nature, as well as in giving classroom instruction in the management of forests. Later in the course much of the work will be carried into larger woodlands where we can have practical work in the managing of forests and where such management can be shown to advantage to the students. This briefly is the work which we propose to do and which we have started out to do in this new school of forestry. The time is ripe, as you have already been told, for such a school. The forestry interests in the United States are excelled in value by nothing but agriculture. It was estimated only a few years ago that the annual value of the wood cut or the annual consumption of wood produced in this country for a single year is a billion dollars. Now, we as Americans cannot afford to sacrifice a natural product which is bringing in this vast amount annually. We have got to keep it in condition so that it will bring us an annual income. We certainly cannot afford to see it destroyed. This great interest must be maintained, but it can only be done through forest conservation and correct management. The purpose of the school is to so train young men that they may become expert foresters, that they can go out and assist in this work. Dr. Rothrock has already spoken of the reservations that have been established in Pennsylvania. Other states have forest reservations. The forest reservations, both State and national, must be put upon a business basis, they

must be handled the same as other property, so there is a need for young men, a need for men to be trained so that they may know how to organize and how to properly manage our forest interests. After the work of educating foresters is well in hand and the great advantage of properly conducting our forests becomes apparent in this country, the farming element will naturally follow and apply more conservative methods to the management of their own forest lands. In connection with the Yale school we propose to do forest planting. We propose next spring to start a plantation of forest trees on land now under our control not far from this city. We purpose to have a nursery and establish seed beds where various kinds of trees may be grown for demonstration purposes. It is the aim of the work to make it as practical as we can. We know we cannot apply at the present development of forestry in this country complicated methods of forest management. The present demand of the country will not permit it. Just as soon as we begin to give some consideration to the regeneration of forests on our lands, then there will begin the practice of forestry. When the public appreciate this fact, then they will begin to look out for the future crop, they will begin the application of correct methods. Our aim is to have our methods such as to meet the economic demands of the country.

Without saying anything further on this subject directly concerning the school, I want to make a few remarks regarding the statement made by Dr. Rothrock relative to the indirect value of forests. He told you forests were not only valuable for the direct value of the wood itself, but that they were valuable indirectly on account of their value in the conservation of moisture. We do not claim that they increase the rainfall, but we know that they conserve the rainfall, and that the greater the area of forest land is, the better, from the standpoint of humidity, is the agricultural land in the vicinity. I am very much interested in the protective side of forestry,

especially regarding the effect of forests upon stream flow, upon the conservation of moisture. The last year that I was in the employ of the Division of Forestry I spent considerable time in the San Bernardino Mountains in Southern California. At the base of these mountains land is worth from \$500 to \$1,000 per acre where water can be gotten upon it. If water is not brought upon this land, it is not worth a snap of the finger. The land is not valuable, it is the water that is valuable. On the watershed of these mountains, in coöperation with a private company, we have determined that the indirect value of the forest is very great. The precipitation has been carefully investigated, and every stream upon the area studied has been accurately gauged, the water has been measured that has run from the watershed, so that we have been able to compare the precipitation and the run-off on areas that are forest covered and areas that are denuded of their forest growth. In a number of instances we have been able to show that at the time of the heavy rains, when the streams rise to great height on the denuded watershed, they immediately recede and in a short time reach their normal flow. On the watershed that is covered with timber the flood water rises to a given height, but instead of receding as rapidly as in the other case it gradually recedes, *i. e.*, it takes a longer time for the water to run off. In other words, the run-off is much more gradual from the forest-covered area, showing conclusively the greater value of the forest-covered area to hold or conserve the water.

A MEMBER. I would like to ask if it has been determined whether in the actual run of water there is any difference in the amount of run-off between the naked and tree-covered area throughout a year?

Professor TOUMEY. Our data on this matter is not entirely worked up, but it appears that the annual run-off is more on the wooded areas. We do not comprehend the enormous amount of water that is taken from the denuded areas

by evaporation. I recall a specific illustration in the San Bernardino Mountains. Before the mountains were lumbered a stream near the summit of the range was perennial in its flow. In recent years the middle area through which the stream runs has been lumbered and burned. At present the stream keeps up its flow until it reaches the denuded and burned area, when it entirely disappears, but as soon as the stream reaches the wooded area again it reappears.

Dr. ROTHROCK. That shows the enormous amount of evaporation which takes place. When I was in Arizona, which, of course, is an exceedingly dry country, I saw some illustration of that. It shows the wonderful power of the sun to take up or absorb the precipitation there, which is principally in the month of June.

Mr. HINMAN. Mr. Hale is not here to combat this theory, but he told us yesterday if we wanted to hold the moisture in our orchards we must not set too many trees. And that if the trees were set so that they covered the ground too closely, they absorbed the moisture, and that the crop was ruined. He said that in a dry season it was better to have fewer trees, because the evaporation from the soil was nothing like as great as the evaporation that the trees threw off through being set closer together.

Professor TOUMEY. I think if you were to put out your orchards and not attempt to cultivate them at all you would find that your trees would die from lack of moisture. In your orchards you conserve the moisture in the soil by cultivation; in the forest the soil moisture is conserved by the mulch. If trees are too far apart no mulch will be produced. I admit if you produce a soil mulch by cultivation, the greater the number of trees upon a given area, the greater will be the loss of moisture through transpiration.

Secretary GOLD. I must beg leave to cut this interesting discussion off at this moment that I may introduce to you a man whom you will all be glad to hear, Professor Ballou of

the Forestry School, recently established by the Connecticut State Agricultural College. I propose to give him five minutes to say something of the scope and purpose of his department in forest work.

Professor BALLOU. Ladies and gentlemen: This is rather unexpected. You have listened to some gentlemen who have told you some facts, gathered by their experience, which have been certainly very interesting and instructive. I have nothing of fact in my own experience to give you, practically nothing, at least nothing that I care to present to this audience, but, as Mr. Gold has informed you, he wanted me to tell something of what we propose to do. This is our plan: The trustees of our college have planned to give a course in forestry broader than we have ever given before, and broader than most of our agricultural land grant colleges have been in the habit of giving. Forestry has been taught generally, or a so-called forestry, but it has been a sort of a branch of landscape gardening in which the characters of different trees were taught and their shape and use, etc., and it has been allowed to go at that.

We have some land that is adapted to this purpose. Some of it is worthless now. It bears a few little clumps of bushes, a few straggling specimens of trees, and quite a quantity of smooth round stones that are of no use. We have somewhere in the vicinity of thirty or thirty-five acres of good timber, oak and chestnut largely. Now we propose to plant that worthless land with a variety of trees, using those kinds which have proven themselves in the State to be of some value for timber, in one form and another, and other kinds that may go with them. We shall try to find out what timbers that are not in much demand now can be grown. I am not going to describe different methods, but we are going to try to see whether the farmer can afford to plant lands with trees for the sake of his woodland or for the sake of getting out what timber he needs for repairs, for posts and rails, and such things. We are going to take measurements,

and find out how rapidly different kinds of trees have grown. Of course our field is limited, and it covers a very small area. Our measurements will not be of as much value as those taken by the department at Washington, but they will be of local value. We shall take the matter that we have in hand, and work it over. Our ideas naturally will be taken from the instruction of those who have had more experience than ourselves. We have picked out one piece of plain, from the appearance of which and from the character of the soil would naturally be good white pine land, some thirty acres, and it is proposed to put upon a portion of this some white pine seedlings. There is one little bunch of yellow pine which is of little value; there is some chestnut and oak and hickory on it. We propose to find out for ourselves in such a way, if possible, that our young men who probably never would have the advantages offered by the Yale School of Forestry can find out some facts which will be of value to them upon their farms, as to how much expense and how much care and labor they can put into the preparation of land devoted to this purpose, and of the care of the same. I think we shall be able to give them some idea of what these things cost. There is one thing that a great many farmers recognize, and that is the fact that time with a farmer is not always money. I mean by that that there are seasons of the year that the average farmer can spend in almost any way, and not have to charge it up against his cash account. That may not be true on every farm, but I know it is on some. And on such, if they can be made to take such seasons of the year to do this sort of work, it is bound to result in advantage. It remains for us to see whether it can be done. We are somewhat in doubt yet as to what we can do at the college. We have two terms a year in this course, the first term beginning after our Christmas recess. We are in hopes of giving the youth of Connecticut who come to the school some practical ideas as to the management and care of forest lands which will be of benefit and use in after life upon their

farms. I presume the plan of our work will appear to some extent in our catalogue.

Mr. HOYT. This is a question that I am interested in. I have had some experience in growing trees and knowing the habits of trees, and I am interested to know that there are some steps being taken to promote forestry in this State, but I would like to give those who are interested in this movement and those who are starting in it a few points in relation to seedling trees, and those which are best adapted for forest growth. As Professor Brewer stated this morning, it is over twenty years ago since this board first commenced to talk upon this question. This question of forestry has been touched upon and discussed at various times at these meetings, but, what has been done in this State by the farmers? I cannot understand that there has been anything done. The profits from it or avails from it are so far in the distant future that the farmers will not as a class take hold of this work. My own opinion is that it is a work that ought to be and must be done by the State. I feel that there should be a commissioner of forestry for the State of Connecticut the same as we have our commissioners for various things. We have our fish commissioner, and dairy commissioner, and cattle commissioner, etc. The farmers are commencing to inquire, or at least some of them are, as to how they shall get these things, or how they shall start them. It has been said here that this must be carried on in a businesslike way. Of course it must be done in a business manner, but the question is, how are the farmers going to get this information that is necessary in order to enable them to start on these lines that are suggested? There must be some effort put forth to educate the farmers up to this work, and to give them proper information. I believe the State could well afford to assist in the work, but as Yale University has taken hold of it I trust that the information that is required will be forthcoming. A few years ago I saw a statement that a black walnut tree had

been sold for, I think it was, \$75. The lumber in that black walnut tree brought \$75. The black walnut lumber of this country is fast passing away, it is lumber that will be wanted always, and he who puts out a black walnut tree upon his land and cultivates it for twenty-five or thirty years, while he may receive nothing from his labors during that time from that land, yet, at the end, he will have a fortune if he puts out enough of them.

A VOICE. Hadn't he better get his life insured? Wouldn't that pay better?

MR. HOYT. Whether he lives to reap the benefit of it, or whether some one else gets it, is in a sense immaterial. We don't live in this world entirely for ourselves. We live in this world, certainly to some extent, for those who are to come after us, as well as for ourselves, and anybody who puts out black walnut trees, or the European larch, or the white pine will have trees that will be sure to bring a heavy revenue in thirty or forty years.

In planting trees for forest, in my opinion, it is advisable, at least from my observation in growing them, to put out a good variety; that is to say, I would not put out pine, oak, or black walnut alone, but I would begin the forest with pine and other valuable timber trees of various kinds interspersed among them. They will grow better and they will grow faster, and they will be more profitable if they are grown in that way. We have on our place trees that I set out, perhaps forty years ago. I put out a tulip in the center of a group and surrounded it with white pine and Norway spruce, and those trees have all been trying to see which would get up the fastest, and that old tulip planted in the center of the group is now a tree seventy-five feet high, and stands there above the rest. There is a white pine two feet in diameter there. I measured that white pine, and it is two feet and four inches.

I have noticed in the nursery where we grow mixed trees

together that we can grow handsomer trees and more of them, and trees that will be finer in shape. I do not know why it is, but that is the result of my observations. It seems to be better to do that than where all of a kind are grown together. Where they are mixed they will grow right up straight, and true and handsome.

The PRESIDENT. Do you think that elm trees surrounded by maples are more exempt from the ravages of bugs or from the attacks of insects that destroy them?

Mr. HOYT. Yes, sir; I do.

Right here there is one other thing I want to say in relation to setting out trees. It doesn't seem to me wise to attempt to raise them from the seed. I believe in mixing the trees together, but I do not think it advisable to attempt to raise them from seed. There is a gentleman here from the college, and, as I understood his remark, he said that they were planting seed. It is a long process to raise trees from the seed. It is a wonderfully intricate process and delicate work to raise these seedlings. They can be bought in Europe for seventy-five cents a thousand, as labor is very cheap there. I do not know but what the college boys can do it, but by buying the seedlings which are advanced, you save just so much time. I think the black walnut can be bought for about \$1.50 a thousand. In New York State Forestry Division they are raising these seedlings. They have set out more than a million. They are feeble little things, and it will cost New York State more to raise those seedlings than it would to have bought the same varieties which have been started where the conditions were better. If you gentlemen are going to start out in forestry business you had better get some seedlings to start out with, and you will be four or five years ahead.

Secretary GOLD. Mr. Hoyt's reference to that recalls to my mind an incident. I advert to one of those incidents or accidents that sometimes happen to seedlings imported from Europe. I think he will recollect a lot of Scotch larch

that were imported. He had some ten thousand, I think, and I had a thousand or two which I set out, but the experiment was an absolutely total failure. They failed to grow in Mr. Hoyt's nursery rows just as they did in my fields, so that my experience has shown that it is not altogether lovely importing these seedlings. The trouble is, they sometimes come in bad shape. I presume that was the case in this instance. That is one of the disappointments that I have met with in my efforts in forest planting.

Mr. HOYT. I think that difficulty comes from bad packing; if they are put up properly they will come in good order; but it is a fact that thousands of them are destroyed by bad packing.

A MEMBER. What is the proper season for transplanting white pine?

Mr. HOYT. The spring of the year.

The PRESIDENT. It seems to me that this discussion is not only interesting, but intensely instructive. There are some classes of wood of which even now the supply is unequal to the demand. The railroad men are very anxious to get all the railroad ties they can all over the country, and their steam saw mills are being moved into every piece of chestnut timber that is left. There is one thing I want to add right on that point. These chestnut stumps that are left and the sprouts that grow up from them, are they good for anything?

Mr. HOYT. All the chestnut that we have got now were started in that way.

The PRESIDENT. I have noticed that while a good many of them looked well on the outside they are defective. They will grow quickly. They will bear chestnuts in a few years. I have got quite a large field of just that kind of trees now, but I have discovered that wherever I cut one I am apt to find it is defective; there is sometimes a hole in it as big as a man's arm. To look at them from the outside they are all right.

Right here I will put in another suggestion. When Mr. Hale was speaking about certain rocky sections where he was clearing out the brush and getting the land ready to plant with apple trees. I have discovered that you have an apple tree in a place where you have cut off wood, where before you would find nothing but a miserable looking apple tree sprout, when you cut the timber then it will grow vigorously; another thing, it will bear vigorously, and bear good apples. That's right along in line with what Mr. Hale said. Another thing, you will never see any San José scale or any kind of insects there. Every apple will be clean and smooth and bright. It is a question with me whether there isn't something for us to utilize, whether we cannot put apple trees on these denuded forest lands, and secure some nice fruit.

Mr. HOYT. What is worth doing at all is worth doing well. You can get good fruit anywhere if you put the trees out and take care of them. You have got to take care of anything that you put out if you expect to get good results.

Secretary GOLD. My experience in tree planting began about seventy-five years ago, and I have continued it from that time to the present with various degrees of success. This theory of our president's was very attractive to me. The idea that our virgin land had been despoiled of its fertility I did not believe. I had an idea that if an orchard was set out in that way that insects would not be encouraged. That what was wanted was to bring back fruit culture here in Connecticut to the same profusion which we were told our fathers and grandfathers enjoyed before us. About sixty years ago I tried this experiment: I took an acre of ground of good strong forest growth, and as good as I had anywhere, cut it over clean, enclosed it with a strong fence to keep out all animals, and proceeded to plant it with a selection of fruit trees, plums, apples, and other trees. I hid them away in the forest where the insects could not get at them, as I supposed, and I fondly

hoped that I should have some nice, well-developed fruit. I kept cutting all the sprouts as they appeared from the native timber in order to kill them as my trees proceeded in growth. I planted my trees. The first difficulty arose when the woodchucks visited my clearing, and used the bark of those trees to sharpen their teeth upon, or to clean their claws on, especially in the early season. We don't know exactly how a woodchuck does that, but he has a way of doing something of that kind that is pretty bad. Next, the rabbits invaded the clearing, and I found on the trees that stood at all that the fruit had about as many stings of the codling moth as those planted elsewhere, and so I concluded to let the trees take their course. I removed the fence, and let the chestnuts sprout up as they would. My experience with other tree planting has not all been like that, or I should not be here to-day.

Walter Mulford

Commonwealth of Pennsylvania

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DEPARTMENT OF FORESTRY.

PROCEEDINGS OF THE FIRST CONVENTION
OF PENNSYLVANIA FORESTERS,

HELD AT HARRISBURG, PA., MARCH 4, 5, 6, 1908.

HARRISBURG:
C. E. AUGHINBAUGH, PRINTER TO THE STATE OF PENNSYLVANIA
1910



THE PENNSYLVANIA DEPARTMENT OF FORESTRY.

THE STATE FORESTRY RESERVATION COMMISSION.

Robert S. Conklin, President.
Dr. J. T. Rothrock, Secretary.
Miss Mira L. Dock.
John Fulton.
S. B. Elliott.

THE OFFICE OF THE COMMISSIONER OF FORESTRY.

Robert S. Conklin, Commissioner of Forestry.
Irvin C. Williams, Esq., Deputy Commissioner of Forestry.
A. E. Strode, Clerk.
George W. Howard, Clerk.

THE STATE FOREST ACADEMY, MONT ALTO, PA.

Robert S. Conklin, Commissioner of Forestry,
Director in Chief.
George H. Wirt, Director.
J. P. Wentling, Assistant Director.
John E. Avery, Class of 1906, Forester.
Ralph E. Brock, Class of 1906, Forester.
William L. Byers, Class of 1906, Forester.
Robert G. Conklin, Class of 1906, Forester.
William H. Kraft, Class of 1906, Forester.
Lewis E. Staley, Class of 1906, Forester.
B. F. Heintzleman, Class of 1907, Forester.
James E. McNeal, Class of 1907, Forester.
Paul H. Mulford, Class of 1907, Forester.
John L. Witherow, Class of 1907, Forester.

THE PENNSYLVANIA DEPARTMENT OF FORESTRY

THE STATE FORESTRY INSPECTION COMMISSION



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Beginning with September, 1906, the first class of foresters from the State Forest Academy went into the field, and the second class followed September, 1907. For the purpose of comparing ideas and notes on their work and enabling them to have an interchange of thought, it was deemed advisable to bring them together during the early part of the following year for discussion of forestal topics and the reading of such papers on pertinent subjects as the men in the field might wish to present or hear discussed. Accordingly, on February 11th, 1908, the Commissioner of Forestry issued a call for the first convention of Pennsylvania foresters to meet at the Department in the new Capitol at Harrisburg on March 4th, 5th, and 6th, ensuing.

In the meantime, the wishes of the men were learned with respect to what subjects they wished to hear discussed, the program of exercises was prepared, and the meeting duly convened at the Department, Wednesday morning, March 4, 1908.

The Commissioner of Forestry presided at the meetings, and at intervals the other members of the State Forestry Reservation Commission, all of whom were present, were called upon to preside.

The papers presented by the young foresters are hereinafter contained and show that the men were interested in their work and desirous of learning whatever will assist them to bring better results. The discussions after the reading of each paper were participated in freely by all present.

The regular meeting of the Commission was held on Friday morning, March 6th, at which the foresters were present and saw how the business of the Department is conducted. During the sessions, at the invitation of the Governor, a visit was paid to the Executive Department where Governor Stuart in a short address welcomed the foresters and gave them some good advice with respect to their conduct both as men and officials. The Convention adjourned finally on Friday, March 6th, and the feeling of those who participated was that it was not only a successful meeting, but that much valuable instruction had been imparted which would be of permanent use to them in the forestal work of the future.



THE IMPORTANCE OF SURVEYS.

JOHN E. AVERY, *Forester.*

Surveying is the art of making such measurements as will determine the positions of points on the surface of the earth, so that a map of any portion of that surface may be drawn and its contents calculated. A survey of all forest lands or reserves of this Commonwealth is exceedingly important. Most of the State's reserve lines have not been run or retraced for years. Often the blazed trees have been cut, or have been destroyed by fire, or blown down. It takes a good surveyor with an instrument to follow them. Therefore, the lines should be run or retraced, plainly blazed, and blazes painted. Corners should be distinctly marked. The lines could be made more visible by cutting an open path and by posting notices at frequent intervals. This would show conclusively the lands of the State to all persons. The neighbor who intentionally or unintentionally gets over the line a little, and very often quite a distance, taking timber that does not belong to him, will not take the chance of crossing a well marked or well established line. Therefore, stealing of timber ceases almost immediately. There are but few cases of timber stealing on the reserves where lines have been retraced and visibly marked.

What can the wardens do, not knowing the lines? Absolutely nothing. They cannot properly patrol the land, and they are not sure of alleged trespassers being on State lands. One of the wardens reported to me several weeks ago that a party was chopping wood either on the reserve or very close to the line, but he was not sure and did not know what to do. He had asked this person where the line is and he could not show him, but said he was on his own land. In such a case, what are we to do? Finally we got a man living in the same community, one who claimed to know almost every line in the woods, to go with us. He put us on a line which had been run years ago and which he said was the State land line. Are we to rely upon the judgment of such persons, and will not work of this kind leave a loop-hole for timber thieves to plunder from the State lands? In a community like the one I have just cited every person seems to be related to every other or else they are bosom friends. What one knows all know. If they once find out that we do not know or are not sure where our lines are, they will cut without the least hesitancy and think all the while they are taking what belongs to them; for in a wooded country, and I think especially in Pike county, there are many men who do not think it a crime to go on his neighbor's tract

and relieve him of some of his timber. I know of a man who was not a native of the county being driven off his own land at the point of a gun by a timber thief. The owner knew he had land, but did not know the exact location until he had his lines run.

If the lines of the reserves were surveyed, blazed, and posted, it would not only be a benefit to the persons in charge, but also to the public and to the sportsmen. The sportsman or hunter, probably not accustomed to the distance travelled, may find himself crossing a State line, opened, blazed, and posted. He is safe to the extent that he is not trespassing on lands of an individual or lands owned by a hunting club, and is not liable to arrest and fine of ten dollars or ten days in prison for trespassing, and have his game taken away from him; but he does know that he is on a State Forest Reserve, free for all to hunt or fish, provided he complies with the rules of the Forest Reservation Commission.

If our reserves were surveyed and the boundary lines cut open, we could have the lands under a better system of patrol. The wardens could cover more of the reserve in one day than they can now in two. As most of the lines are at present they are delayed by tramping through underbrush. Again, the cut lines would serve as wagon roads for getting out timber in the future, or as fire lanes, along which back-fires could be set whenever a fire is headed toward the reserve. We would thus protect the reserve from its most deadly enemy, and save hundreds of dollars for the Commonwealth.

From a forester's point of view, he cannot make a forest working plan until he knows what he has. Here again a survey is very necessary. Not only the outside lines should be run, but township roads, railroads, creeks, bluffs, and other obstacles should be located. Lines between localities having different jurisdiction, as county and township boundaries, interior tracts, lands upon which any rights are reserved, or any individual property, should be accurately located. The forester cannot divide his reserve into compartments which should have natural boundaries, as streams, crests of ridges, swamps, and valleys, because they are permanent, until he has a topographical survey which will show the various undulations and inequalities on the reserve.

In conclusion, without a survey, the forester is continually handicapped, because

1st. The wardens are unable to do their duty for the simple reason that they are not positive as to location of lines and have to depend upon the honesty of neighbors.

2d. It is not fair to the public, as the State Forest Reserves are open for recreation purposes to the people of the Commonwealth.

3d. It is most important for a forester to have a map of his reserve. He can do scarcely anything without a map from which to make his calculations and working plans.

FERTILIZERS FOR RENEWING NURSERY SOILS.

RALPH E. BROCK, *Forester.*

In discussing the subject "The Best Method of Renewing Nursery Soil," I have endeavored to include the two methods most generally followed in best agricultural practice, that is, the one in which there is application of commercial or other fertilizers, and the other, green manuring. The latter is preferable for supplying essential plant foods, because of its cheapness, reliability, and mostly because it involves few or no experiments to determine the plant foods, or the amounts that are most needful.

But laying aside the methods of fertilizing, there is nothing that brings the soil up to "dot," so much as thorough tillage, bringing out the old adage from which we get the word manoeuvre or manure, "he who tills the soil, manures it." From this tillage or working of the soil, the texture is improved, and in heavy or clay soils its absorptive value is increased. Of course tillage alone will not suffice. Composting or fertilizing must be relied upon to aid. From this source we obtain the needed materials, nitrogen, potash, and phosphoric acid.

Supply of Nitrogen.

There are two ways of supplying this essential plant food to the soil, the one by the application of nitrates, and the other by the practice of green manures, the latter of which is preferable, especially if the soil is poor. Where the nursery is of sufficient size to keep a portion of it (one-fifth) unused, this method is very suitable. To restore this portion is to begin early in the spring, sowing Canada field pea, seeded deeply at the rate of two bushels and one-half per acre, giving the soil a top dressing of 300 pounds of acid phosphate and 120 pounds muriate of potash. This crop should be ploughed under during the latter part of June and the land sown in cow peas. Plow this under in September and then sow rye. Give the land now a top dressing of 350 pounds Thomas meal, 2,650 pounds slaked lime, and 900 pounds kainit. This method will give the area one year in good nitrogen catch crops, and will improve the texture of the soil considerably, making a loose soil more binding and retentive of moisture or a clayey soil more open, porous, and absorptive. Also, it would insure nitrogen for years to come, the soil being thoroughly inoculated and also possessing a supply of potash and phosphoric acid.

The Supply of Potash.

The most available supply of potash and the one from which the least trouble can be expected, is in the use of unleached hard wood ashes especially on a soil that is clayey and wet. I have found ashes alone a splendid fertilizer at Mont Alto. Professor Johnson suggests 30 pounds of freshly burned shell lime, 10 pounds of bone meal and 8 pounds kainit a good substitute for wood ashes. This formula is equal to 100 pounds of wood ashes. The ingredients can be bought at the rate of \$4.40 per ton; hence, it is decidedly cheaper and has no weed seed.

Phosphoric Acid.

Bone-meal containing three per cent. nitrogen and twenty per cent. phosphoric acid, and kainit containing the same amount of phosphoric acid, besides many other valuable plant essentials in small amounts, are the two best sources of phosphoric acid to be had at a reasonable price.

Formulae for mixing fertilizers and composts are as follows:

Composts.

Substitute for wood ash equal to 100 pounds, 30 pounds freshly burnt shell lime, 10 pounds bone meal, and 5 pounds kainit.

Thomas-meal, 16 per cent. citrates, 350 lbs.

Slack lime, 2,650 lbs.

Cornallite, 900 lbs.

Mix well together with fine turf, scatter over ground in late fall or winter, and work well in early spring.

Two measures of well rotted wood, two measures of well rotted horse manure, one measure of liquid manure. Keep in covered place until used. Even quantities of chip dirt and well rotted dung well mixed, to which wood ashes and lime have been added. Keep two years.

Ground bone, 300 lbs.

Bone black super phos., 300 lbs. (Fall).

Muriate of potash, 400 lbs.

Nitrate of soda, 89 lbs. (Spring).

Von Schroeder's:

Kainit, 520 lbs.

Super phosphate, 60 lbs.

Whale Guano, 320 lbs.

A good reliable fertilizer for general purposes, is:

Mixture of 30 pounds hen manure, 10 pounds sawdust, 16 pounds acid phosphate, 8 pounds kainit.

This will carry about 1.25 per cent. nitrogen, 4.5 per cent. phosphoric acid, and 2 per cent. potash, which used at the rate of two tons per acre would furnish 50 pounds nitrogen, 185 pounds phosphoric acid, and 80 pounds potash.

Substitute for Barn Manure.

Dissolve one bushel salt in enough water to slack five or six bushels lime. The best method for preparing for composting is one bushel of this lime to one load of swamp muck, though three bushels to five loads is a very good manure. Mix well.

In laying up the heap let layers of muck and lime be thin so that decomposition will be more rapid and complete. Sprinkle salt water on the lime as heat goes up.

When lime cannot be obtained, use three or four bushels of unleached ashes to one cord muck. Turn in a month or six weeks.

Home-made Guano.

Save all fowl manure from sun and rain under cover. Spread a layer of dry swamp muck and dump fowl manure on top of it. Beat into a fine powder with back of spade, add hard wood ash and plaster paris to make following proportions:

Dried muck, 4 bushels.

Fowl manure, 2 bushels.

Ashes, 1 bushel.

Plaster paris, $1\frac{1}{2}$ bushels. Mix well.

A little before planting moisten with water or liquid manure. Mix with soil when planting.

While home mixing of fertilizers is less expensive than prepared fertilizers, care must be exercised in the selection of the needed constituents for two reasons; first, when certain materials are mixed chemical changes take place in which a valuable material is lost, as when lime and barn-yard manure are mixed, ammonia is given off; and second, a change to a less available form occurs as, when lime and super phosphate are mixed, the phosphoric acid is rendered less soluble; also, when potash salts and Thomas meal are mixed the product is apt to cake and becomes hard to distribute evenly. For this reason a German expert lays down the rule that lime and sulphate of ammonia; lime and super phosphate, lime and Thomas slag; lime and barn-yard manure; lime and nitrogenous guano, should never be mixed. Nitrate of soda and Thomas meal; nitrate of soda and lime; potash salts and lime; and potash salts and Thomas meal, should never be mixed. Kainit and lime; and kainit and Thomas meal, should never be mixed unless used at once.

No seed should be sown until several weeks after fertilizers have been sown, and where kainit is to be used in mixture, that is, in connection with a highly nitrogenous product, all but the nitrogenous product should be sown the fall before. Concerning lime and nitrate of soda I add the following, especially concerning the nitrate of soda.

A tree is a slow growing plant and soluble salts, as nitrate of soda, leach away before they can be assimilated by the plant. Regarding lime, except as a mechanical ingredient in compost heaps, no conclusive results have been found, except in the case of three hard woods. Cherry, linden, and American elm appeared to be benefitted.

My experience has been that all conifers suffer from the use of lime. Even from the use of diluted Bordeaux mixture as a fungicide in the endeavor to check "damping off" the coniferous plant suffered.

BROADCAST SOWING vs. DRILL PLANTING.

RALPH E. BROCK, *Forcster.*

In the raising of seedlings for commercial purposes, the idea of importance is to raise the greatest number of even sized, vigorous, and thrifty seedlings on the smallest possible area at the least expense.

Whether this can best be accomplished by sowing the seed broadcast or in drills, depends largely upon the character of the soil in the germinating beds, the moisture conditions of the locality surrounding, as influencing the amount of soil moisture in these beds, the species to be raised and the character of the location in which they are to be finally planted. Broadcast seeding is most practicable where the land has been under a system of thorough tillage for several years, in which weeds have been effectually subdued, the water table raised by successful cultivation, and where the drainage conditions are such that excessive moisture easily and quickly passes away. These conditions would most likely be found in soil that varies from a sand to a sandy loam, and where the surface water of the higher ground surrounding the nursery site is drained away from the beds naturally or artificialy. Drill planting is successful under a wider range of conditions, the four to six inch space between the drills renders weeding less difficult, permits cultivation at all times, and, in times of drought, where there is no adequate water system at hand, allows one to break the soil to facilitate capillary attraction of water from the sub-soil. Again, billets of wood may be laid between the rows of seed-

lings, in a measure, keeping down weeds, preserving moisture and lessening the quantity of leaves needed to cover the beds in the fall.

In beds that have been sown broadcast, the raising of even-sized seedlings excepting by chance is nearly impossible. The seedlings on the edges of the beds are larger, more vigorous and possess a more healthy color, than the dense masses near the centre of the beds. From broadcast sowing it is possible to secure a larger number of seedlings per bed, but the beds present an uneven appearance. The north and east ends of the bed have seedlings several times larger than those of the centre, and those on the south side are likely to be dwarfs and possess a less healthy color, though this may have been caused by exterior conditions. Where the seed had been sown in drills these conditions do not exist to such great degree.

It has been said that broadcast sowing chokes out weeds, but in this State our sowing season is in the latter part of April, after plant life has started. Even if we soak the seed, germination does not take place for three weeks. During this time the weeds have a good start, and from this time on a proportionately larger number of young seedlings are pulled out by weeding in broadcast sown beds than from those sown in drills. For this reason alone one would think that broadcast sowing would be inadvisable except in old beds where weeds have been greatly subdued. The cost of this method of sowing is so large as against drill sowing, except as above, that it would be inadvisable.

The cost of making a bed 100 feet by 4 feet averages one dollar, and the cost of the seed \$14.40, making an initial cost of \$15.40, not counting the cost of sowing and weeding. Ideally, allowing one seedling per square inch, this bed should give fifty-seven thousand six hundred seedlings, over half of which would be lost in weeding, and from damping off and other causes. In clayey soil after a heavy rain with bright sun following, the soil would bake and nothing could be done. If a drought should follow under these conditions, as it generally does, the soil could not be loosened artificially. In drill planting the baking of the soil can be remedied, and the initial cost of a bed 100 feet by 4 feet is seven dollars and forty cents. There would also be from fifteen to twenty thousand plants with a greater likelihood of surviving. For this illustration two dollars are allowed as the cost of white pine seed per pound, using one and eight-tenths pounds per hundred feet broadcast and eight-tenths of a pound in drills. Of course drill sowing will increase the bed surface needed, but not necessarily increase the cost of working the nursery. More beds could be weeded per day, the time gained could be applied to cultivation, and in the end labor would be saved, more thrifty and vigorous seedlings would be produced suitable for planting both in brush and cleared land, and be more satisfactory to the nurseryman who raises them.

FOREST PROTECTION.

WILLIAM L. BYERS, *Forester.*

In considering forest management, among the first things should be the establishment of an efficient protection from fire, insects, and atmospheric influences. The most important of these in our case is protection from fire. Any reason for an economic forest policy implies forest protection as the first step to be taken. The object of forestry would be defeated without protection. The planting and tending of forests are useless and a direct loss without protection. The management of a reserve will otherwise certainly prove a failure. It is possible to do lumbering on only a few portions of the different reserves at this time; but if these lands be protected from fire for a period of from twenty-five to forty years, we will then be able to cut a crop of timber from the greater portion of the reserves. The first protective measure should be the demarkation of the reserve boundaries. This survey should be done by competent surveyors. In this manner all disputes as to ownership of land will be settled. Without a survey some people will advance claims as owners of land, and thus have an excuse for trespass upon State forests. In the survey of land, nothing but stone corners should be made wherever possible, as they are not so easily destroyed as posts and trees.

The next step should be the making of a good system of roads, trails, and fire lanes, which should completely cover the reserve. They will furnish safe and effective places from which to fight fire, and they will also make the reserve accessible in case of fire. If it is possible, a good system of roads and trails should be made in preference to the making of fire lanes. Fire lanes should be made only where the grade is too heavy for a road and where it is necessary for one or the other to be used.

There should be an efficient force of rangers, about one for every 5,000 acres of land, and in some cases, one for 3,000 acres, and, during fire season, there should be appointed wherever it is found necessary an assistant ranger. These rangers should be trustworthy and not be appointed for political reasons. They should be required to learn their districts, all roads, trails, streams, and note any improvements that may be needed. They should patrol their districts thoroughly, and learn the needs and habits of the people who frequent their ranges. There should be a tower on every reserve, located on the highest point, from which may be had a view over most of the reserve.

During fire season there should be one man in this tower at all times. He should be provided with a good pair of field glasses, a complete map of the reserve, showing the roads and streams, and should also have telephone connection with the officer in charge of the reserve, or the nearest ranger. There should be placed on the reserve at different points, small tool houses or chests, fitted with a lock and keys, and each man employed on the reserve should have a key. These chests should contain shovels, rakes, picks, and one or two torches for use in back-firing. One of these outfits would not cost over ten dollars. They should be placed along roads, so as to be easily accessible in case of necessity.

With a private individual, forest protection is a question of profit and loss; but with the State, whose purpose in obtaining this land is to perpetuate the forest supplies and preserve the water supply of the State, it is its duty to protect, even if it does not pay. By affording protection, the land will bring the results for which it was bought. It pays to protect forested land in Germany, and there is no reason why it will not pay to do so in this country. Protection from fire would be greatly benefitted by having the law of June 12, 1907, P. L. 527, apply to all timber lands.

In case of attacks by insects, one way in which they may be stopped is by introducing into the forest insectivorous birds. Trap trees may also be resorted to. It is seldom that insects will attack healthy trees. Therefore, having a healthy stand of trees, is, in most cases, a protection against insects. Against atmospheric influences, a change of species will in some cases stop wind-falls. The attention of campers should be called to the loss that results from forest fires, often caused by carelessness. It is necessary to educate the people so that they will be more careful with the use of fire in the forest. The slashing of cut-over lands should be burned at a season of the year when there is no danger from fire being communicated to surrounding forests. In the planting of old fields, it would be well to leave an open strip around the planting area, to be kept free of all inflammable material as a protection to the young seedlings from fire. Seedling transplants should be carefully watched for any attack by insects. From November, 1903, until March, 1908, or a period of 52 months, the cost of protecting the Bedford county reserve, consisting of about 9,000 acres, outside of the regular ranger's salary, was \$374.48, \$7.20 per month, or \$0.0096 per acre per year. This includes the opening of fire lanes, the repair of a road a distance of three miles, and the employing of an assistant ranger during several of the fire seasons, and a surveyor for a few days.

NECESSITY FOR ADVANCING IMPROVEMENT WORK.

 ROBERT G. CONKLIN, *Forester.*

The lands which the State owns are commonly called forest lands, but this is a comprehensive term. These lands may be divided, according to the character of growth, into six types, as follows:

Type A. *Mature Growth Areas.* Lands on which there is a growth to maturity, which will only depreciate in value by being allowed to stand.

Type B. *Normally Stocked Areas.* These are the lands which contain an average stock of young growth, being neither greatly over-stocked nor greatly under-stocked. This does not mean that they contain a normal growing stock.

Type C. *Over-stocked Areas.* These are the lands on which there is a good young growth of various species, but which stands too thick for proper growth. There may be a few cases of lands which are over-stocked with old growth, but they are few.

Type D. *Under-stocked Areas.* These are the lands on which there are not sufficient trees to form a forest canopy to protect the soil. On these areas there is very often considerable young growth of little value.

Type E. *Barrens.* These are not lands entirely without growth, as the name might indicate, but are lands which contain nothing more valuable than scrub-oak or fire-cherry. Hundreds of acres of this type of land are to be found in all parts of the State, and Pike county has a large area.

Type F. *Open Fields.* This, perhaps, needs no explanation, as they are just what their name implies. They are found on almost all of the reserves, but not in large areas.

This classification is not intended to be taken as a standard, but is intended merely as a rough classification for the purpose of this paper.

To give here a lengthy picture of the conditions existing in many parts of the State where fire has followed the lumber man, and only the stumps are left, is not necessary. We have all seen them and know what they are. Likewise we are familiar with the other types of land as given above, so a picture of them is not necessary.

We are given the work of making something of these lands. What we make out of them depends on the success we have in keeping out fires, and the improvement work put upon them.

This improvement work is mainly directed toward the correction of bad conditions, as stated in the types above, and may be said to consist of three operations, improvement cuttings, thinnings, and plantation work.

There is a distinction to be made between improvement cuttings and thinnings.

An improvement cutting is the first cutting made on a new area, with the purpose of bringing the growing stock as near the normal as possible, by removing dead, dying, and valueless species. *A thinning* is one of the cuttings made at regular intervals during a rotation, to reduce the growing stock to the normal. This distinction is used by the Federal Forest Service, and has been sanctioned by various authorities.

While our systems of protection embrace all of the lands we own, our improvement work is directed mainly towards the lands of types C and F, the over-stocked areas, and the open fields. In one case, on the Mont Alto Division of the South Mountain reserve, a tract which came under type A has been improved, but this is the only one of that class.

All of our lands demand more or less immediate attention, and I shall attempt to show why this attention should be given them; that is, show the necessity for advancing improvement work on the reserves.

First, we will consider it from the point of silvicultural reason. This reason applies more closely to lands of the over-stocked type than to any of the others. On these areas we find conditions which are the very reverse of good. The trees are crowded together, their boles are thin and spindly, and their crowns small and sparse.

Every quality of soil has a definite amount of nourishment available for plant use, and no more. Consequently when an area contains more trees than the soil contains nourishment to sustain, we find the conditions stated above. And this is what we find on lands of type C. There is insufficient nourishment for the stock, consequently the trees are retarded in their development and what growth there is, is generally of an inferior quality. These conditions are opposed to the best silvicultural development standards, and the longer they are allowed to remain so, the worse they will become. Now, go in there, remove the smaller and less valuable trees, and make available for the remaining stock the food which the removed trees used, and also the space for the spreading of their crowns. The remaining stock will advance rapidly, their crowns will spread out, and the diameter and height increment will increase. If enough trees are removed, the boles of the small spindly trees will increase more rapidly in diameter. If carrying out this improvement work means the advantages here

stated, does not neglect of the work mean a corresponding loss? Every year the work is omitted means a year lost to the trees' development, and in the aggregate this is a great loss.

On the Mont Alto division of the South Mountain reserve, on the point of Pine Mountain, along the public road to the Consumptive Camp, there was made in the year 1904, an improvement cutting, covering a number of acres. The worthless and stunted trees were removed, cut into cord wood, and sold. Here we can see, in one phase, the silvicultural value of the work. Before this work was done there were a few white pine seedlings growing here. Their tops were of a sickly yellowish color, and the seedlings were not making their best growth. Since the cutting was made there is the greatest difference to be seen in these seedlings. Their tops are of a deep rich green, and they are growing very fast. And in addition, there are great numbers of all kinds of young seedlings coming on. These will soon fill the blanks left by the removal of the worthless and dead trees. To obtain the best returns and development on all these lands, they must be managed so as to bring the growing stock as near normal as may be done, and as soon as possible.

The economic and financial side of this question is somewhat closely allied with the silvicultural side, for on the attainment of the best silvicultural development depends the highest financial return. While the carrying on of this work now does not mean large financial return at the present time, there are economic reasons why it should be done at once.

One thing is sure: The carrying on of this work at present does not mean any increase in the cost of the work, but may mean a somewhat lower rate. The cutting and removal of small soft saplings is certainly cheaper than the removal of the larger harder poles, not only in the cutting but in the handling. Does not forest economy demand that work of this kind be done when it can be done with the least cost?

And then there is another phase. The removal of the stunted, diseased, and dying valueless trees means there is so much more nourishment available for the remaining trees. As stated above, this produces higher development both as to wood quality and quantity. Better development means greater financial return.

Take an area capable of producing two cords per acre per annum under the over-stocked conditions. The improvement of these lands will mean an increase of perhaps one cord per acre per year bringing the total up to three cords per acre per year. At the common rate for cord wood this means an increase in value of \$2.00 per acre per year. Should this work be put off for 10 years, it would mean a loss of 10 cords per acre at a value of about \$20.00 in the value of the woods. Will it not be better, financially, to do this work now when the cost is the lowest, and secure this increase in value?

Another economic reason for doing this work now is to prevent loss by reason of waste in the woods. This applies to two classes of lands, those on which there is no stock of any value or of very small value, and those on which there is a great quantity of timber, the removal of which is a help, both by benefitting the remainder and by a financial return.

Take those referred to first, which includes the open fields and the barrens. In the open fields and barrens we have a dead investment, *i. e.*, one which calls for expense, protection and taxes, but which produces no return. This is wasteful, but it cannot be remedied at once. In three counties, Adams, Franklin, and Huntingdon, we have taken steps to put these lands into the paying class. White pine and other seedlings have been planted on the open fields.

And again in the open fields we have another source of waste. On these places we encounter two great soil enemies, leaching and erosion. Rains beat down on the soil and what goes into the ground takes with it some of the soil fertility while that which runs off carries away the soil bodily. Trees are natural soil fixers and hence they are the things to use here.

So for every year these lands, the open fields and barrens, are left in their present state there is a loss through lack of return and payment of expenses, through loss of soil and soil fertility.

On hundreds of acres of State land, the ground is occupied by a mixture of valuable and valueless species. By the removal of the latter so much greater area will be available for the use of the former. On the Mont Alto Division on the top of the mountain, along the public road to the Sanatorium, there was a stand in which oaks of no value and aspen occupied much of the area. Under the direction of the forester, during the fall of 1904, these were removed, and now a good growth of oaks and chestnut is occupying the ground and filling the blanks.

As for the second mentioned lands, where the logs and tops are strewn around and dead and dying standing trees occupy the ground, the question has three phases. First, unless this stuff is utilized immediately it will be impossible to derive from it any revenue, for it will become rotten and worm eaten. Second, this stuff is occupying ground which should be supporting good young growth. Third, areas like this are fire traps. Fire starts easily here and once started burns fiercely, destroying everything in its path.

So improving areas like this will do three things; produce a definite financial return, give the young growth a chance, and destroy fire traps. On the Mont Alto division, Pondtown tract, there were 40 or 50 acres of dead poles. It had been a growth of oak and chestnut of 4 to 10 inches in diameter, but fire killed it all. This stuff was

cut by the people of the vicinity, and hauled away. The Department received \$0.50 per cord on the stump. Here the young sprouts are again taking hold and making a good start.

On lands of type A, where we have the mature and over-mature stuff, the question of the immediate advancement of this work hinges on the fact that these lands have ceased to increase in value by reason of any wood increment; but are either at a standstill or are going back. Just as soon as stock ceases to increase in value it is ripe for cutting, and where it has started to go back or depreciate in value it should be cut at once. Why not reap the crop while it will give us the highest returns, and give the second growth the advantage of that much start?

Again we have to go to the Mont Alto division for an example of this phase. On the Guilford tract near Pondtown there was a mature stand of oak and chestnut. Under the supervision of a forester this was cut off. It yielded the State about \$1,400.00 clear profit. And here the sprouts are already starting, although this was cut over only during the spring and summer of 1907.

On the Caledonia division of the same reserve there are several stands which are about ready for cutting, and should be cut within the next few years. But so long as a stand is not really going back, it will perhaps be better to expend all our efforts upon those areas which are in greater need of improvement.

The financial side has this to be said in its favor, that by deriving a return from the lands we will be meeting the popular demand for some visible sign of what this business will amount to.

There is still another phase to this subject, which, while it may not appeal very strongly to the forester, has a decided hold on the minds of the people. This is the aesthetic value of the forests. One of the popular ideas of forestry is that we are working toward the creation and maintenance of forests as parks and outing places for the people. As we are to a greater or less extent working for the interests of the people, we should recognize this public demand so far as is compatible with the best interests of the forest.

When we come to look at the two extremes of forest land, and scrub oak barrens of Pike county or the stripped hillsides of Tioga county on one hand; and the cathedral pines of Mont Alto or the hard-wood grove on the road between Caledonia and the Sanatorium on the other, we will all agree that there is a great deal of good in the idea of developing the aesthetic beauty of the forests. There is a necessity at this time to get the work before the public. We must show that we are doing something real. Where will we find anything so likely to attract attention as the fact that an agency has been at work removing some of the eye-sores which exist along the public roads? A well regulated forest, without a tangle of old logs and

greenbriars littering the floor, means more to the people than all the explanation about silvicultural development and economic use of the soil, and they will appreciate any effort we may make along this line.

Almost all of the operations so far carried out have been along the routes of public travel. Here the people see and appreciate the fact that something is being done. So with the necessity of getting the public's attention. Since the people will appreciate the development of natural beauty, do you not think this another reason for the advancement of improvement work?

And now will this work pay? There is an idea somewhat prevalent among the people that the real object of improvement work is the immediate return to be derived from the sale of material. That this idea is erroneous we all know. The real value of improvement work lies in the increased value of the remaining stock. In many cases improvement work can be made to pay for itself and in some cases to yield a profit. But where the need for advancing the work is great, it would be better to do it at a small immediate loss than to neglect it and lose the increase in value of the stock. As for plantation work it will more than pay for itself in the future.

Most of the states are taking up work in forestry, Pennsylvania perhaps in the lead. She has gone into it deeper and more business like than any of the others. There is still a lot of criticism and abuse by people who do not know anything of the subject.

On our work will depend the disarming of these critics and their change to friendliness. As before stated, most of the criticism is on the ground that there is nothing of any value resulting from the work. By advancing improvement work as rapidly as possible and showing by actual results that there is something being done, we will make and hold them friends.

While we all concede that improvement work is a necessity, we must not forget the need for another phase of the work, perhaps as important. I refer to protection. All improvement will count for nothing if we are to have it destroyed by fire. Every year thousands of acres are burned over. What will it benefit us if our work is to be obliterated within a year or two? While paying, therefore, all possible attention to the work of improving the lands, let us see that lands and work are properly protected.

A SYSTEM OF FOREST BOOK-KEEPING.

ROBERT G. CONKLIN, *Forester.*

In working out a system of book-keeping for a reserve, there is one thought to be kept constantly before you, simplicity. Where a forester has to do his own book-keeping, a complicated system will increase his work two-fold. Book-keeping will generally be done in the evenings after the day's reserve work is over, and a complicated system will needlessly increase his labors.

The conditions under which we must work are, perhaps, unlike any others where book-keeping is done. Each reserve is like a department in a big manufacturing concern, and yet different; for while a department of manufacturing has only one operation to deal with, here we have as many different operations as there are compartments or cutting areas in the reservation.

All our expenses are returned to a central office, and paid by moneys from there. Likewise all receipts go into the same office, but are paid from there into a different fund.

To work out a system of book-keeping which will be simple, yet applicable to the conditions under which we must work, will take time and experience. I am not an expert accountant, nor have I had an extensive experience in book-keeping. Consequently I do not set up any recommendations I may make as the best, but simply as recommendations.

In modern business practice, the card index system is rapidly taking an important part. Business forms of various kinds simplify matters, and system plays an important part.

On the Mont Alto division, there is in use a system of book-keeping which combines the use of books, blank forms, and cards under a somewhat elaborate system. This system of book-keeping is good and I thoroughly approve it, as it is clear and practical. There the conditions differ very much from the conditions on the reserves generally, for there are school accounts and reserve accounts which intermingle somewhat. But it is too complicated and elaborate for use on a reserve where conditions are simpler and the forester has to do his own book-keeping.

At Mont Alto they use the day-book, cash book, and ledger; a card index system, and a system of time-sheets and reports. The system of time-sheets and reports is good, and as it is, perhaps, as simple

and effective as could be devised, it will be suitable for use on all reserves; but as for the books and cards, I believe them too cumbersome and require too much work to be valuable on reserves.

At the Asaph Nursery I tried to devise a system, which, while simple, would fill all requirements. Of course, here conditions were much different from those found on a reserve, for we had only one operation to take care of. Other operations such as surveys and road work, were simply charged to the Department. Here only two books were used in connection with the system of time sheets, a journal and a ledger. In the journal everything was charged as used, except labor, which was entered only at the end of each week or the last day of the month. In the ledger the work was divided into such accounts as operation, protection, grounds and buildings, equipment, etc. The real stock account was headed "Pennsylvania Department of Forestry," and all goods and checks received were credited to this account. All expenditures made for outside reserve work, but paid from the nursery, were debited to this account. At the end of the season the inventories of equipment, protection, and seedlings, were debited to this account and the account balanced. This system is faulty without a doubt, but having had no previous experience and needing it immediately it was the best that could be evolved at the time.

When I submitted this question for the Convention I had not expected to be assigned it as a subject, but had expected to get some information from the Department as to their wishes in this matter. So far as I know there has never been any statement made to the foresters as to how they wanted the accounts kept. Are we to keep a simple record of expenses and receipts, and allow the profits and losses to be determined for each reserve as a whole, or by compartments, at the Department? Or are we to keep a more elaborate system of accounts so that we can determine at a glance whether the operations on each compartment, or on the reserve as a whole, are being carried on at a profit or a loss? So far, I have been going on the supposition that the second case is the one under which we are working.

There is one thing which should be kept in mind though, and that is that all operations, expenses, and receipts, for each compartment should be kept separate. Whether this will mean simply a separate account in the ledger or a separate ledger for each compartment, depends on the viewpoint. Suppose we use one ledger. In this ledger each compartment or operation should have a separate account, and different accounts such as pole wood, lumber, shingle wood, etc., should be kept.

The use of a loose leaf ledger will, perhaps, be better than this for at the end of each year the leaves of the various compartments could be separated and filed, each under its own head.

By keeping these separate accounts or books, each compartment will be made a separate investment.

But this is, perhaps, too elaborate, for it will require that each compartment have its own rangers; that the forester and his assistant will have to keep record of their time so as to charge it to the compartments they have worked on; and that will mean perhaps too many accounts.*

I believe the best way would be to have someone whose business it is to solve such problems work out a simple but comprehensive system of book-keeping for reserve use.

I do have a few recommendations to make:

First: Let the system be as simple and comprehensive as possible. Nothing causes so much trouble and worry as mistakes in book-keeping, due to ignorance of the system used.

Second: Use wherever possible blank forms which indicate clearly what is required.

Third: Keep the accounts of each range or compartment separate, so that a glance will suffice to show whether the operations have been carried on at a loss or gain.

Fourth: Keep separate accounts, if possible, for the various classes of products.

Fifth: Keep a general account which will show the status of the business of the entire reserve at once.

There is still another point which I wish to place before this convention, and that is the value of an accurate and minute record of the daily progress of the work on each reserve. The use of a separate record book for each compartment would very likely be much better, but perhaps it would entail too much work. The best way may be to use what may be called a Year Book. Each book would be divided into the same number of parts as there are compartments in the reserve and the complete record of the operations on the compartments entered in the part of the book allotted to it. By the use of a separate leaf book waste in paper could be eliminated, and the sheets used could be removed from the cover at the end of the year and filed under their proper head. This would not only be cheap but would reduce bulkiness in the record.

But whatever is done, one thing must be remembered: A full and complete record of all transactions both in book-keeping and records, should be kept on each reserve. The sooner a practical system is worked out and put into use, the better it will be for all parties and interests concerned.

*At present the conditions on each reserve differ from those on every other. With the instruction in forest book-keeping received at the Academy, each forester is expected to keep the best accounts under the circumstances, determining for himself largely what are his needs. After work on new reserves has been reduced to a system, uniform accounts will be required.

FOREST NURSERIES AND NURSERY WORK.

 W. H. KRAFT, *Forester.*

The ever increasing demand for desirable timber trees brings to our mind the mission of Forest Nurseries, which is to supply seedlings of the most desirable species, in large quantities, at a nominal cost, to be used in reforesting waste and burned over lands.

These forest nurseries are being established by individuals, railroad, and lumber companies, state and national governments, for their own use, and professional nursemeymen for the sale of desirable seedlings of the timber species for forest planting. This method is used to overcome the uncertain and slow natural regeneration of our most desirable species of timber trees.

The forest nurseries I will deal with mostly are the ones now established and operated under the direction of the Pennsylvania Forest Reservation Commission.

These nurseries, of which there are three principal ones at the present time are so situated in different parts of the State, that seedlings from them may be supplied to the different reserves without long or expensive shipment.

The one situated at Mont Alto, Franklin county, was established in the spring of 1902, and with which most of you are familiar from our forestry reports. One is situate at Greenwood, Huntingdon county, established in the fall of 1906. The other is situate near Asaph, Tioga county, established in the spring of 1907. Of the nursery at Greenwood, of which I now have charge, I wish to state as follows:

This nursery contains about two and one-half acres, is situate on a northwest slope in an old field, which was under cultivation for farm crops until the nursery was established thereon. The site is an ideal one for the raising of coniferous seedlings. The soil is of a shaly character and is protected on the west by a strip of woodland, which breaks the force of the prevailing westerly winds.

In the fall of 1906, Forester W. L. Byers, had this site plowed, manured, and cleared of stones. He also prepared the soil and planted in nursery rows two feet apart, one and one-half bushels of white oak acorns, one-quarter bushel of pignut hickory, one pound of black locust, which he gathered in the locality nearby. He also prepared twenty nine seed beds 4 x 70 feet, for the planting of white pine seed the following spring. In the spring of 1907, I was placed in charge of this nursery, but owing to the unfavorable weather and a late season I was unable to advance the work begun the fall before,

until the last week in April. With what help that could be procured at that time, the seed beds were prepared and there were planted 75 lbs. of white pine in drills six inches apart, sowing a few beds broadcast as an experiment only; 5 lbs. Scotch pine, 5 lbs. European larch, 10 lbs. white ash, 3 lbs. cucumber, 40 lbs. shellbark hickory, 40 lbs. bitternut hickory, all sowed in drills six inches apart.

The seed beds are raised about four inches above the path, are 4 x 70 feet, and run east and west giving them the benefit of the shifting light throughout the day. All the seeds above mentioned were procured by the Commissioner from professional seedsmen, and were sent me too late to make test for germination. Owing to the ground remaining cold and damp until in June, the germination of all the seeds was retarded, none making any appearance until late in June and in July. The conifers showed almost a perfect germination, also the white ash. The cucumber was evidently worthless, as none of it germinated. The hickories were so badly ravished by the pine squirrels that very few were left to germinate. At the present time I am unable to give the exact number of seedlings in the nursery as no inventory was taken in the fall of 1907 owing to insufficient help. Taking an inventory in the fall requires another in the spring to account for loss by severe winter or heavy spring frosts. With proper appliances, such as screens to shade the beds, and an available water supply in case of drought for watering beds and seedlings, I think this nursery when fairly started will produce from five to eight hundred thousand seedlings a year. This will depend largely on the age of the seedling to be used in the planting operations, as more two year old seedlings can be procured than those transplanted. The age at which the seedlings may be used will depend largely on the location of the plantation; two year old seedlings being satisfactory for plantations in old fields and ground which are easily prepared for planting; but where there is a heavy growth of brush or briars, four year old transplants are more advisable. The additional cost of these transplants will be about \$2.50 per thousand.

Other work done at Greenwood in connection with the nursery was the making of a black walnut plantation in an old field containing about four and one-half acres. This was planted in the fall of 1906 by Forester Byers, about 30 bushels of walnuts being used and planted four by four feet. The nuts were greatly destroyed by the squirrels during the winter. What seed germinated made a thrifty growth, in the fall of 1907 ranging from six to twelve inches in height. The blanks were filled in in the fall of 1907 with nuts, nineteen bushels being used for the purpose.

The year 1907 having been a fairly good white pine seed year, one hundred and fourteen bushels of white pine cones were gathered by

boys of this locality, for which I paid thirty cents per bushel. While these cones when dried did not turn out as large a quantity of seed per bushel as some foresters estimate, from 114 bushels of cones I cleaned 77 lbs. of seed, ready for planting, averaging one pound of seed to not quite every bushel and a half of cones. Counting total cost of building screens on which to dry the cones, trays to catch the seed, and cost of cones, the price per pound was about \$0.59. Allowing that these screens and trays will last five years instead of one, the cost would be reduced nearly one third.

The crop of other desirable seeds in this region, excepting walnuts, was a total failure in the year 1907.

The cost of labor in our nurseries and upon reserves could be reduced considerably, I think, if the question of hiring labor could be better adjusted than at present. Men are now employed only during the busy season of the year. This is unsatisfactory, as a man acquainted with the character of the work will do considerably more than one who is not. Therefore, steady, industrious men, who are quick to learn the work, are unwilling to be employed at a low wage for a few months only in the year. When men can obtain work at a higher wage even if it require their being away from home a great part of the time, they will seek such work. On account of the increased cost of living a man is unable to provide for a family on an average of eight months' work a year with 16 to 18 days per month, working only 145 to 150 days per year out of a possible 300 working days. Many of these men could be retained by giving them every possible day's work the weather permits. This could be done in opening necessary fire lanes, repairing roads, making improvement cuttings, and doing other work. Thus by employing a regular force, considerable more work could be done on the reserve with a smaller force than in the present way, and it would keep desirable labor in and about the reserve.

DIVIDING THE RESERVES.

LEWIS E. STALEY, *Forester.*

The subject of dividing the reserves into ranges, blocks, compartments, and sub-compartments is, without doubt, one which requires much forethought and a careful study of actual conditions found in the forest. Not alone must we be well acquainted with present conditions, but past conditions should be known in so far as they are

of value in the future management of the area to be treated. If the reserves were to be divided into their several divisions at short intervals, say every five or ten years, the subject would be quite different; but since when once divided they are divided for all time excepting for small changes, we should have nothing short of a complete past and present record. A division of the forest depends largely upon the kind of management to which the reserve will be subjected: that is, do the conditions of the forest require an intensive management, or are they such that warrant only an extensive management?

These conditions can only be actually known by a complete survey. Until recently, the boundaries of lands owned by the Commonwealth were not well located. The method of this complete survey depends largely on the value of the forest as represented by the returns. Generally speaking, all main lines such as boundaries, all public roads, all streams, meadows, farms, and anything else that may be of a permanent nature should be surveyed and accurately marked. As these data, so procured, will form all skeleton maps for future management of the entire area, they should be carried out in the minutest detail and to the greatest degree of accuracy. Nothing should be left undone that might be of value in determining what lines to follow for the future.

Considering conditions as we have them on the reserves today, each reserve may be well divided under the following general heads, viz:

- 1st. Ranges,
- 2nd. Ranges into Blocks,
- 3rd. Blocks into Compartments,
- 4th. Compartments into sub-compartments.

By a range is understood such an area as may be conveniently covered by one man called a ranger. In the division of a reserve of twenty thousand acres or more there are two conditions which must be considered: The situation and the intensity of management.

In the case of scattered blocks, or in hilly country such as we have to deal with, the ranges may comprise a smaller area than if the blocks are consolidated or situate on level ground. In forests which yield a small return, as is the case with ours at present, the ranges may be large. Where the returns are large it pays to make the ranges small in order to facilitate a more intense management of the area. The boundaries of ranges should in all cases conform to some very conspicuous topographical features. If for some reason no well defined ridge can be had, some permanent fixture as a public road may be well suited to mark the boundary. In rare instances either of these may make the range too small or too large. Then the only method would be to designate the boundary by an opened line. It

might happen that this line between the ranges may be well located for a fire lane and under these conditions would serve for both boundary line and fire protection.

Each range may again be divided into smaller divisions called blocks. These may or may not be of value other than reducing the area into workable sizes. If it should be convenient to divide the range into blocks by natural boundaries, very good; if not, it may be no detriment to the range. On large ranges this division into blocks may aid in designating any particular part of the range.

Again blocks are divided into compartments. Compartments are sometimes called the sylvicultural unit because they form the unit of work. The whole of this division is effected by using in addition to the outer boundary lines, interior natural lines, as creeks and smaller water courses; or some geographic unit, as a basin formed by two hills, the entire flat on top of a hill, or, in some cases, from the top of a hill to a ravine.

The boundaries of compartments may be made to coincide with the conditions of growth. For instance, a compartment may be composed of a pure stand of pine, of chestnut, or of some other species. Age conditions and, in some cases, public roads may conveniently form compartment boundaries; but it is best to have some geographical feature form boundaries when convenient. This will do away with the possibility of the lines ever being changed,—something that must be guarded against.

The size of the compartments as well as of other divisions depends on the intensity of management, the extent of danger from fire, and the size of the former division.

When there is necessity for dividing compartments these divisions are known as sub-compartments. Such sub-divisions should be avoided as much as possible because of the additional expense incurred in their management. When a compartment is composed of an area of large trees and an area of small trees each area may be called a sub-compartment, but as soon as there areas can be thrown together without much distinction of age classes it should be worked as one compartment.

Among the advantages to be gained by dividing the reserves are the following:

Each ranger knows exactly the area which he is to cover or patrol.

In case of operations a record can be kept and the exact location designated.

The best management can be effected by striving toward the ideal forest, and this is most easily accomplished by a systematic division of the forest into workable units.

A REGULARLY EMPLOYED LABOR FORCE.

LEWIS E. STALEY, *Forester.*

The necessity of a regular force of laborers is becoming more apparent as forestry advances. Not alone in forestry has this necessity manifested itself, but in all business operations one of the first things to be considered is men,—a regular force of laborers—men that can be depended upon at all times.

How can good results be accomplished if the men that are doing the work are careless and unconcerned? If good results are to be accomplished in forestry as in any other business, the men must be more or less trained for the work they are to do. They must have practice, and this can only be obtained by having them employed regularly.

Some one may make the statement that men are plentiful, that men can be picked up at any time. Of course to a very great extent this is true at present, but is it not also true that such men as are available at any time of the year, are in many cases men that cannot be depended upon? You have them one day and the next day they are gone. They have some excuse, your work does not suit them, or perhaps the wages are too little.

Why does the State train its own foresters? It is simply because the Commission has found it to be the most advantageous way in which to fit men for the work. Men who are trained along certain lines can undoubtedly work to better advantage than those who may be picked up at any time. The same rule may be applied to laborers. They may not be so well adapted to the work in the beginning, but in most cases, woodsmen, in particular, can in short time do the work as it must be done.

A very good example of a regularly employed force of laborers is the section gang of a railroad. These companies have a certain amount of work which must be done just as the forester has on each reserve. Could not these railroad companies depend on picking up men as the occasion demanded? Is it not true that the "section" labor is almost at an end as soon as the rough weather sets in, and yet the majority of the gang are retained the entire year? There is something at all times to employ them if it is only to make a surplus of handles for their tools. The retaining of these men, in my opinion, is simply because the railroad companies have found it to be to their

advantage to stick closely to their experienced workmen. The companies have so distributed their labor over the entire year that men are needed at all times.

The same idea with reference to distributing labor over the entire year could be used to advantage in forestry. While it is true there is certain forestry work, such as nursery work and fire patrol, which requires prompt action, there is a great deal of labor of other kinds which can be distributed over the greater part of the year just as it must be done when laborers cannot be had.

In forestry nearly every kind of labor must be done with the greatest care. Ordinary laborers in many cases are not capable of accomplishing the best results. For instance, take a man into the forest to do improvement work who has never swung an axe more than to split wood on his own wood pile; while he may be one of the best of workmen, he knows nothing about handling an axe, nothing about felling trees, cannot cut stumps as they should be cut, and in general knows little about the woods and the requirements of the work. But he is willing and always ready to do what is asked of him in his way of working. This man will soon realize how improvement work must be done, and in a short time can do fairly well. If men of this kind could be employed regularly, they undoubtedly would work to better advantage than if picked up at leisure.

Not alone in improvement work would a regularly employed force of laborers be a great advantage, but on reserves where nurseries have been established they could be available for the rush season of the year. In the early spring when nursery work must be pushed, when most planting must be done, and, as a rule when men are scarce, these regular men could be used to great advantage. By experience they would soon learn how nursery work must be done and in case of the absence of the forester in charge they could go ahead and cause no delay which so often is the case where the forester has charge of work other than that of the nursery.

Again in the spring and fall fire seasons there is always necessity for placing extra fire wardens on most of the reserves. The ranger in most cases has to patrol at least from five to seven thousand acres of mountainous country which, of course, is entirely too great. He may be in one region and fire be burning in another for several hours before he discovers it. Instead of taking some laborer not suited to the position, as in many cases the forester is compelled to do, one of these regular men could be available for each range at any time; and in case of rain or damp weather there is always plenty of other work for them, such as opening roads, fire lanes, repainting boundary lines, and numerous other small jobs that otherwise must be done.

The salary of these men would necessarily vary according to the standard of the locality. In localities where lumbering is carried on

and where manufacturing establishments are near at hand a larger salary would be required. Under conditions as we have them on the Mont Alto reserve, \$30.00 per month would be a reasonable salary to begin, with the chance of a raise as proficiency in the work is reached. These men would soon realize the importance of the work and once being interested they would undoubtedly work to the advantage of the State.

Next, the value of these men could hardly be estimated in case of fire. While this may not be true on the Mont Alto reserve where the Academy students are ready in a few minutes to respond to any fire call, yet on reserves other than this one, and where men are scarce, truly great results could be accomplished with these regular men. They would be ready at any time and cause no delay in getting to the fire, something that may aid in checking disastrous fires.

As a summary, where nurseries have been established on the reserves, the regularly employed force of men could greatly aid in getting the work through. After the rush season of nursery work they could be used to advantage in improvement cutting, thinnings, opening fire lanes and trails, and in any surveying that might be done; and last but not least they would be at all times ready for fire service which, in case of scarcity of men, would alone more than repay the salaries paid them by the State.

IMPROVEMENT OF THE RANGER SERVICE.

B. FRANK HEINTZLEMAN, *Forester.*

As the State forest reserves are placed in charge of foresters the more intense system under which they are managed demands that some improvements be made in the ranger service to aid in putting the system into effect. The ranger has an important part to perform in the management of the State reserves.

The first thing to discuss when considering improvements along this line is the duties of rangers. When a forester has charge of a large reserve, 20,000 or 25,000 acres, upon which much work has to be done, it is not possible for him to look after the details. He should plan and direct how it is to be done. The ranger should then be able to take charge of what does not require direct supervision of the forester, and carry it forward according to orders. Such work includes improvement cuttings, building roads, cutting fire lanes, burning brush, and the like.

For all work to be done on the respective ranges, they should under direction of the forester, employ the help needed and keep the time sheets. They should have the right to dispose of fire-killed timber in the way prescribed by the forester. Some rangers, especially those on reserves which are not yet supplied with foresters, seem to think that patrolling is the one thing required of them; that if a certain amount of time is spent riding or walking over the reserve they have done their full duty. Instead of patrolling being their whole duty it should be but a small part of it. The other part should consist in keeping roads in a passable condition, in opening the trails where necessary to make any part of the reserve accessible, in keeping springs well cleaned and paths opened leading to them, and in doing any other work directed by the Department.

The rangers should traverse that part of the reserve boundary along their ranges, at least once a month. Under the present method used by some rangers, of patrolling only the roads nearest the lines, adjoining owners might cut over them for a long while and the rangers not be aware of it. Rangers should be encouraged to operate small nurseries in connection with their work and should be supplied with the necessary material for planting and instructions concerning the raising of seedlings. There are many half days when a ranger would otherwise be doing nothing that his time might profitably be spent in a nursery. The seedlings raised could be used to plant the many small blanks found in almost all forests.

All rangers should give their entire time to work on the reserves, and should not be engaged in an additional occupation, as farming or lumbering. No one can farm and care for a large area of forest land at the same time. He will either have to slight one or the other, and in most cases it will be the forest. Foresters should try to get their rangers interested in the work. Until the men are interested it will always be somewhat retarded and of a poor quality. Probably one of the best ways to arouse interest is for the forester to explain to them his plans of work for the coming month or the coming year. Explain why such work is necessary and ask their views concerning the manner of performing it. State to them the financial results of past operations. Men like to know what returns their labor is yielding.

The placing of rangers in charge of men employed on the reserves should help stimulate interest, for a man is always interested in a piece of work if he knows he is the one held responsible for the manner in which it is done. Copies of all reports, bulletins and circulars issued by the Department should be forwarded to them, so that they can gain a clear idea of exactly what the State is doing and wishes to do on its reserves.

At the present time some men hold positions as forest rangers who who are scarcely able to read and write. As long as the duties of

rangers include only patrolling and watching, these men do very well; but as the reserves are now beginning to be managed more intensely, a ranger should be a man of at least sufficient intelligence to be able to make reports on work done, to keep the time of laborers, and conduct the sale of wood.

Again, some of the present rangers are too old to be of much service to the Department. These men were often appointed when the land was purchased, no doubt because of their familiarity with the lines of the tracts. In this, it is true, they are often superior to younger men, but as the boundaries of the reserves are now being carefully located by surveys and men are being put in charge of the reserves who know how to determine the position of a line when the question arises, the need of their services in this direction is diminishing yearly. Because of their age they do not spend the amount of time on the reserves that they should, and they are not able to perform well severe labor, which often has to be done under trying conditions, such as fighting fire. Therefore, if the maximum age of men appointed was about 45 years, and then only those considered who are physically able to do hard labor, the reserves would show the result of the change in a short time. When a ranger is to be appointed, other conditions being equal, a man should be chosen who lives nearest to the reserve. One living three or four miles from his reserve cannot give good service with this distance to traverse to reach his work. If dwelling houses found on the reserves are to be used as houses for rangers and their families, they should be kept in repair. If it is necessary to erect buildings for this purpose, comfortable cabins should be built as the kind of men we like to occupy them is not the kind that is satisfied with anything.

All rangers should be sworn forest officers. When a man is under oath to see that the law is obeyed there is no inclination to leave wrongs unrighted. The ranger service might be greatly improved by the payment of a salary of about \$45 per month, every man receiving the same amount. Very efficient men could be secured at such a salary. Even at the present salaries which as a rule are lower, some very capable men who are often making a great deal more than the rangers, figuring on a per day basis, inquire as to the prospects of getting a position, being attracted by the regular all-the-year-round employment. Much good might be accomplished by having the rangers make out their reports according to a regular system, showing the kind of work at which they were employed each day of the month, and the number of hours per day. The latter would prevent men from spending two or three hours on the reserve and recording it as the work of a full day. They should be allowed to be absent from the reserve a definite number of days per month. If they wish to be absent more days than the required number, the permission of the forester or of the Department ought first to be obtained.

A SYSTEM OF FOREST PROTECTION.

JAMES E. McNEAL, *Forester.*

Considering the short time which Forestry has been practiced in this State, and the condition of our land at present, the primary and most essential thing with which we have to deal is the protection of forests from damaging agencies.

Dr. J. T. Rothrock, in an article printed in the 1897 Report of the Division of Forestry, has written,—

“The one central point among existing conditions is that there is no use in attempting to save what forests we have, or to restore them upon ground from which they have been removed, until a reasonable protection against fire is assured. Neither the State nor the individual can hope for success until a thorough, radical change has been effected.”

Fire protection, together with protection from other damaging agencies, precedes all benefits which we can receive, either directly or indirectly from our forests, and should be dealt with accordingly. We should not only fight the danger after it has made its appearance, but should take measures for the prevention of all dangers to the forests. These dangers are numerous, and may, in a way, be divided into three classes:

1. Dangers from human agencies.
2. Dangers from organic agencies.
3. Dangers from inorganic agencies.

Under the first class, or dangers from human agencies, fire is certainly the greatest and most dreaded. Its source may be in so small a thing as a match, carelessly thrown aside by a smoker, but whose damage may be almost beyond computation, depending upon the condition of the weather, the efficiency of a protective system, or the nearness of a rain.

In calculating the amount of damage done by fire to forest land, usually only the destruction of good trees is taken into consideration, but indirectly the forest expectation value is seriously affected and the productive capacity of the soil lessened. Through the agency of fire the drain on our forests has been almost beyond belief, and although there have been large areas cut over, the amount of land burned over, in many places greatly exceeds it. This may be illustrated by a case in Oregon, where, during the past fifty years, there have been nearly 1,000,000 acres more land burned over than cut over.

Another case in which fire has done inestimable damage, occurred in New Brunswick in 1825, when there occurred what is known as the Miramichi fire, which, in nine hours, destroyed a belt of forest eighty miles long and twenty-five miles wide. More than 2,500,000 acres were burned over and nearly every living thing was swept from its path, 160 persons and nearly 1,000 head of stock perished. A number of towns were destroyed and 590 buildings burned.

Fires of this type are seemingly of the past, greatly due to laws and regulations governing the burning of brush, the awakening of the people to the importance and necessity of our forests, and the good work of Federal and State authorities. In our own State, statistics show a marked decrease in loss from forest fires. In 1902 the loss was \$620,573, in 1903 it was \$241,240, in 1904, \$135,873, and in 1905 it was reduced to \$63,951, which is less than 1-9 of the loss four years before. It does not follow, however, that the loss will decrease annually, and until there is a good system of protection established, we may look for very heavy losses.

The loss due to trespass is comparatively small and may be guarded against, to a great extent, by having good ranger service, by making all boundary lines conspicuous, and by placing warning notices through the tract.

Protection from organic agencies, i. e., from insect and fungus attacks, is very difficult and entails much study and experiment. The loss by reason of this agency is not nearly so great as that by reason of fire, but we must guard against it, nevertheless. This may be accomplished to some extent, by removing all breeding places, as dead or dying trees, and slashings.

Under dangers from inorganic origin we have "wind-falls" which, although they do not occur frequently, are often accompanied by very heavy losses. On September 30th, 1896, a destructive "wind-fall" occurred in Sullivan, Wyoming, and Luzerne counties, and although there is no exact estimate of the damage done, it is probable that not less than 200,000,000 feet were destroyed, covering an area of from 10,000 to 15,000 acres. This danger may be partly overcome by using proper methods of cutting, which should always be done under direction of a forester.

In establishing an effective system of forest protection it is necessary to do away with the cause of destruction. One of the most essential things is good fire and trespass laws. Penalties should be so severe that malicious people will be afraid to violate these laws, and careless people will be more careful.

It should be the duty of rangers, from the point of forest protection, to patrol the woods in order to guard against fire and trespassers, and to keep all fire lanes, or roads and trails used as fire lanes, free from

inflammable material. They should have some knowledge of harmful insects and fungi, in order that attacks may be promptly reported to the proper authority and effective measures taken to check them.

During fire seasons, there should be men employed to patrol the woods, if there are not enough rangers to do it properly. There should be one man to not more than 5,000 acres. "Look-out" stations, with telephone connection when possible, should be built on points commanding a good view of the surrounding country. There should be a man stationed at each of these stations while there is danger of fire. With the aid of field glasses he would locate fires as nearly as possible, and report them so that men might be sent out promptly. If a system of telephone lines were established, one can readily see that help could be had soon after the fire started and in many cases could be controlled, with little damage. A system of telephone lines has been successfully operated in the state of Maine, and in 1904 reports from one telephone are said to have saved many thousands of dollars.

All lumbering contracts should obligate the careful burning of slashing, whether on state land or private land adjoining other forest land. Although lumbermen do not meet such demands favorably, on account of the expense, experiments show a very small cost. In pine regions the slash has been piled and burned at the rate of less than 25 cents per M. B. F. logs scaled, and in some cases it has been as low as 15 cents. In California experiments have been made in which the slashing was burned as the lumbermen left it, by burning small areas at a time, in a way that the fire can be controlled at all times. This has been done successfully and at a small cost.

Many advantages are derived from the burning of slashing, among which are clear ground for better reproduction, destruction of so-called "fire-traps," breeding places for insects and fungi, and easier means of travel through the woods.

There should be on all large tracts, a network of roads and trails in order to confine fires to areas as small as possible. When cutting fire lanes it is advisable to cut them in places where there are likely to be permanent roads in the future, which will be used as fire lanes. All fire lanes should be kept free from inflammable material and should be opened up annually, soon after the growth stops and before the fall fire season begins. When there are railroads through forest land there should be a strip burned on either side of the tracks and kept free from inflammable material during the time there is danger from fire.

Protection from trespass through ignorance may be established by cutting a clean and distinct path along all boundary lines. This path should be made conspicuous by marking line trees with a special blaze and posting warning notices. Warning notices should also be

placed along frequently traveled roads and paths through the interior of the tract. All corners should be solidly built of stone which will not be greatly affected by the elements. In order that corners will be conspicuous they should be built of material which is not found in the immediate vicinity.

Although an effective system of forest protection will be expensive and will run into a good sized sum of money, it is better to establish it as soon as possible than to have losses, every year, that will in a comparatively short time exceed the cost of an adequate system of protection for many years. This may be illustrated by a case in the Adirondack Mountains where, in 1903, fires involving a loss of \$3,500 entailed an additional expense of \$175,000 for fire fighting alone. If this amount had been used in carrying out a system of protection during the dangerous months the great loss would have been averted, and protection afforded for many years.

MANAGEMENT OF FOREST LANDS UNDER PRESENT FOREST CONDITIONS.

JAMES E. McNEAL, *Forester.*

Under various circumstances a forest may yield its best return in wood, bark, or other forest products, in money, or interest on the capital which it represents, but whichever of these ways of using a forest is chosen in any given case, the fundamental idea of forestry is that of making the forest yield the best service possible at present and in such a way that its usefulness in the future will not be diminished, but rather increased. A forest well managed under practical methods will yield a return in at least one of the ways just mentioned; but before it will be in condition to render the best service, there are four things which a forest must have.

These are,—

1. Protection, especially against fire and thieves; for without such protection no investment is secure and the most skillful management is of little effect.
2. A strong and abundant reproduction. Without this a forest will speedily die out.
3. A regular supply of mature trees to be cut.
4. The proper amount of growing space for each tree, in order that all trees may grow to the best advantage.

The first requirement in the management of any property is that its condition be known and recorded. Hence, in placing a tract of forest land under management a survey is necessary. The object of such a survey is to have maps showing,

1. Outside boundaries.
2. Roads, rivers, railroads, and other means of transportation.
3. Lines between different localities having different laws, or which come under different jurisdiction, as county and township lines. Interior tracts of forest land, and land upon which any rights are reserved.
4. Contour lines and configuration.
5. Differences of soil. Whether agricultural, forest, or unproductive.
6. Fire lanes.
7. Cleared land within the tract.
8. Types of forest.
9. Any special land marks which may be noted.

In connection with these maps there should be a general description of forest, climatic, and surrounding conditions, of possible dangers, of market and labor conditions, and of means of transportation.

After this work has been done and one knows the condition of the forest, a division may be made into lots and aggregation of lots into ranges. In Pennsylvania, where most of the State forest land is in mountainous districts, division lines should follow the configuration of the soil. Difference of soil or character of growth within lots gives rise to sublots.

A valuation survey should then be made, ascertaining amounts of standing timber, rate of growth on various sites, and determining capability of production and future yield in material and money.

All these preparations should be made before a plan of management is determined. After one knows what can be expected from the forest, general plans should be made for all time, and special plans for a period of from ten to twenty years. The length of rotation should be determined and amounts to be cut should be designated, stating lots to be cut, with view of obtaining favorable distribution of age classes. Thinnings should be made, and methods determined to be used in felling and culture.

DISPOSAL OF FIRE-KILLED TIMBER.

PAUL H. MULFORD, *Forester.*

A fire running through a forest often assumes proportions that cause great damage to the roots of trees, burning the humus and ground floor, often burning the roots themselves, thus leaving the

trees with few supports to withstand heavy winds. They are blown down and become a prey to fires which pass over that land again. Or the fire may burn away the bark of a tree, girdling it and leaving it standing a prey to injurious insects which are thus invited to and fostered in starting a breeding colony in these dying trees. Finally, finding no living tissue to feed upon, these insects go at once to the broken branch, or scarred trunk of a living tree, and proceed to start their work of destruction.

These two types of fire-killed trees we have to deal with largely on the reserves in this State. A method to dispose of them must be found. Standing or lying, they are a detriment to young growth, both by crowding and because of fire menace.

In the work of the U. S. Forest Service, it has been proved by many strength tests that fire-killed timber, for instance white pine, or fir, (Cir. No. 113, U. S. F. S.) is about twice as strong as green white fir; and that it is 9-10 as strong as kilndried timber where it has received the same treatment.

So there should be no hesitation in offering fire-killed timber as second-class lumber, and also as timber ready for preservative process. As the moisture has evaporated, there is no watery sap to act as a mechanical barrier to the entrance of the preservative. Green or unseasoned timber must be piled for several weeks before it is in proper condition for treatment, else it has to be subjected to several processes to season it artificially. Artificial seasoning is expensive and is liable to reduce the strength of the timber; therefore, sound fire-killed timber is really more valuable for preservative purposes than green. The dead timber being perfectly seasoned is more easily handled and cheaper to ship. Making the larger material salable for mining timbers, railroad ties, telephone poles, dimension stuff, and posts, which have a ready sale in our State, results in a double economy, the prevention of waste, and the saving of more valuable material for better uses.

The principal defect of fire-killed timber is check. This appears soon after the death of the tree, and apparently does not increase later. To prevent decay on the surface, fire-killed timber should be barked soon after it is killed. If the bark has been left on, the sapwood will be found somewhat decayed. Most of the conifers, and some hardwoods, will last a long time, if not lying flat on the ground.

In the west, especially in Colorado, where the mines of one city alone, Leadville, (Cir. No. 113, U. S. F. S) use each month 350 M.ft. B. M. of fire-killed timber for mine props, fire-killed timber is decidedly preferred to green timber because it is perfectly seasoned and light. In Denver, fire-killed timber has been used for a number of years for boxes and crates with excellent results, being odorless and not liable to shrink or warp.

Pennsylvania with its many mines and factories using great quantities of mine timber, boxes, pails, and baskets, in their operation, should be impressed with the value of this class of material, and thus create a market for large quantities of fire-killed timber.

On a part of the Stone Reserve, an area of about $3\frac{1}{2}$ acres, lie 25 M. ft. B. M. of fallen timber killed by fire. It stood for about two years only to be wind swept, and having no root system to hold it, fell. This is in a place six to eight miles from a railroad, and accessible only by a very poor trail road. One man made an offer to pay \$1.00 per M. feet for all logs sawed mill measure, 50 cents per M. for shingles, 50 cents per M. for lath, and 30 cents per M. for fence posts. This prospective buyer says "that by taking all fire-killed and down timber, there is still left a good profit at these rates." Another, a boss logger, not wishing to make a bid says "\$12.00 per M. can be safely paid for all the better stuff, and fire wood or charcoal be made of the inferior material."

Confining this subject to our own State, we must first realize that each reserve because of its geographical and geological position would be governed by its own peculiar conditions. The money consideration in the disposal of fire-killed timber in one case could hardly be used as an example for every other. However, having in mind the idea of advanced forestry, and the thought that fire-killed timber is a great detriment to growing trees, seedlings, and necessary undergrowth, as well as to the cause of forestry, its removal is warranted at an expense equal to its revenue. Personally, I believe that its removal is warranted at a cost in excess of its return value. Such a deficit is to be regarded a good investment on account of the improved conditions obtained in the then cleared and growing forest.

Again, with a careful system thoroughly thought out for each reserve and operated under good management, there will eventually be a return of revenue far above the expense, and plus this, give a clean forest, a practical object lesson in applied forestry, an opportunity to train unskilled labor, as well as create a force of local workers, breed a friendly instead of a hostile feeling to the cause of forestry, and last, but far from least, leave a general result that "He who runs may read."

Each reserve, with an idea of profit from fire-killed timber, must first cater to the need of its local market, and then create a market for the remainder of the product, the idea being to make the former bear the expense, and from the latter, the fragments, receive the clear gain or profits of the operation.

At my station, the Stone Reserve in Tioga county, from personal observation and information received from loggers, lumbermen, and local residents, it is believed the amount of fire-killed fallen timber warrants the erection of a model plant for the manufacture of lumber,

boxwood, paving blocks, crate wood, lath, shingles, baled shavings and sawdust, poles, fence posts, stakes, fire logs, cordwood, wood distillation, charcoal, wood ashes for lye and compost, acid wood butts, and pulp wood. All of these could be marketed in a local or foreign market at a profit on the total production.

Having three streams of sufficient volume to generate electrical power to operate such a plant, also to supply power to operate a pumping and watering system for the five acre nursery of the reserve, the installation of such a system would not be amiss.

Certain kinds of fire-killed timber can be disposed of to local buyers, as in the cases already mentioned, and some cordwood could be sold to those making their homes nearby, and at no cost of labor or material to the Department; but such sales will be slowly made, and the period to exhaust the thousands of cords of stove wood and the many thousands board feet of lumber in log form will be long, after which the real cleaning up must be done by the State. Until this is done the reserve is open to fire, being practically without trails or fire lanes, at the present time. With a plant as mentioned, or any other of value, and an organized working force fully equipped, the question of the disposal of local fire-killed timber will be quickly solved, leaving a benefit in wages, a better sentiment toward forestry, and a lasting benefit in the impression of its advantages.

Thus briefly are outlined my ideas of the very important question of the "Disposal of Fire-Killed Timber," on the Stone Reserve, a matter on which I have had too little time to go into minute detail. After careful consideration it is believed each acre of State land having such timber, can be successfully handled, leaving to the State a money profit and an improved acreage for reforestation. Of the opportunity afforded by the danger of fire-killed timber to improve the ranger service, its relation to the question of roads, fire lanes, and trails, and a regularly employed labor force, cannot be entered upon at this time. That fire-killed timber has a bearing on all these matters is well understood by those who have given the subject consideration.

Finally, with a sales division of the Forestry Department organized to study and ascertain the needs of every portion of this State or nearby states, many or all of these products and by-products of the reserves could be disposed of to advantage with permanent benefit to the Department of Forestry.

ROADS, FIRELANES, AND TRAILS ON THE RESERVES.

 JOHN L. WITHEROW, *Forester*.

Of all the branches of forestry, one that certainly deserves and requires our attention at present, is a system of forest roads, firelanes, and trails. Without these, forestry would be theoretical only.

A few reasons why:

1. They make reserves accessible and the removal of products possible.
2. They aid in the suppression of forest fires and insect depredations.
3. They may be made comparatively permanent.

A reserve road system should be laid out only after a careful study of the topography and market conditions of the reserve. It should not be built all at one time but rather developed gradually, and always fast enough to meet the demands of the increasing intensity of management.

An ideal road would be one which is perfectly level longitudinally, solid, smooth, and without curves, but we can only conceive of that just as we can an "Ideal Forest." In proportion to the number of these qualities that are lacking, so much less useful is that road.

The roads of a reserve should always be divided into two classes, main roads and minor roads.

Main roads should lead to the interior of the reserve and should be at least 16 feet wide, have a grade of five per cent. or less, and be made of stone.

Minor roads need not be so well built. They will connect main roads and also reach out from them into short valleys.

The old roads that we find on the reserve today were made for the purpose of removing forest products. On many of them travel was only one way, the empty wagons reaching the top by some other road much longer and less steep. On such roads the grade is so great that today they may be more properly called trails. They were laid out and built by men who knew little or nothing of engineering, but simply began and continued their work until their desired point was reached. Many of these roads are the best the locality would afford. Others should not be followed in our road building.

In all cases the route for a road should be surveyed in order to accomplish the best results from a given sum of money. Time spent on the survey must always mean both time and money saved on the construction of the road.

Not until a road is reduced to a five per cent. grade can it be called a good road, on account of the extra time and energy required for moving a load on it, and the great expense for maintenance.

It is the opinion of most men of authority, that the road that avoids the grade and is ten times longer, is the better road.

In laying out a road the survey should not be depended upon as the only guide. By every road the largest area possible should be made accessible.

Side drainage is as necessary, if not more so, on forest roads, as it is on roads running through cleared country, owing to the retentive nature of most forest soil. When building or repairing roads the camp should be moved as often as necessary to keep with the work. A working force of less than four men is unprofitable.

In our road building operations in Fulton county last year, we wanted a fair road up through a narrow valley seven miles long to serve both as a road and firelane in case of fire.

There was a road for three miles that was built over a hundred years ago for hauling out charcoal. We used it most of the distance except where grades could be avoided or the road straightened. A space seven feet wide was cut clear of everything on both sides for four miles. After this had been done, it was gone over, all rocks above the ground were removed, water turned off and holes filled up. This was done for \$18.00 per mile for labor. After it was completed we could drive from one end to the other in fifty-five minutes.

There are perhaps no other branches of forestry, unless it be protection or survey, on which money spent at present, would give as quick returns or equal results as on forest roads, provided they are built in the proper places, and not at too great an expense.

To open up good roads from the interior of a reserve out to settled country, and where they are not needed, would be wasting money, beside being a temptation to trespass. After roads have been built it is comparatively easy to calculate the money saved by considering the difference in cost of marketing forest products, or it may be represented by an increased stumpage value. At present we are taking out about 500 railroad ties in Perry county at a profit of at least twenty-three cents on each. Had it not been for a road running to market, the timber probably would have rotted on the ground, the distance being so great as to prevent the building of a road at present.

No forest road should ever be made less than eight feet wide. A narrower road will admit of only one track and a narrow space at each side for the water to collect.

The transverse slope of a narrow road should be one-half inch to a foot. On a wide road of, say twenty feet, this may be increased for if water has to run a distance of ten feet with a fall of five inches

it will run to the sides of the road very slowly. Steepness is the worst quality a road can have, as all other bad ones may result from it.

Water breaks are necessary on hills to turn off water. They should be made straight across the road, rather than diagonally, for when so made they are liable to break the couplings of heavy wagons.

It has been found by experience that stone roads built of three layers of stone of different sizes, prove most durable. The road bed should be level, solid, and free from roots and decayed wood. The largest stones are laid or thrown on it. On these a thin layer of smaller stones is put to fill up low places and to make it solid. The last layer should be fine dust and stones from a stone crusher. It should be of stones that contain cement such as lime stones. Such a road as this may be sprinkled and rolled or left for a year to settle before using.

A few facts worth remembering when building roads.

1. It is cheaper, quicker, and easier to remove large rocks by explosives than by hand.
2. Plenty of all kinds of tools, kept in good condition, lessens the cost of labor.
3. The laborers should never be left without instructions where to work. They will always find the wrong road.
4. A lazy man on the working crew is dear at any price.
5. Be boss yourself unless your advisors are more experienced.

All public roads on a reserve should be in charge of the Department of Forestry. The location of many of these will often be such that they should be main reserve roads. They cannot be so if township officers have the authority to repair them in any way they see fit.

Not until the annual two cent road tax is taken off forest reserves, and all the roads on the reserves built and maintained by the Department will it be satisfactory, to our side at least.

Firelanes.

Firelanes will serve only for the suppression of fires and diseases, and as boundaries of forest divisions.

They will likely always be necessary in Pennsylvania. The problems that interest us most are their cost, location, and width.

The expense of cutting firelanes will, in some cases, be reduced by the sale of the trees cut. Where old roads can be cut out and used for firelanes, the cost will be from \$10.00 to \$20.00 per mile. When made separate from roads they take up a large area from which no revenues can be had, and require frequent cleaning with money produced by the forest.

The width of firelanes will depend upon the species and its height through which the lane is cut, also the density of the stand and number of roads nearby. Their width in Pennsylvania will probably range from 10 to 25 feet.

Before laying out or cutting a system of firelanes on a reserve the general direction of winds should be noted, as the opening caused by some lanes may produce windfalls with certain species if the edge of the forest is directly exposed to the strong winds of the locality.

Sharp curves in narrow lanes will allow fire to cross. They should be avoided if possible.

For several years after being made they will have a tendency to grow shut. This they will lose as soon as the strength of the roots is exhausted. Firelanes should be of as uniform widths as possible and brush cut in the lane should not be piled up along the edges or pushed in between bushes, but should be thrown back over the brush, where it will decay sooner and not be blown back into the lane by every strong wind.

The entire boundary of all reserves should be a firelane of sufficient width to prevent fires from crossing. Reserve boundaries are often on the summit of mountains where growth is not dense or soil valuable for tree growth. These will allow lanes to be wider than elsewhere without any great loss of the working area of the reserve.

Most forest roads should also serve as a firelane by being cleared of all growth on each side, as far back as is necessary to make the whole opening of the proper width for a lane.

There are many reasons why firelanes should be made in connection with roads.

1. The expense for making and cleaning is less.
2. Floor space is saved allowing a larger working area which results in a higher normal yield.
3. The number of lanes that must be cut through the forest apart from roads will be fewer.
4. Travel will keep the road free from inflammable material.

Trails.

Trails may be necessary in many places on the reserve.

They should connect roads, or roads and streams, or may run from the nearest roads to fire towers. They take up little space and can be made and kept up at a small expense.

The loss that may be prevented by time saved on one trip over them in case of fire may be more than the original cost of such a trail.

They should be made sufficiently good to allow a horse to be led or ride quickly either way, or for water to be carried by a pack-saddle horse if they are in use on the reserve.

The only expense for maintenance will be for keeping off water.

Where a trail has been cut out in the middle by water, it usually retards travel so much that it is easier through the woods than on the trail. Their width and grade will vary as to their usefulness.

The necessity for roads, firelanes, and trails is so great that if they are neglected, Pennsylvania will fail to receive early revenues from her forests.



13
Commonwealth of Pennsylvania

DEPARTMENT OF FORESTRY

ROBERT S. CONKLIN, Commissioner of Forestry
in Cooperation With the
Forest Service, U. S. Department of Agriculture
HENRY S. GRAVES, Forester

Wood-Using Industries

OF PENNSYLVANIA

By ROGER E. SIMMONS,
United States Forest Service,
1912.



HARRISBURG, PA.
WM. STANLEY RAY, STATE PRINTER
1914

Commonwealth of Pennsylvania

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ROBERT S. COLLIER, Commissioner of Forestry

in cooperation with the

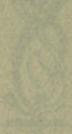
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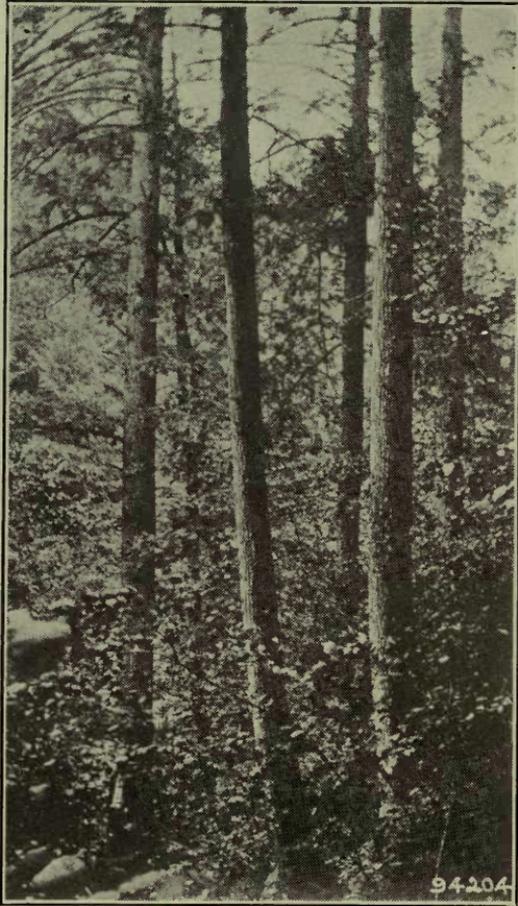


Fig. 1.—Virgin hemlock mixed with white pine in the Jack's Mountain Division of the Seven Mountains' State Forest. Shows types which Pennsylvania did and can produce.

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NOTICE

The study upon which this report is based was undertaken by the Department of Forestry of Pennsylvania in cooperation with the United States Forest Service, the work being done under the direction of Robert S. Conklin, Commissioner of Forestry of Pennsylvania, and O. T. Swan, in charge Office of Industrial Investigations, United States Department of Agriculture. The statistics were compiled from data collected in the summer of 1912, covering a period of one year from July 1, 1911 to June 30, 1912, inclusive.

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WOOD-USING INDUSTRIES OF PENNSYLVANIA

INTRODUCTION.

In the work of practical forestry, Pennsylvania is a leading State and bears this distinction as a result of the development and operation of an effective State-wide policy. To this Commonwealth also properly belongs the credit of being the cradle of American forestry. When William Penn made the well known provision in the Charter of Rights, that for every five acres cleared one should be left in woods, the seed of forestry was first sown. Following this, as early as 1700, the proprietary Government enacted forest fire laws, and from that time to the present, State Legislatures have debated upon and passed similar enactments. Popular sentiment favoring the practice of forestry by the State, grew steadily from the beginning, but in the past 20 years it has developed with remarkable rapidity. Directing this educational propaganda were men who have since gained prominence and who stand high among those recognized as authorities pertaining to forestry subjects.

Naturally, much has been written and said on all phases of forest conservation and improvement in Pennsylvania. In the discussions, the economic importance of forests, aside from the collateral values they are regarded as possessing, has been reckoned usually in terms of production of the rougher forest products, such as lumber, lath, shingles, crossties, cooperage stock, telegraph poles, fence posts, mine timbers, cordwood for fuel and distillation purposes. The commercial gain that comes to the State through the millions of feet of lumber that the forests supply through their conversion into such finished commodities as vehicles, boxes, handles, novelties, has always been recognized; but reference thereto has been made only in a casual manner as the detailed data have not heretofore been available. It is a well established fact that the cutting and shipping away of lumber and other forest materials like pulp wood, cooperage stock, chemical wood, etc., is not as permanent a commercial and industrial gain as when those materials find a home market and are held for the manufacture of finished articles within the State, but to what extent this development has taken place in Pennsylvania, no previous investigation has ever attempted to ascertain. This study has been projected, therefore, with this special view, and of outlining the relations of the wood-consuming industries to the growing forests, as well as of collecting information respecting wood uses and factory waste.

The information presented in this report covers the period of twelve months, prior to July, 1912. It was gathered in the late summer and fall of that year by the Department of Forestry of Pennsylvania, and by the Forest Service, United States Department of Agriculture, working under a cooperative agreement. The information was solicited from the manufacturers, not only from those producing complete wooden commodities, but from those making wooden parts of products, axe handles, brush blocks, and piano cases, for example; those factories that use lumber as a means of manufacturing other commodities, like patterns and flasks in foundry work, and factories of all kinds that require lumber in the marketing of their wares by manufacturing their own boxes and crates. The names and locations of all manufacturers were obtained through the assistance of the postmasters in the

State, and the thoroughness and accuracy of this report were made possible by the kind co-operation of the wood users in giving detailed information as to their individual operations. Report blanks were mailed to each, with the request that they be filled in and returned. After a time, agents representing Pennsylvania and the Federal Government were sent throughout the State to visit factories which had failed to report, and more particularly to study at close range processes of manufacture, waste problems, and industrial conditions. On completion of the field work, in accordance with agreement, the data were compiled and the report written by the office of Industrial Investigations of the Forest Service, whereupon the manuscript was turned over to the Pennsylvania Department of Forestry for revision and publication.

For a number of years the Federal Government has kept a record of the annual production of rough lumber and other forest products by States, and for the last seventeen years the State has been gathering similar statistics for Pennsylvania. These reports should not be confused with the present investigation, which in no way concerns the output of sawmills, except in a supplemental capacity. This investigation relates to the rough lumber after it leaves the sawmills and to the bolts and billets after they leave the woods, tracing them through different channels into commodities of final manufacture. It is not the purpose of this study to record the total quantity of wood used annually in the State. Much of it, in the form of rough lumber, goes into construction, which needs no other change than cutting or trimming the timbers, planks, or boards, to fit them into place in the house, bridge, tunnel, concrete forms, scaffolding, fences, etc. This material has not been taken into account and neither have the large quantities of dressed lumber which are brought into the State in the form of flooring, siding and ceiling, finished and ready for use. In addition there are parts of products made in other states and sent into Pennsylvania merely to be assembled; vehicle parts and box shooks are examples; also there are commodities partly manufactured, like club turned handles, spokes, rough bobbins and speeders, chair stock, etc., that have not been included in Pennsylvania but accredited to states in which the principal operations that change the forest material into the finished articles occur.

PURPOSE OF THE STUDY.

The Pennsylvania investigation has been conducted under the same plan as that followed by the Forest Service in 30 other states. Eventually, the information from all the states will be correlated in a national study and a series of publications issued by the Federal Government relating to the wood-using industries and the commercial woods of the United States.

Every factory was asked to state the amount of each species used, the commodity into which each was made, the form in which it was received, and whether these woods came from within Pennsylvania or from outside the State. Inquiries referred also to tendencies of manufacture, closer utilization, and methods followed for waste utilization. As stated above, no data were solicited from sawmills or those producing veneer, laths, shingles, crosssties, cooperage, stock, posts, telegraph poles, chemical wood, pulp wood, etc. This information for all the States has been kept and reported annually by the Bureau of the Census, and such of these statistics as relate to Pennsylvania, appear in the appendix of this report; they were taken from the census bulletins issued for 1911-1912. Apart from the concerns producing the above named rough forest products, there are scattered throughout Pennsylvania nearly 5,100 factories that take wood and convert it into articles

of final form. These have been separated into classes or industries, and as much as possible of the data which they represent has been similarly arranged and is presented in this report in tabular form.

The question of the disposal of that part of the rough lumber cut going into the various channels of manufacturer is answered by this report and by the others of this series. For instance, the furniture woods are grouped together in the order of their importance as to amount consumed and in the same way is presented the species demanded for the making of other chief commodities, like chairs, vehicles, refrigerators, matches, farm implements, sporting goods, etc.

The Pennsylvania Department of Forestry and the United States Forest Service are constantly receiving inquiries from points throughout this and nearby states concerning markets for various kinds of timber and lumber, and are called on for data on practical uses of wood and for suggestions and advice on possible solutions of waste problems. This report will answer many of these questions. The farmer, the timber owner, and the sawmill man are aided in selling their material by having the information of the kinds of wood the manufacturers demand and of the forms and prices applying to their purchase. The manufacturers in turn are benefited in these added opportunities for buying raw material and in the suggestions offered for finding in the waste of another factory suitable materials for making their own wares. The report may also suggest to manufacturers possible substitutes of cheaper woods for the more costly ones that are being used, besides pointing out the chief regional sources from which the industries procure their raw material. Dealers in wooden products throughout the country can learn what the Pennsylvania manufacturers have to sell, while those outside of Pennsylvania who desire to dispose of their lumber or wood in other forms can find what the manufacturers demand.

To illustrate the use of this bulletin for reference, suppose information is requested concerning the raw material the handle makers demand. On page 96 appears Table 59, giving the list of handle woods, the prices and amounts of each, and other pertinent information, while in the directory appended to this report, grouped also by industries, appear the names and addresses of the handle manufacturers buying these woods, page 186. Again, suppose information is needed as to what uses are made of ash, with a view of selling to the best advantage. By first turning to the list of uses on pages 145, 146, one can find all commodities made in the State for which the manufacturers demand ash. Should interest be attracted to the use of this wood in the form of lumber, say for passenger cars, by means of the table of contents the industry table embracing prices f. o. b. factory and other data referring to car building material is quickly found. Then by turning to the names of car builders in the directory, all preliminary information is at hand relating to the conditions of marketing this material with the factories engaged in the industry.

FOREST CONDITIONS.

The earliest settlements were naturally in the hardwood regions of the eastern part of the State, where were found extensive forests of various species of oak and hickory. Chestnut, yellow poplar, black walnut, elm, white ash, basswood, and other valuable trees were also common and often attained large size. In the southern tier of counties were magnificent forests, mostly of deciduous growth similar to those in the eastern part of the State. Probably in no region of the United States were there finer hardwoods than here, and magnificent specimens still standing confirm this

presumption and make one realize the almost inconceivable wealth Pennsylvania had in her timber lands. West of the Allegheny River the prevailing timber was largely hardwoods, similar to those in eastern Pennsylvania; but in the central and northeastern parts of the State, in the mountains, is the home of the cone bearing trees, the pine and the hemlock. With these, especially in the northern counties, were associated beech, birches, sugar maple, ashes, the black cherry, and scattered stands of other hardwoods. At first there was an exceedingly limited market for timber, and the gigantic trees that constituted the forests proved a hindrance rather than an asset. The same destructive method of cutting them and rolling the logs together to be burned was pursued in Pennsylvania, with the same zest as in other timbered states. Even the older living citizens recollect the custom of removing timber by fire from ground which was to be used for agricultural pursuits. Farm land was needed above all, but the unabated desire to clear away the timber was not limited to areas suitable for cropping but was extended into thousands of acres that have since been abandoned, after being denuded, as unsuitable for profitable farming.

In the days of the early settlers of Pennsylvania, there was practically no market for hardwoods aside from what was required for local use. In comparison with the demand for softwoods to meet the needs for buildings and other structural purposes, the call for hardwoods was very limited. White pine was then regarded as the principal and only desirable lumber, and was the first in demand when the exploitation of the Pennsylvania forests began. Large rafts of pine logs were floated down the Susquehanna River and its tributaries as these streams drained a region abounding in the growth of this wood. About this period, large quantities of timber were sacrificed for the bark, which was peeled for tanning purposes; the logs being left in the woods to rot and burn. Not long after eastern woods had begun to be felled, similar activities were started in the forests of the far western part of the State. Here the Allegheny and Monongahela Rivers afforded the means of rafting large quantities of timber from that part, which, after being manufactured into lumber, was taken to market by water through the Ohio and Mississippi Rivers. The introduction of railroads extended the lumber industry inland, remote from the rivers, where the finest developed stands of conifers and hardwoods were abundant. After the great demand for white pine had considerably increased its price, hemlock began to attract attention. Though at first considered an inferior lumber, this prejudice soon faded away and Pennsylvania was destined to meet a constantly increasing demand for this species and has since been among the three States leading in hemlock products.

The marketing of the stands of magnificent hardwood forests which had to give way to provide room for agriculture and homes for farmers, was for many years an important economic problem in this State. There was little demand for this kind of timber abroad and still less in any of the other States. This presented the situation that if the hardwoods were to be exploited at all, it would be necessary to develop a market at home, by the establishment of factories like those concerned in this report, which would consume this material for making various manufactured products. These wood-working industries though prosperous, developed gradually at the outset. Later they not only rapidly increased in number, but grew to substantial proportions and contributed largely to the industrial expansion which gave Pennsylvania probably her early recognition as one of the leading manufacturing states. The products turned out by these industries not only

found markets in other states, but were demanded as important articles for export to European cities.

IMPORTANCE OF MANUFACTURING.

Besides the forests, the other natural resources of the State—coal, petroleum, gas, ore, stone, clay, and rich productive soil—have also influenced the starting and growth of particular industries. These resources, with the further advantages Pennsylvania offers through its harbors and waterways, and a network of railway systems, making raw material accessible and products easily marketed, have gained for Pennsylvania a commercial prestige surpassed by only one other state.

In the report of the 13th Census, taken in 1910, the Federal Government shows the valuable farm products taken from Pennsylvania in 1909 to approximate nearly 166 $\frac{3}{4}$ million dollars; the value of mineral products, including the output of mines, wells, and quarries, amounted to 226 $\frac{1}{2}$ million dollars; while for the same period the factories, 27,563 in number, gave an added value to raw material of nearly 1 $\frac{1}{2}$ billions dollars. Manufacturing then is preeminently the first of Pennsylvania industries.

The wood-using industries, with which this report deals, constitute one of the important classes of the State's manufacturing enterprises. The value of the commodities turned out by them, together with that of the rough forest products produced, such as crossties, telegraph poles, etc., annually approximate \$100,000,000. Although this is small compared to the production of factories using iron and steel, it is next in importance and indicates clearly the part that forests and their affiliated industries have and are still taking in the commercial development of the State. The capitalization of these wood factories amounts to over \$63,000,000, and they give employment to nearly 100,000 wage earners, many of whom are skilled mechanics. It is known that the continued operation of these industries depends upon the future timber supply. And equally obvious is the fact that if these factories have to shut down and move closer to other timber producing regions, the result will be general industrial depression and loss.

FUTURE TIMBER SUPPLY.

For more than fifty years lumbering has been actively carried on in Pennsylvania, and has been especially active for the past twenty-five years. Valuable scattered tracts of old growth hemlock and hardwood timber are still to be found in the State, but they represent only a small percentage of its wooded area and before many years pass they will be consumed. It is, therefore, recognized that the second-growth forests will have to be depended upon to meet the demands of the manufacturer, and this can only be made possible by the practice of forestry, according to a definite State-wide policy similar to that which this State has already inaugurated.

Studies by the Pennsylvania Department of Forestry of forest conditions in the State, have pointed out vast areas like that contained in the State forests already established, that are better suited to forest growth than for agriculture. A large portion of these areas has a forest cover of valuable young trees in situations most conducive to their rapid growth. By the same practical and systematic management which is now being followed on the established forests, all of these lands can probably not only maintain the present lumber output of the State, but increase the production in a comparatively short time. In other words, the State, by looking to the future timber supply, can continue her three fold industry of growing timber, cutting it into lumber, and making it into commodities.

SCOPE OF THE STUDY.

This report is divided into three parts. Part I relates to the species of wood used by the wood-working factories in Pennsylvania, independent of their particular uses and the factories purchasing them. There is a general discussion of each wood, its range, and importance in the State as a lumber tree, the proportion of the amount used grown within the State, and a brief though particular enumeration of the properties of the wood. Uses are referred to only in a general sense by calling attention to the industries reporting the wood in large quantities.

Part II concerns the wood-using factories of Pennsylvania which have been divided into industries according to products manufactured. Following this is a discussion of individual industries, referring to the products manufactured, processes of manufacturing, woods demanded, and the principal qualities determining their use. In a majority of cases, the most suitable wood for each particular purpose is known, but the second best of the available kinds is pointed out where possible, and in this way, as well as in others previously mentioned, the report will prove valuable to wood users.

Part III is a summary of wood uses, independent of any industry classification or statistical data. In compiling this list, the Forest Service endeavored to arrange it to include every wooden commodity manufactured in Pennsylvania. It constitutes the most nearly complete compendium of uses of wood that has ever been arranged, and will be of particular value for reference. Part III further includes the directory of the names and addresses of manufacturers, grouped according to industries, who supplied the information contained in this report. The appendix presents data pertaining to Pennsylvania taken from reports of the Bureau of Census, United States Department of Commerce.

PART I.

KINDS OF WOOD.

A summary of the kinds of wood consumed in Pennsylvania manufacture, together with the cost, total quantity, and average price are presented in Table I following. Seventy-two kinds of wood were used within the State in the year 1911-12. White pine heads the list, representing nearly 14½% of the total, but had longleaf, loblolly, and shortleaf pine been grouped under the term "southern yellow pine" it would have stood first in the list, and in amount equal to more than ¼ of the total consumption.

It is interesting to know that the consumption of lumber in Pennsylvania exceeds the production. In 1912 the lumber cut by the State was 992,180,000 feet while the quantity consumed by the wood-using factories was 1,114,000,000 feet. Of the quantity used, 313,683,000 feet or 28% was accredited to the State, leaving 800,536,000 feet as coming from the forests of other States and from foreign countries. Cost is the principal consideration with the manufacturer purchasing raw material and the fact that his own State produces the same kind of lumber that he uses is of little consideration unless that material be the cheapest and readily and conveniently procured. That only a little more than one-fourth of the State's lumber production is consumed in factories within the State suggests a probable duplication in distribution that does not tend to economy. This condition is worthy of consideration by both lumber consumers and lumber producers, and when generally understood, can, through the medium of the regular trade agencies, be considerably improved.

So far as possible in this study, the data were presented by species rather than by genus in order to enable one more easily to study uses according to inherent properties. It is of far greater value to know that a wood is white oak, yellow poplar, or sugar maple than to have merely the generic name, oak, poplar, or maple. Owing to the many difficulties encountered this effort was but partially successful and was followed only to the extent warranted by the information furnished by the manufacturers and by general information as the particular uses of woods or the location where they were cut.

The southern states, and next to them the Lake states, contribute more of the shipped-in material than any other lumber producing region. Shipments of white pine, sugar maple, beech, birch, ash and elm were reported as originating in the Lake region. The largest part of the shipped-in supply of oak, yellow poplar, hickory, chestnut, and sycamore came from the forests of West Virginia, Maryland, Kentucky, and Tennessee, included within the hardwood region. Canada contributed a larger amount of wood but not as many kinds as the region embracing New York and the New England states, while the Pacific coast states sent a supply of six woods that aggregated nearly 10,000,000 feet. That such a large amount should have been brought over so great a distance to meet the demands of the Pennsylvania wood-users is significant of the growing scarcity of native eastern soft-woods.

Table 1.—Summary of kinds of wood used in Pennsylvania, year ending June, 1912.

Kind of Wood.		Quantity Used.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.
Common Name.	Botanical Name.	Feet b. m.	Per cent.		
White pine,	<i>Pinus Strobus</i>	160,749,759	14.43	\$31 55	\$5,071,607
Shortleaf pine,	<i>Pinus echinata</i> ,	149,744,213	13.44	23 34	3,494,950
Longleaf pine,	<i>Pinus palustris</i> ,	108,577,308	9.75	31 71	3,443,246
White oak,	<i>Quercus alba</i> ,	98,190,060	8.81	34 00	3,338,005
Red oak,	<i>Quercus rubra</i> ,	83,837,570	7.52	30 94	2,593,836
Yellow poplar,	<i>Liriodendron tulipifera</i> ,	56,720,991	5.09	32 62	1,850,151
Sugar maple,	<i>Acer saccharum</i> ,	54,955,805	4.93	22 29	1,225,049
Chestnut,	<i>Castanea dentata</i> ,	51,326,097	4.61	25 23	1,294,609
Loblolly pine,	<i>Pinus taeda</i> ,	51,241,544	4.60	19 91	1,020,167
Hemlock,	<i>Tsuga canadensis</i> ,	43,027,872	3.86	20 60	886,201
Beech,	<i>Fagus atropunicea (F. grandifolia)</i> ,	40,244,300	3.61	17 42	701,244
Cypress (bald),	<i>Taxodium distichum</i> ,	23,195,290	2.08	38 94	903,285
Red gum,	<i>Liquidambar styraciflua</i> ,	22,865,144	2.05	22 78	520,842
Spruce,	<i>Picea species</i> ,	20,539,028	1.84	21 34	438,216
Basswood,	<i>Tilia americana</i> ,	18,698,836	1.68	29 53	552,118
Birch,	<i>Betula species</i> ,	18,635,582	1.67	28 05	522,774
Hickory,	<i>Hicoria species=(Carya species)</i>	17,853,255	1.60	40 59	724,635
Ash,	<i>Fraxinus species</i> ,	14,304,627	1.28	44 02	629,752
Pitch pine,	<i>Pinus rigida</i> ,	10,630,700	.95	18 07	192,084
White elm,	<i>Ulmus americana</i> ,	9,708,643	.87	27 61	268,014
Cottonwood,	<i>Populus deltoides</i> ,	6,335,850	.57	26 66	168,938
Cotton gum,	<i>Nyssa aquatica</i> ,	5,957,687	.54	32 29	192,350
Spanish cedar,	<i>Cedrela odorata</i> ,	5,812,660	.52	112 98	656,435
Red and silver maple,	<i>Acer rubrum and Acer saccharinum</i> ,	5,711,275	.51	21 66	123,690
Black gum,	<i>Nyssa sylvatica</i> ,	4,957,160	.45	19 35	95,923
Southern white cedar,	<i>Chamaecyparis thyoides</i> ,	3,737,300	.34	41 74	155,986
Mahogany,	<i>Swietenia mahagoni</i> ,	3,650,254	.33	122 29	450,064
Douglas fir,	<i>Pseudotsuga taxifolia</i> ,	3,364,138	.30	43 19	145,296
Western white pine,	<i>Pinus monticola</i> ,	3,070,500	.28	40 22	123,496
Cherry (black),	<i>Prunus serotina</i> ,	2,723,493	.24	39 73	108,191
Scrub pine,	<i>Pinus virginiana</i> ,	2,386,095	.21	19 10	45,557
Norway pine,	<i>Pinus resinosa</i> ,	2,327,340	.21	28 74	66,897
Sugar pine,	<i>Pinus lambertiana</i> ,	1,213,700	.11	50 53	61,323
Red cedar,	<i>Juniperus virginiana</i> ,	878,500	.08	56 29	49,454
Western yellow pine,	<i>Pinus ponderosa</i> ,	830,000	.07	26 06	21,630
Black walnut,	<i>Juglans nigra</i> ,	782,615	.07	72 94	57,085
Sycamore,	<i>Platanus occidentalis</i> ,	697,073	.06	28 73	20,030
Cork elm,	<i>Ulmus racemosa</i> ,	672,200	.06	32 88	22,982
Hornbeam,	<i>Ostrya virginiana</i> ,	547,184	.05	43 83	23,105
Locust (black),	<i>Robinia pseudacacia=(R. Pseudo-Accacia)</i> ,	505,850	.05	22 93	11,601
Redwood,	<i>Sequoia sempervirens</i> ,	505,682	.05	50 36	25,464
Western hemlock,	<i>Tsuga heterophylla</i> ,	500,000	.05	20 00	10,000
Cucumber,	<i>Magnolia acuminata</i> ,	351,400	.03	24 73	8,691
Yellow buckeye,	<i>Aesculus octandra</i> ,	324,200	.03	25 19	8,168
Appplewood,	<i>Pyrus species</i> ,	172,435	.02	48 84	8,422
Dogwood,	<i>Cornus florida</i> ,	164,137	.01	22 59	3,708
Ebony,	<i>Diospyros species</i> ,	134,777	.01	188 18	25,363
Persimmon,	<i>Diospyros virginiana</i> ,	113,010	.01	58 92	6,659
Circassian walnut,	<i>Juglans regia</i> ,	108,140	.01	340 45	36,816
Butternut,	<i>Juglans cinerea</i> ,	86,810	.01	33 72	2,927
French briar,	<i>Erica species</i> ,	81,800	.01	351 34	28,740
Teak,	<i>Tectona grandis</i> ,	65,590	.01	191 95	12,590
Holly (American),	<i>Ilex opaca</i> ,	61,000	.01	89 10	6,045
Congo,	<i>Diospyros species</i> ,	60,000	.01	133 00	8,000
Western red cedar,	<i>Thuja plicata</i> ,	55,000	.01	39 09	2,150

Table 1.—Summary of kinds of wood used in Pennsylvania, year ending June, 1912—Continued.

Kind of Wood.		Quantity Used.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.
Common Name.	Botanical Name.	Feet b. m.	Per cent.		
Tamarack,	<i>Larix laricina</i> ,	40,300	*	28 81	1,161
Balsam fir,	<i>Abies balsamea</i> ,	40,000	*	45 50	1,820
Boxwood,	<i>Tabebuia pentaphylla and Buzus sempervirens</i>	32,416	*	298 90	9,689
Aspen (popple),	<i>Populus tremuloides</i> ,	30,000	*	15 00	450
Willow (black),	<i>Salix nigra</i> ,	25,000	*	13 00	325
Sitka spruce,	<i>Picea sitchensis</i>	15,000	*	35 40	531
Rosewood,	<i>Dalbergia species</i> ,	6,185	*	462 89	2,863
Eucalyptus,	<i>Eucalyptus species</i> ,	5,000	*	260 00	1,300
Lignum-vitae,	<i>Guajacum officinale</i> ,	2,050	*	175 61	360
Mountain laurel,	<i>Kalmia latifolia</i> ,	1,000	*	40 00	40
Sumach,	<i>Rhus hirta (R. typhina)</i> ,	500	*	80 00	40
Olive wood,	<i>Olea europea</i> ,	480	*	81 25	39
Satinwood,	<i>Chloroxylon swietenia</i> ,	120	*	200 00	24
Sassafras,	<i>Sassafras sassafras (S variifolium)</i> .	50	*	25 00	1
Wechsel roots,	<i>Prunus mahaleb</i> ,	30	*	540 00	16
Sarbo, .....	.....	30	*	200 00	6
Doncella,	<i>Byrsonima spicata</i> ,	10	*	100 00	1
Total, .....	.....	1,114,219,650	100.00	\$29 15	\$32,483,227

Reeds,24,000 lbs.
Rattan, 2,000 lbs.

*Less than 1-100 of 1 per cent.

Under the heading "Kind of Wood" the above table shows two separate lists of names. In the first column appear the names of the several woods as they are known to the trade, called common names. The scientific names which the botanists use to distinguish species are shown in the second column. In this and similar State reports, it has been the purpose of the Forest Service to call woods by their proper name with a view of standardizing nomenclature. Common names vary considerably according to locality but botanists as a rule are in agreement as to the scientific names. There are exceptions to this and among those shown in the above table are hickory, beech, locust, and sassafras. It will be noted that two botanical names are given for these woods. The first set is used by the Forest Service as given in the publication issued by the Federal Government entitled "The Check List of the Forest Trees of the United States." The second set is from the seventh edition of Gray's Botany which is used as a standard by the Pennsylvania Department of Forestry.

Thirteen of the species shown in the above table are foreign woods, the most prominent being Spanish cedar, and mahogany, followed by ebony and teak. Those accustomed to purchasing foreign woods in the form of logs, flitches, or lumber may regard the average cost of these woods as excessive. This is because a part of the supply of these woods is purchased in the form of thin veneer which, in order to be included in the tables of this report, was reduced to feet board measure with no allowance for waste or the cost of production.

THE WOODS GROWN IN PENNSYLVANIA.

Of the seventy-two woods which the manufacturers reported using, the entire amount of only six was home grown. These were aspen, (or popple), mountain laurel, sometimes called kalmia, black locust, sassafras, sumach and willow. The forests in the State also furnished a part of the supply of thirty-six other woods, making an aggregate of State-grown material used equal to a little more than 28% of the total consumption.

Instead of arranging the woods in the order of the quantity consumed, as in Table 1, they are shown in Table 2 alphabetically according to their generic names. This arrangement throws together consecutively the birches, the cedars, the oaks, the maples, and the pines, and allows an easy comparison of amounts of each species used, and if desired, an aggregate of any of them can be made readily. For a more convenient comparison of the home-grown woods with those grown out of the State, not only the quantities of these two classes are given for each species but also the per cent. which each class represents.

Table 2.—Summary of State-grown and shipped-in wood used in Pennsylvania, year ending June, 1912.

Kind of Wood.	Grown in Pennsylvania.		Grown Out of Pennsylvania.		Total.
	Quantity Feet b. m.	Per cent.	Quantity Feet b. m.	Per cent.	
Applewood,	87,435	56.71	85,000	49.29	172,435
Ash,	6,568,952	45.92	7,735,675	54.08	14,304,627
Aspen (popple),	30,000	100.00	.....	.....	30,000
Balsam fir, .....	.....	.....	40,000	100.00	40,000
Basswood,	7,933,764	42.43	10,765,072	57.57	18,698,836
Beech,	27,556,900	68.47	12,687,400	31.53	40,244,300
Birch,	9,326,614	52.73	8,808,968	47.27	18,635,582
Boxwood, .....	.....	.....	32,416	100.00	32,416
Buckeye, yellow,	184,000	56.76	140,200	43.24	324,200
Butternut,	79,500	91.58	7,310	8.42	86,810
Cedar, red,	17,500	1.99	861,000	98.01	878,500
Cedar, southern white, .....	.....	.....	3,737,300	100.00	3,737,300
Cedar, western red, .....	.....	.....	55,000	100.00	55,000
Cherry, black,	1,802,880	66.29	920,613	33.80	2,723,493
Chestnut,	22,479,333	43.80	28,846,764	56.20	51,326,097
Congo, .....	.....	.....	60,000	100.00	60,000
Cottonwood,	88,500	1.40	6,247,350	98.60	6,335,850
Cucumber,	235,600	67.05	115,800	32.95	351,400
Cypress (bald), .....	.....	.....	23,195,290	100.00	23,195,290
Dogwood,	140,122	85.37	24,015	14.63	164,137
Doncella, .....	.....	.....	10	100.00	10
Douglas fir, .....	.....	.....	3,364,138	100.00	3,364,138
Ebony, .....	.....	.....	134,777	100.00	134,777
Elm, cork,	154,600	23.00	517,600	77.00	672,200
Elm, white,	846,300	8.72	8,862,343	91.28	9,708,643
Eucalyptus, .....	.....	.....	5,000	100.00	5,000
French briar, .....	.....	.....	81,800	100.00	81,800
Gum, black,	272,716	5.50	4,684,444	94.50	4,957,160
Gum, cotton, .....	.....	.....	5,957,687	100.00	5,957,687
Hemlock,	31,217,942	72.55	11,809,930	27.45	43,027,872
Hemlock, western, .....	.....	.....	500,000	100.00	500,000
Hickory,	3,367,596	46.87	9,485,659	53.13	17,853,255
Holly, American, .....	.....	.....	61,000	100.00	61,000
Hornbeam,	397,184	72.59	150,000	27.41	547,184
Laurel, mountain,	1,000	100.00	.....	.....	1,000

Table 2.—Summary of State-grown and shipped-in wood used in Pennsylvania, year ending June, 1912—Continued.

Kind of Wood.	Grown in Pennsylvania.		Grown Out of Pennsylvania.		Total.
	Quantity Feet b. m.	Per cent.	Quantity Feet b. m.	Per cent.	
Lignum vitae, .....	.....	.....	2,050	100.00	2,050
Locust, black,	505,850	100.00	.....	.....	505,850
Mahogany, .....	.....	.....	3,680,254	100.00	3,680,254
Maple, red and silver,	3,073,275	53.81	2,638,000	46.19	5,711,275
Maple, sugar,	35,482,200	64.56	19,473,605	35.44	54,955,805
Oak, red,	25,681,362	30.63	58,156,208	69.37	83,837,570
Oak, white,	41,536,349	42.30	56,653,711	57.70	98,190,060
Olivewood, .....	.....	.....	480	100.00	480
Persimmon, .....	.....	.....	113,010	100.00	113,010
Pine, loblolly, .....	.....	.....	51,241,544	100.00	51,241,544
Pine, longleaf, .....	.....	.....	108,577,308	100.00	108,577,308
Pine, Norway,	25,000	.....	2,302,340	.....	2,327,340
Pine, pitch,	4,432,200	41.69	2,138,500	58.31	10,630,700
Pine, scrub,	105,500	4.43	2,280,595	95.58	2,386,095
Pine, shortleaf,	10,000	.01	149,734,213	99.99	149,744,213
Pine, sugar, .....	.....	.....	1,213,700	100.00	1,213,700
Pine, western white, .....	.....	.....	3,070,500	100.00	3,070,500
Pine, western yellow, .....	.....	.....	830,000	100.00	830,000
Pine, white,	69,236,764	43.07	91,512,995	56.93	160,749,759
Red gum,	5,500	.03	22,859,644	99.98	22,865,144
Redwood, .....	.....	.....	505,682	100.00	505,682
Rosewood, .....	.....	.....	6,185	100.00	6,185
Sassafras,	50	100.00	.....	.....	50
Satinwood, .....	.....	.....	120	100.00	120
Sarbo, .....	.....	.....	30	100.00	30
Spanish cedar, .....	.....	.....	5,812,660	100.00	5,812,660
Spruce,	1,786,400	8.70	18,752,628	91.30	20,539,028
Spruce, Sitka, .....	.....	.....	15,000	100.00	15,000
Sumach,	500	100.00	.....	.....	500
Sycamore,	31,603	4.53	665,470	95.47	697,073
Tamarack,	300	.74	40,000	99.26	40,300
Teak, .....	.....	.....	65,590	100.00	65,590
Walnut, black,	443,705	56.70	338,910	43.30	782,615
Walnut, Circassian, .....	.....	.....	108,140	100.00	108,140
Welchsel roots, .....	.....	.....	30	100.00	30
Willow, black,	25,000	100.00	.....	.....	25,000
Yellow poplar,	13,013,636	22.94	43,707,353	77.06	56,720,991
Total,	313,683,632	28.15	800,536,018	71.85	1,114,219,650

SPECIFIC DESCRIPTIONS.

Notwithstanding the very general substitution of other materials like concrete, metals, stone, and clay for wood there is no clear indication that the call for lumber and other forest products is decreasing at this time. With the opening of the Panama Canal and the changing conditions which are constantly taking place in trade, it is difficult to predict what the future will bring forth. As it is there is a large demand for lumber of all kinds and especially for the better grades of native woods. If there were an inexhaustible supply of timber now as there appeared to be fifty years or more ago, there would be less reason for making a study of this kind; but on account of the growing shortage of commercial timber it is most important that investigations be made to determine the qualities of woods that best fit them for a particular use. With this in view, this section of the report has been devoted to a brief account of the several woods used by the manufacturers.

In dealing with the properties of woods in the following paragraphs, a graded set of terms, such as hard, very hard, fairly hard, soft, very soft, etc., is used. These terms of course indicate an approximate scale and apply only to the average run of woods, as many conditions governing the growth of the tree affect materially the structure of the wood so that the same kind appears to have slightly different qualities. Generally the scale of terms used will serve to give a fairly clear idea of the properties of woods. To prevent confusion in their application, efforts have been made not to use them too loosely. The schedule setting forth the terms showing the relative gradations to which all descriptions of qualities conform will be found on page 60. By reference to this schedule the properties of the woods described may readily be studied and compared.

Lumbermen divide woods into two general classes, hardwoods and softwoods. This classification is not based so much upon the qualities of hardness and softness as upon distinction which custom has standardized because it is practical and holds true generally. Hardwoods are trees with broad leaves, while the softwoods have the needle leaf.

THE SOFTWOODS.

There are nineteen species of conifers going into final manufacture in Pennsylvania. Ten of them are pines, constituting nearly fifty per cent. of the total consumption, and of these the supply of seven is obtained entirely from other states, and of the three home-grown species, scrub and pitch pine are required in relatively small amounts, leaving white pine the foremost softwood representative of the Pennsylvania forests. Pine lumber is generally admitted to be the most valuable wood that the earth produces and the species that are used in Pennsylvania together with the other softwoods are described in the order of quantity as follows:

PINES.

White Pine (Pinus Strobus).

White pine was the first lumber tree in Pennsylvania that attracted the attention of the lumbermen. It was not found in this State in thick stands of vast areas like the white pine in the Lake regions and parts of New England, but it grew plentifully in various parts of the State. The trees were generally of large development, and in the early years of lumbering, Pennsylvania trees contributed a large proportion of the total white pine cut of the country. In 1880 the estimated cut of white pine in Pennsylvania amounted to 380,000,000 feet, in 1900, 221,000,000 feet, and in 1910 only 92,000,000 feet. In a few localities the remnants of the original stands are still being cut and here and there trees are found scattered among the hemlocks and hardwoods, besides the second growth that helps to make up the supply. White pine reproduces vigorously and in certain parts of the State under favorable conditions grows with astonishing rapidity. In quantity, it is the most used of any wood for manufacture in Pennsylvania, and owing to its valuable qualities of being light, soft, comparatively durable, of whitish color, easily worked, and holding its shape when in place, it is called for by the factories comprising thirty-two of the fifty-four industries. The largest quantity was used for making planing mill products and general mill work, and the next largest for boxes, these two industries accounting for 71% of the supply going to the Pennsylvania factories. It is interesting to note that white pine cut for Pennsylvania was only 2,000,000 feet more than the reported quantity of home-grown wood used. This gives white pine the distinction of being con-

sumed by manufacturers in the largest proportion of the amount cut in the State of any home grown tree that is important in the production of lumber.

Table 3.—Consumption of White Pine, year ending June, 1912.

Industry.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Planing mill products,	62,556,492	38.92	\$36 53	\$2,285,337	29,261,299	33,295,193
Boxes and crates, packing,.....	51,583,373	32.09	21 03	1,084,714	19,390,373	22,193,000
Car construction,	12,829,420	7.98	31 38	402,637	4,041,869	8,787,551
Patterns and flasks,	9,141,449	5.69	56 09	512,735	2,276,198	6,865,251
Caskets and coffins,	4,733,000	2.98	18 90	138,495	703,500	4,089,500
Ship and boat building,	4,544,650	2.83	46 85	212,928	2,733,150	1,811,500
Pumps,	2,092,000	1.30	24 50	51,435	1,575,000	517,000
Boards,	1,000,000	.62	32 00	32,000	.....	1,000,000
Tanks and silos,	820,000	.51	34.84	28,570	60,000	760,000
Machinery and apparatus, electrical,	787,200	.49	40 03	31,504	150,000	637,200
Toys,	725,000	.45	24 90	18,050	487,500	237,500
Fixtures,	452,450	.28	45 64	20,649	100,450	352,000
Trunks and valises,	428,500	.27	28 60	12,255	128,500	300,000
Furniture,	298,700	.19	44 32	13,239	281,500	17,200
Mine equipment,	239,000	.15	23 70	5,665	13,000	226,000
Baskets, fruit and vegetables,	230,000	.14	21 00	4,830	230,000	.....
Woodenware and novelties,	225,000	.14	11 78	2,650	225,000	.....
Butchers' blocks and skewers,	200,000	.12	22 00	4,400	200,000	.....
Machine construction,	143,500	.09	41 34	5,932	83,500	60,000
Vehicles and vehicle parts,	140,550	.09	34 62	4,866	118,050	22,500
Agricultural implements,	116,000	.07	31 71	3,673	26,000	90,000
Instruments, musical,	88,000	.05	34 56	3,041	.....	88,000
Dairymen's, poulterers' and ap- paratus' supplies,	79,000	.05	22 58	1,784	15,000	64,000
Laundry appliances,	78,200	.05	35 92	2,809	25,000	53,200
Excelsior,	63,500	.04	15 00	953	63,500	.....
Elevators,	62,200	.04	40 45	2,516	32,200	30,000
Manual training practice (sloyd),	21,575	.01	72 35	1,561	8,675	12,900
Gates and fencing,	5,000	*	22 60	110	5,000	.....
Plumbers' woodwork,	2,500	*	36 00	90	.....	2,500
Instruments, professional and scientific,	1,000	*	90 00	90	.....	1,000
Refrigerators and kitchen cab- inets,	500	*	28 00	14	500	.....
Miscellaneous,	7,002,900	4.36	26 00	182,070	7,002,000	.....
Total,	160,749,759	100.00	\$31 55	\$5,071,607	69,236,764	91,512,995

*Less than 1-100 of 1 per cent.

Shortleaf Pine (*Pinus echinata*).

In quantity shortleaf pine is the most important yellow pine used by the Pennsylvania wood users. It was demanded, next to white pine, in the largest amount of any wood going into final manufacture in the State. Twenty-four industries report using this wood, but over ninety-one per cent. of the total went to three of them: boxes, planing mill products, and car construction. Shortleaf pine grows in Pennsylvania and, to a limited extent, is sawed into lumber; but the manufacturers report the use of the home cut wood in very small quantities and purchase almost their entire supply in the southern states. Shortleaf pine is a soft, yellow wood with considerable sap and has wider rings than the longleaf pine. Its qualities may be indicated

as intermediate or coarse grained, moderately hard, dense, tough and elastic, strong, stiff, durable, resinous, moderately stable, rather easy to work, and takes paint well. It is not infrequently bought and sold as longleaf pine, especially that coming from the Gulf states. The Virginia and Carolina shortleaf pine is generally handled under the name North Carolina pine, being a mixture of loblolly and shortleaf in the proportion of about four to one.

Table 4.—Consumption of Shortleaf Pine, year ending June, 1912.

Industry.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.				
Boxes and crates, packing,	52,719,727	35.21	\$18 00	\$949,008		52,719,727
Planing mill products,	51,870,590	34.64	26 68	1,383,733		51,870,590
Car construction,	32,724,334	21.85	26 10	854,105		32,724,334
Boards, cloth, hosiery, etc.,	8,000,000	5.34	25 00	200,000		8,000,000
Machinery and electrical apparatus,	968,200	.65	21 89	21,191		968,200
Mine equipment,	567,000	.38	21 14	11,983		567,000
Ship and boat building,	480,800	.32	28 77	13,820		480,800
Vehicles and vehicle parts,	467,200	.31	26.67	12,461		467,200
Refrigerators and kitchen cabinets,	453,750	.30	27 07	12,284		453,750
Fixtures,	256,000	.17	25 92	6,635		256,000
Patterns and flasks,	242,012	.16	20 89	5,056		242,012
Equipment, playground,	240,000	.16	27 00	6,480		240,000
Machine construction,	163,000	.11	23 99	3,910	10,000	153,000
Dairymen's, poulterers', etc.,	145,000	.10	15 69	2,275		145,000
Furniture,	141,000	.10	23 92	3,374		141,000
Agricultural implements,	95,000	.06	29 74	2,825		95,000
Tanks and silos,	86,200	.06	29 47	2,540		86,200
Elevators,	50,000	.03	22 00	1,100		50,000
Ladders,	25,000	.02	25 00	625		25,000
Instruments, musical,	19,900	.01	34 52	687		19,900
Plumbers' woodwork,	12,250	.01	28 00	343		12,250
Handles,	12,000	.01	30 00	360		12,000
Frames and moulding, picture,	5,000	*	30 00	150		5,000
Manual training practice (sloyd),	250	*	40 00	10		250
Total,	149,744,213	100.00	\$23 34	\$3,494,950	10,000	149,734,213

*Less than 1-100 of 1 per cent.

Longleaf Pine (*Pinus palustris*).

For strength, stiffness, and durability, longleaf pine is considered superior to other species of yellow pine. The distinguishing features of the wood are its narrow rings and its relatively small proportion of sapwood. It is hard, with fine straight grain, dense, moderately heavy, elastic, tough; splits rather easily, is fairly hard to work, and does not take paint well. Nearly three-fourths of all that is used in the State is consumed in car building, although seventeen other industries reported its use in varying small amounts. The most prominent among these are planing mill products, ship building, and the manufacture of tanks and silos.

Table 5.—Consumption of Longleaf Pine, year ending June, 1912.

Industry.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Car construction,	76,932,160	70.85	\$32 21	\$2,477,985	.....	76,932,160
Planing mill products,	19,612,698	18.06	29 39	576,370	.....	19,612,698
Ship and boat building,	5,286,000	4.87	37 56	198,520	.....	5,286,000
Tanks and silos,	2,565,000	2.36	26 57	68,150	.....	2,565,000
Machine construction,	1,431,000	1.32	27 66	39,585	.....	1,431,000
Vehicles and vehicle parts,....	576,550	.53	34 33	19,791	.....	576,550
Agricultural implements,	563,200	.52	31 77	17,893	.....	563,200
Mine equipment,	423,000	.39	26 39	11,163	.....	423,000
Elevators,	269,900	.25	36 73	9,912	.....	269,900
Boxes and crates, packing,....	241,800	.22	22 04	5,330	.....	241,800
Patterns and flasks,	234,000	.22	20 70	4,844	.....	234,000
Weighing apparatus,	200,000	.18	30 09	6,060	.....	200,000
Furniture,	138,500	.13	31 83	4,408	.....	138,500
Ladders,	50,000	.05	28 00	1,400	.....	50,000
Fixtures,	39,500	.04	32 41	1,280	.....	39,500
Equipment, playground,	7,000	.01	52 00	364	.....	7,000
Caskets and coffins,	6,000	*	37 50	225	.....	6,000
Machinery and electrical apparatus,	1,000	*	25 00	25	.....	1,000
Total,	108,577,308	100.00	\$31 71	\$3,443,246	.....	108,577,308

*Less than 1-100 of 1 per cent.

Loblolly Pine (*Pinus taeda*).

Loblolly pine does not grow in Pennsylvania though it has a wide range extending from southern Maryland through all the southern states and extends as far west as Texas. Most of that used in Pennsylvania was reported as coming from Virginia and North Carolina, in which states it constitutes the largest proportion of the lumber production. It is a soft, wide ringed, thick sapped, yellow pine. It has very coarse straight grain, is moderately hard, strong and durable, resinous, brittle, easy to season and work, and takes paint well. It closely resembles shortleaf pine and meets similar uses, so that no attempt is ever made to distinguish it commercially. Over 51,000,000 feet is demanded yearly by the Pennsylvania wood users for a great variety of purposes, but over nine-tenths is reported by the box makers and the manufacturers of sash, doors, blinds, and other planing mill products.

Table 6.—Consumption of Loblolly Pine, year ending June, 1912.

Industry.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Boxes and crates, packing,.....	36,173,429	70.59	\$17 51	\$623,493	.....	36,173,429
Planing mill products,.....	7,307,090	14.26	27 53	231,076	.....	7,307,090
Car construction,.....	4,827,625	9.42	25 98	125,422	.....	4,827,625
Boards, cloth, hosiery, etc.....	1,000,000	1.97	18 13	18,125	.....	1,000,000
Patterns and flasks,.....	579,000	1.13	20 27	11,733	.....	579,000
Equipment, playground,.....	400,000	.78	20 00	8,000	.....	400,000
Ladders,.....	400,000	.78	20 00	8,000	.....	400,000
Trunks and valises,.....	160,000	.31	24 22	3,875	.....	160,000
Fixtures,.....	153,000	.30	22 17	3,392	.....	153,000
Elevators,.....	96,500	.20	32 31	3,118	.....	96,500
Furniture,.....	58,000	.11	22 79	1,322	.....	58,000
Vehicles and vehicle parts,.....	41,900	.08	28 07	1,176	.....	41,900
Machine construction,.....	25,000	.05	32 00	800	.....	25,000
Instruments, musical,.....	3,000	.01	40 00	120	.....	3,000
Miscellaneous,.....	17,000	.03	30 00	510	.....	17,000
Total,.....	51,241,544	100.00	\$19 91	\$1,020,167	.....	51,241,544

Pitch Pine (Pinus rigida).

Pitch pine furnishes the largest amount of yellow pine lumber that is cut in Pennsylvania. The tree has a large proportion of sapwood and is decidedly resinous. It grows scatteringly throughout the State and is more extensively used than the total in Table 7 would indicate. owing to the fact that after it is cut into lumber it is difficult for the manufacturer to identify it. The wood is very brittle, of medium weight, hard, coarse grained, weak, stiff, durable, and does not hold paint. Its principal use in Pennsylvania for manufacturing is for boxes and crates, though it meets a wider demand for structural work and for other uses where rough timber is required without further manufacture.

Table 7.—Consumption of Pitch Pine, year ending June, 1912.

Industry.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Boxes and crates,.....	6,931,800	65.21	\$16 32	\$112,519	979,600	5,952,200
Planing mill products,.....	3,826,000	26.58	23 37	63,206	2,826,000	.....
Car construction,.....	458,600	4.31	16 10	7,383	214,800	243,800
Mine equipment,.....	246,000	2.32	23 07	5,675	246,000	.....
Vehicles and vehicle parts,.....	55,200	.52	22 77	1,257	55,200	.....
Machine construction,.....	49,100	.46	16 44	807	49,100	.....
Patterns and flasks,.....	44,000	.41	30 84	917	41,500	2,500
Fixtures,.....	20,000	.19	16 00	320	20,000	.....
Total,.....	10,630,700	100.00	\$18 07	\$192,084	4,432,200	6,198,500

Western White Pine (Pinus monticola).

This is not the species which produces the white pine lumber of Pennsylvania and the Lake states, but in appearance the wood closely resembles eastern white pine and is suitable for most of the purposes for which the eastern wood is used. Idaho, western Montana, and Washington supplied the most of it used in Pennsylvania. The industries demanding it are the makers of planing mill products and the car builders.

Table 8.—Consumption of Western White Pine, year ending June, 1912.

Industry.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Planing mill products,	2,914,500	94.92	\$39 55	\$115,281	.....	2,914,500
Car construction,	87,500	2.85	54 99	4,812	.....	87,500
Patterns and flasks,	28,000	.91	56 98	1,594	.....	28,000
Fixtures,	20,500	.67	46 78	959	.....	20,500
Caskets and coffins,	20,000	.65	42 50	850	.....	20,000
Total,	3,070,500	100.00	\$40 22	\$123,496	.....	3,070,500

Scrub Pine (Pinus virginiana).

This tree occurs most frequently in the coastal plain region from New York to Virginia, and for that reason is found in New Jersey and Delaware more extensively than in Pennsylvania. Its range extends from the clay ridges in the southeastern part of the State westward and northward into the foothills and mountain regions, scattered among the hardwoods. The common names in different localities are: Jersey pine, nigger pine, and bastard pine. On cut over areas restocking is heavy and springs up rapidly but the reproduction is best on old fields where in some localities it forms thick stands. It grows more slowly than loblolly or shortleaf and only a comparatively small proportion of the trees reach a size large enough for lumber. It has coarse, straight grain, wide sapwood, and is very brittle, soft, moderately strong, stiff, splits rather easily, is fairly durable and resinous. It can be recognized readily by its short dark green needles, two in a sheath, and by the fact that cones generally remain on the trees several years after they have dropped their seed. In Virginia the box makers and excelsior manufacturers use large quantities of this wood, while in Maryland and Delaware, it is cut into railroad ties, converted into boxes and crates, and, to a limited extent, is used for building materials. In Pennsylvania a quantity equal to the entire cut of yellow pine went to the box makers.

Table 9.—Consumption of Scrub Pine, year ending June, 1912.

Industry.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Boxes and crates, packing,	2,251,400	94.36	\$18 93	\$42,613	30,000	2,221,400
Planing mill products,	70,000	2.98	20 50	1,435	25,000	45,000
Car construction,	64,695	2.71	23 32	1,509	50,500	14,195
Total,	2,386,095	100.00	\$19 10	\$45,557	105,500	2,280,595

Norway Pine or Red Pine (Pinus resinosa).

Pennsylvania is the southern limit of the range of Norway or red pine. It occurs in the State infrequently on higher elevations, scattered with hardwoods. The reddish color of the bark is the easiest means of identification. It is most commonly cut into lumber in the New England states and in the Lake states near the Canadian border. All that has been said of white pine generally applies to Norway pine. The two trees grow mixed together and are marketed in most cases indiscriminately as white pine, the other constituting only a relatively small per cent. of the consignment. It differs from white pine in that it is slightly heavier, harder, and more resinous. Where color is a consideration, red pine is separately specified and this accounts for the distinction that the manufacturers make who reported it separately for this investigation. When sold alone as Norway pine it grades lower than white pine. None of that used in Pennsylvania was reported as growing within the State. It has fine, straight grain, medium sapwood, is moderately hard, fairly dense, of medium weight, moderately strong, stiff, non-elastic, fairly brittle, readily split and easily seasoned, easy to work and keeps its shape.

Table 10.—Consumption of Norway Pine, year ending June, 1912.

Industry.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Car construction,	1,518,300	65.24	\$28 97	\$43,985	25,000	1,493,300
Planing mill products,	526,000	22.60	29 20	15,357	.....	526,000
Elevators,	100,000	4.29	28 00	2,800	.....	100,000
Boxes and crates, packing,	90,000	3.87	20 00	1,800	.....	90,000
Tanks and silos,	50,000	2.15	35 00	1,750	.....	50,000
Patterns and flasks,	43,040	1.85	28 00	1,205	.....	43,040
Total,	2,327,340	100.00	\$28 74	\$66,897	25,000	2,302,340

Sugar Pine (Pinus lambertiana).

Sugar pine is the largest pine tree in the United States and is cut almost entirely in California. The name is due to a sugary substance which exudes from the tree when the wood is bruised. It is a true white pine and the wood, except for its being slightly more resinous, is quite similar in appearance to eastern white pine. The uses of the two pines are almost identical, and for a number of purposes the western wood is substituted for the eastern. Sugar pine has a fine straight grain, narrow sapwood, is soft, fairly dense, of very light weight, moderately strong, stiff, non-elastic, easily split and seasoned, and very easy to work. Over a million feet are annually demanded by the Pennsylvania manufacturers. The largest quantity goes to the producers of sash, doors, and blinds. It is also demanded in considerable quantities for foundry patterns and for special uses in store and office fixtures.

Table 11.—Consumption of Sugar Pine, year ending June, 1912.

Industry.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Planing mill products,	1,122,000	92.45	\$48 20	\$54,078	.....	1,122,000
Patterns and flasks,	50,000	4.12	85 00	4,250	.....	50,000
Fixtures,	25,000	2.06	65 00	1,625	.....	25,000
Instruments, musical,	11,200	.92	87 50	980	.....	11,200
Instruments, professional and scientific,	5,000	.41	70 00	530	.....	5,000
Manual training practice (sloyd),	500	.04	80 00	40	.....	500
Total,	1,213,700	100.00	\$50 53	\$61,323	.....	1,213,700

Western Yellow Pine (Pinus ponderosa).

This species next to Douglas fir is more extensively cut into lumber than any of the other western woods, and in the western and central states is used for every purpose for which wood can be employed. Its range includes nearly all of the Rocky Mountain and Pacific coast states. On the market it goes to a large extent as white pine. Sometimes it is called California white pine and in the eastern states dealers give it assumed names, as in Philadelphia it was found being sold as maraschino white pine. The wood in a large number of cases closely resembles white pine and by ocular examination it is difficult to distinguish. It is, however, a true yellow pine, fine grained, and although somewhat heavier and more resinous than white pine, meets a number of uses for which white pine has heretofore been used. It is a cheaper wood and for that reason is a valuable lumber tree and has great possibilities. Box makers and the planing mills are the industries using it most extensively in Pennsylvania.

Table 12.—Consumption of Western Yellow Pine, year ending June, 1912.

Industry.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Boxes and crates, packing,	500,000	60.24	\$20 00	\$10,000	.....	500,000
Planing mill products,	320,000	38.56	34 94	11,180	.....	320,000
Furniture,	10,000	1.20	45 00	450	.....	10,000
Total,	830,000	100.00	\$26 06	\$21,630	.....	830,000

HEMLOCKS.

Hemlock (Tsuga canadensis).

Although the cut in Pennsylvania is over 150 times the amount the manufacturers use, it is interesting to note that twenty-seven per cent. of the hemlock going into further manufacture came from other states. In 1912 Pennsylvania ranked third in the production of hemlock lumber, being surpassed by Michigan and Wisconsin. Of the imported wood, West Virginia and New York furnished the largest amount. This is the eastern species of the hemlock, that grows from Nova Scotia to Georgia and as far west as Minnesota. It is light, brittle, cross grained, and coarse. It is more difficult to work than the pines and has more of a tendency to warp and twist. It is, however, strong and stiff and non-resinous, holds nails well, and is fairly durable. It is cheaper than similar grades of the principal pines, and in the east central states it is more largely used than any other wood for framing, sheathing, and other uses of rough lumber in building construction. Among the factories of the State, the box industry and that of the planing mills use the largest amounts of this wood, but ten other industries demand small quantities for a variety of purposes.

Western Hemlock (Tsuga heterophylla).

Another species of hemlock was found being used in Pennsylvania, and it is interesting to note that it is the kind that grows only in the far western states commonly known as western hemlock to distinguish it from the eastern wood. This tree usually attains larger sizes than the eastern hemlock, but, like the latter, is found in association with other species and seldom in pure stands. It ranges from two to five feet in diameter and when cut into lumber, generally classes higher, showing less defects than its eastern relative. It is used by only one industry in Pennsylvania, the makers of tanks and silos.

Table 13.—Consumption of Hemlock, year ending June, 1912.

Industry.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Planing mill products,	23,077,000	53.63	\$21 24	\$490,263	15,349,900	7,727,100
Boxes and crates, packing, ...	9,269,637	21.54	16 85	156,224	5,365,055	3,904,580
Ship and boat building,	4,343,000	10.09	25 92	112,551	4,217,000	126,000
Mine equipment,	2,260,750	5.26	20 82	47,666	2,260,750	.....
Car construction,	2,006,075	4.66	15 53	31,153	1,975,075	31,000
Caskets and coffins,	1,000,000	2.32	28 00	28,000	1,000,000	.....
Machine construction,	926,000	.69	18 22	5,392	296,000	.....
Patterns and flasks,	291,500	.68	18 37	5,356	291,500	.....
Dairymen's, poulterers' and apiarists' supplies,	215,000	.50	15 49	3,330	215,000	.....
Machinery and apparatus, elec- trical,	143,600	.33	26 85	3,856	143,600	.....
Fixtures,	44,300	.10	26 64	1,180	30,300	14,000
Refrigerators and kitchen cabi- nets,	37,100	.09	22 13	821	33,100	4,000
Tanks and silos,	25,000	.06	18 00	450	25,000	.....
Elevators,	3,500	.01	30 00	114	3,800	.....
Instruments, musical,	2,600	.01	35 00	91	1,600	1,000
Manual training practice (sloyd), Miscellaneous,	262 12,250	......03	34 35 28 16	9 345	262 10,000	..... 2,250
Total,	43,027,872	100.00	\$20 60	\$386,201	31,217,942	11,809,930

CYPRESS.

(Taxodium distichum)

In Pennsylvania cypress next to yellow pine is the most widely used of any lumber coming from the southern states. It is typically a swamp tree of the southeastern coast and gulf region and up the Mississippi Basin as far as Missouri. The wood is light, soft, straight-grained, and of fine texture. Though more difficult than some woods to season properly, it holds its shape when thoroughly dried and is one of the most durable woods for which the manufacturers call. These qualities make it desirable for many purposes. The planing mills use the largest quantities, not only for porch, cornice, and other exterior work, but also for doors, sash, panels, moulding and other interior finish. The other seventeen industries in the State demanding this wood and the quantities used are listed in the following table:

Table 14.—Consumption of Cypress (Bald), year ending June, 1912.

Industry.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Planing mill products,	18,790,200	81.01	\$39 68	\$745,612	.....	18,790,200
Boxes and crates, packing,	1,719,250	7.41	16 62	28,570	.....	1,719,250
Tanks and silos,	1,138,000	4.90	56 32	64,090	.....	1,138,000
Dairymen's, poultryers', etc., ..	545,000	2.35	37 02	20,175	.....	545,000
Car construction,	352,800	1.52	37 93	13,380	.....	352,800
Ship and boat building,	287,000	1.24	55 64	15,970	.....	287,000
Fixtures,	111,800	.48	37 38	4,179	.....	111,800
Furniture,	80,500	.35	43 19	3,477	.....	80,500
Ladders,	62,500	.27	54 64	3,415	.....	62,500
Laundry appliances,	39,000	.17	39 10	1,525	.....	39,000
Agricultural implements,	30,000	.13	35 00	1,050	.....	30,000
Caskets and coffins,	20,000	.09	40 00	800	.....	20,000
Elevators,	10,000	.04	55 00	550	.....	10,000
Gates and fencing,	3,840	.02	55 00	211	.....	3,840
Instruments, musical,	2,500	.01	43 60	109	.....	2,500
Manual training practice (sloyd),	1,750	.01	63 43	111	.....	1,750
Vehicles and vehicle parts,	1,000	.....	50 00	50	.....	1,000
Machine construction,	150	.....	75 00	11	.....	150
Total,	23,195,290	100.00	\$38 94	\$903,285	.....	23,195,290

SPRUCE.

Two species of eastern spruce, namely, red and white, and one north-western species, Sitka spruce, are reported by the Pennsylvania manufacturers. It is impossible from the information obtained to present separate statistics for the eastern species. The red spruce, the species common in New York, Maine, and New Hampshire, is the tree appearing on the mountains in various parts of Pennsylvania. In 1912 spruce was reported cut by 129 saw-mills of the State. The white spruce came into the State largely by water through the Great Lakes, from Wisconsin, Michigan, and Minnesota, where it is the common lumber tree. In appearance, qualities and sizes white spruce resembles red spruce. Spruce lumber irrespective of species is being substituted for white pine, especially in constructive work, box making, tanks and silo manufacture, and many other less important places where white pine was formerly used. Compared with it, however, spruce is weaker, less durable, more brittle, harder to work, whiter and of finer grain. It is non-resinous and therefore valuable for containers of foodstuffs. The western wood, Sitka spruce, comes from Washington and is used for a few special purposes. The planing mills reported its entire amount.

Table 15.—Consumption of Spruce, year ending June, 1912.

Industry.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Boxes and crates, packing,	14,648,870	71.32	\$17 42	\$255,211	975,350	13,673,520
Planing mill products,	1,999,734	9.74	29 96	59,904	176,350	1,823,384
Car construction,	1,367,636	6.66	26 35	36,032	189,700	1,177,936
Ship and boat building,	1,013,000	4.93	31 06	31,464	200,000	813,000
Refrigerators and kitchen cabinets,	413,800	2.01	37 39	15,474	190,000	223,800
Instruments, musical,	325,500	1.58	43 24	14,075	.....	325,500
Patterns and flasks,	223,988	1.09	33 63	7,533	44,000	179,988
Ladders,	191,000	.93	43 40	8,290	.....	191,000
Frames and moulding, picture, ..	100,000	.49	30 00	3,000	.....	100,000
Tanks and silos,	100,000	.49	20 00	3,000	.....	100,000
Machinery and apparatus, electrical,	87,700	.43	26 00	2,280	.....	87,700
Gates and fencing,	36,000	.17	25 00	900	.....	36,000
Elevators,	10,000	.05	30 00	300	10,000	.....
Vehicles and vehicle parts,	8,000	.04	48 88	391	1,000	7,000
Fixtures,	1,500	.01	42 00	63	.....	1,500
Toys,	1,300	.01	43 00	56	.....	1,300
Woodenware and novelties,	1,000	.....	43 00	43	.....	1,000
Miscellaneous,	10,000	.05	20 00	200	.....	10,000
Total,	20,539,028	100.00	\$21 34	\$438,216	1,786,400	18,752,628

DOUGLAS FIR.

(Pseudotsuga taxifolia).

Over three and a third million feet of Douglas fir, often called Oregon pine, is brought from the far western states to Pennsylvania to meet the demands of three industries: Ship building, planing mill products, and the manufacture of tanks and silos. It is primarily reported for structural work, because it possesses superior tensile strength, and, because it grows in large sizes and timbers of large dimensions are readily obtainable. In this latter respect it is the chief competitor of longleaf pine in the eastern and middle states. It is also valuable as a decorative wood, owing to its attractive grain and figure and the fact that it takes stain readily. This accounts for its rapid growth in popularity in recent years for doors, moulding, wainscotting, stairwork, and for other interior finish.

Table 16.—Consumption of Douglas Fir, year ending June, 1912.

Industry.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Ship and boat building,	2,521,000	74.94	\$42 41	\$106,926	.....	2,521,000
Tanks and silos,	450,000	13.37	43 33	19,500	.....	450,000
Machine construction,	200,000	5.94	51 25	10,250	.....	200,000
Planing mill products,	108,500	3.23	43 33	4,701	.....	108,500
Car construction,	70,238	2.09	45 55	3,199	.....	70,238
Miscellaneous,	14,400	.43	50 00	720	.....	14,400
Total,	3,364,138	100.00	\$43 19	\$145,296	.....	3,364,138

CEDARS.

Red Cedar (Juniperus virginiana).

The Pennsylvania wood users report the use of three woods known as cedars. Two of them grow in Pennsylvania and the other is a western wood. Red cedar, often called juniper, has a range covering all the states east and several west of the Mississippi River, but now commercially most abundant in Tennessee and southward. The Pennsylvania factories consume annually 861,000 feet of this and only about two per cent. was cut in the State. It was called for by nine industries, the most important of which were makers of professional instruments, including the lead pencil makers, planing mill products, furniture and caskets.

Table 17.—Consumption of Red Cedar, year ending June, 1912.

Industry.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Instruments, professional and scientific,	240,000	27.32	\$52 00	\$12,480	.....	240,000
Planing mill products,	213,000	24.25	49 27	10,495	10,000	203,000
Furniture,	178,100	20.27	60 31	10,880	.....	178,100
Caskets and coffins,	169,000	19.24	66 72	11,275	.....	169,000
Dairymen's, poulterers' and apiarists' supplies,	45,000	5.12	55 00	2,475	.....	45,000
Brushes,	23,000	2.63	64 57	1,485	5,000	18,000
Boxes and crates, packing,	5,000	.57	35 00	175	2,500	2,500
Manual training practice (sloyd),	400	.04	37 50	39	.....	400
Miscellaneous,	5,000	.57	40 00	200	.....	5,000
Total,	878,500	100.00	\$56 29	\$49,454	17,500	861,000

Western Red Cedar (Thuja plicata).

The western cedar is the largest cedar that grows and it is the foremost shingle wood of the country. It is commonly cut into wide boards and plank and is more abundant than eastern cedar, but the wood is lighter, weaker, softer, less durable, and more spongy in texture. The red cedars are so named on account of the color of the heartwood and the white cedar on account of its lack of color. The planing mills are the only class of factories bringing the western red cedar into Pennsylvania.

Southern White Cedar (Chamaecyparis thyoides).

Southern white cedar grows principally near the Atlantic Coast on lowlands and is best developed in states from New Jersey southward. The western limit of its range is in the extreme eastern portion of Pennsylvania, but none of the wood the manufacturers used was State-grown. The boat builders and the tank and silo makers accounted for ninety-seven per cent. of all the nearly four million feet used in the State. White cedar lumber is readily seasoned, easily worked, splits straight, and is regarded the most durable of any of the domestic woods. It possesses a remarkably straight, fine grain and a fine compact structure. It is probable that a small per cent. of this wood reported as white cedar may have been the northern white cedar often called arborvitae (*Thuja occidentalis*), but there was nothing in the information received to indicate it. Arborvitae is found on high elevations as far south as North Carolina but south of New York State rarely attains sufficient size to be of any commercial importance.

Table 18.—Consumption of Cedar, Southern White, year ending June, 1912.

Industry.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Tanks and silos,	2,554,000	68.34	\$36 31	\$92,740	.....	2,554,000
Ship and boat building,	1,081,000	28.92	56 40	60,970	.....	1,081,000
Gates and fencing,	100,000	2.68	20 00	2,000	.....	100,000
Furniture,	1,300	.03	120 00	156	.....	1,300
Planing mill products,	1,000	.03	120 00	120	.....	1,000
Total,	3,737,300	100.00	\$41 74	\$155,986	.....	3,737,300

REDWOOD

(Sequoia sempervirens).

This tree is closely related to the famous "Big Trees," which attain the largest size of any known tree. Practically all of the redwood lumber produced in this country comes from California. Redwood, and the sugar pine, the other California wood described above, are the highest priced softwoods that the Pennsylvania manufacturers report. Owing to its fine texture, great durability, stability in place, and excellent quality, redwood is more and more entering the eastern markets in spite of its cost. Its name is due to the red color of its wood, which fades when long exposed to the weather.

Table 19.—Consumption of Redwood, year ending June, 1912.

Industry.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Planing mill products,	197,132	38.98	\$49 19	\$9,697	.....	197,132
Patterns and flasks,	136,000	26.89	60 74	8,260	.....	136,000
Car construction,	100,000	19.77	36 00	3,600	.....	100,000
Caskets and coffins,	20,000	3.96	54 00	1,080	.....	20,000
Printing material,	20,000	3.96	63 00	1,260	.....	20,000
Ship and boat building,	20,000	3.96	52 30	1,046	.....	20,000
Instruments, musical,	10,000	1.98	40 09	400	.....	10,000
Rollers and poles,	2,000	.39	45 00	90	.....	2,000
Fixtures,	500	.10	55 00	28	.....	500
Manual training practice (sloyd),	50	.01	60 00	3	.....	50
Total,	505,682	100.00	\$50 36	\$25,464	.....	505,682

TAMARACK.

(Larix laricina).

Pennsylvania marks the southern limit of the eastern species of tamarack. Of the limited quantity of lumber used by the factories, a small per cent was from timbers cut in the extreme northwestern part of the State. It is distinctly a swamp tree, but the wood in its physical properties is similar to southern pine, although it is claimed to be more durable. In quality it is hard, dense, moderately heavy, strong, very stiff, moderately tough, elastic, hard to split, difficult to work, non-resinous, and with an intermittent grain. Only two industries in Pennsylvania reported the use of tamarack. It went for parts in boat building and to the planing mills for finished material used in house construction.

BALSAM FIR.

(Abies balsamea.)

Balsam fir is found growing in Pennsylvania, but being near the southern limit of its range the trees are of small size and of little commercial value. In the Lake states and in New England, as well as throughout the whole of Canada, this tree grows in swamps, usually associated with tamarack, black spruce, white cedar, etc. It appears also on the uplands, but it is much less common. The wood is soft, weak, and perishable, but has long, tough, colorless fibers, which make it valuable in paper manufacture. Like black spruce, its principal use is for pulp.

In Canada ninety-five per cent. of this wood is said to be cut for this purpose. The lumber serves many of the purposes for which spruce is demanded, but in Pennsylvania the planing mills were the only class of manufacturers reporting it.

THE HARDWOODS.

In the use of wood for making articles of final form a larger quantity of softwood is demanded than of hardwood; but the hardwoods meet a greater number of uses than softwoods and are more important as to distribution among the various industries. The hardwoods form about forty-five per

cent. of the total lumber cut in the State, and of the thirty-five kinds reported for manufacture, exclusive of the imported foreign woods, all but five were cut wholly or in part within the State, while of the twenty-three conifers or softwoods a portion of the supply of only thirteen were returned as State-grown.

OAKS.

The oaks are the leading hardwoods consumed by the Pennsylvania wood users. In trade the wood of the oaks is separated into two general classes, white oaks and red oaks, but the botanist's classification, which is based on difference in flower, fruit, and leaf, divides the oaks into more than fifty species. The manufacturer bases his distinction upon the qualities of the wood. The white oaks possess an even grain and fine texture, and are usually strong, hard, heavy, tough, dense, and durable but difficult to season; the red oaks are less strong and durable, and not so dense, but more easily worked because softer, more easily kiln-dried and, on account of being more porous they take stains and varnish more readily. Oak is brought into Pennsylvania in greater quantities than any other wood except shortleaf pine notwithstanding the fact that the cut of State-grown oak exceeds the quantity used by the manufacturers by over ninety million feet. There are many instances in which oak is demanded because it is the best suited and often the only practical material for the purpose. This accounts for the wood being first in importance for meeting a greater number of uses in Pennsylvania than any other American wood. Thirty-five industries demand some one or more of the white oak group and thirty-two industries one or more of the red oaks. The number of uses reported, as shown in the summary in the following pages, for the white oak is 738 and for the red oak 310. The car builders consume over one-half of the former and considerably more than one-third of all the latter that goes into further manufacture in the State. The furniture makers, including the chair industry, use over six and one-half million feet more red than white oak, but on the other hand, for vehicles, ship building, machine construction and agricultural implements white oak is largely preferred to red oak. For a comparison of the qualities of the two classes, the white oaks may be said generally to have intermediate straight grain, and are very hard, porous, very heavy, very strong, moderately stiff and elastic, and tough. They also split easily, are durable, rather difficult to season and to work. The red group generally are relatively coarse, straight grained, very hard, very porous, heavy, strong, stiff, non-elastic, and tough. This wood splits rather easily, is moderately durable, and rather difficult to season.

Table 20.—Consumption of Oak, year ending June, 1912.

Industry.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.				
Car construction,	81,393,363	44.72	\$26 14	\$2,127,488	30,089,792	51,303,571
Planing mill products,	29,806,771	16.38	44 05	2,313,133	10,809,400	18,997,371
Furniture,	26,224,750	14.41	40 20	1,054,280	5,214,650	21,010,100
Vehicles and vehicle parts,	7,873,867	4.33	35 48	279,372	4,968,100	2,905,767
Boxes and crates, packing,	7,604,877	4.18	16 08	122,249	1,949,877	5,655,000

Table 20—Concluded.

Industry.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Ship and boat building,	6,305,400	3.46	34 92	220,206	3,410,900	2,894,500
Chairs and chair stock,	5,226,000	2.87	37 43	195,622	1,348,300	3,877,700
Fixtures,	4,228,060	2.32	50 63	214,086	813,100	3,414,960
Agricultural implements,	3,295,700	1.81	34 12	112,448	1,334,700	1,961,000
Machine construction,	2,923,600	1.61	26 59	77,749	2,558,600	365,000
Mine equipment,	2,827,772	1.55	17 22	48,697	2,827,772	.....
Caskets and coffins,	1,188,500	.65	50 02	59,452	132,500	1,056,000
Equipment, playground,	607,300	.33	33 65	20,437	314,800	292,500
Refrigerators and kitchen cabinets,	565,900	.31	32 82	18,571	250,000	315,900
Toys,	277,300	.15	28 32	7,852	232,800	44,500
Dairymen's, poulterers' and ap- arists' supplies,	241,000	.13	20 26	4,883	200,000	41,000
Plumbers' woodwork,	219,500	.12	41 90	9,197	70,000	149,500
Instruments, musical,	190,000	.10	42 28	8,033	33,000	157,000
Baskets and veneer packages for fruit and vegetables,	125,000	.07	23 00	2,875	125,000	.....
Machinery and apparatus, elec- trical,	123,500	.07	33 08	4,085	10,000	113,500
Frames and moulding, picture, Insulator pins and brackets, ..	119,000	.07	54 30	6,462	29,000	90,000
Saddles and harness,	78,000	.04	68 21	5,320	60,000	18,000
Handles,	74,000	.04	25 42	1,881	74,000	.....
Laundry appliances,	60,000	.03	23 50	1,410	20,000	40,000
Elevators,	53,200	.03	48 03	2,555	23,200	30,000
Tanks and silos,	50,000	.03	43 00	2,150	50,000	.....
Sporting and athletic goods,....	42,000	.02	38 21	1,605	31,500	10,500
Patterns and flasks,	36,000	.02	34 67	1,248	36,000	.....
Shuttles, spools and bobbins, ..	35,000	.02	50 00	1,750	5,000	30,000
Woodenware and novelties,	27,100	.02	31 88	864	26,600	500
Manual training practice (sloyd),	23,570	.01	77 64	1,830	14,020	9,550
Pulleys and conveyors,	20,500	.01	28 05	575	20,500	.....
Rollers and curtain poles,	19,000	.01	16 63	316	19,000	.....
Clocks,	16,500	.01	68 97	1,138	.....	16,500
Instruments, professional and scientific,	10,000	.01	55 00	550	.....	10,000
Brushes,	600	*	37 00	22	600	.....
Total,	182,027,630	100.00	\$32 59	\$5,931,841	67,217,711	114,809,919

36.93% in. 63.07% out.

*Less than 1-100 of one per cent.

†The white and red oak groups have been combined in this table.

In Part II of the Report the information is given separately.

YELLOW POPLAR.

(Liriodendron tulipifera).

Forty-one classes of factories demand yellow poplar, which next to sugar maple, shows the widest distribution among industries of any wood that Pennsylvania factories demand. In this particular it excels white oak. The number of particular uses (see table of uses) reported for yellow poplar, however, is nearly 50 per cent. less than for white oak, while the total poplar used in the State was less by forty million feet. Yellow poplar is of fine texture, more easily worked, takes paint readily, and holds its shape after drying better than any other domestic wood. In texture it is similar to basswood. Because it is frequently called whitewood it is often confused with basswood, but is softer. There is a great difference between the heartwood and the sapwood of yellow poplar; the former in a number of in-

stances being sold on the market as yellow poplar because of its yellow color, and the latter as white poplar or whitewood, and therefore number of instances being sold on the market as yellow poplar because of its yellow color, and the latter as white poplar or whitewood, and therefore often regarded by users as separate species. The tree is frequently called tulip tree and the wood tulip poplar. There is but one species of this genus in this country. It is interesting to note that of the total amount of yellow poplar going into manufacture, over thirteen million feet were cut from State-grown timber. This amount was about two million feet less than the reported cut of this species in the State.

Table 21.—Consumption of Yellow Poplar, year ending June, 1912.

Industry.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Boxes and crates, packing,	18,576,293	32.75	\$17 44	\$323,871	4,330,100	14,246,193
Planing mill products,	17,123,372	30.19	37 38	640,042	4,127,990	12,995,382
Vehicles and vehicle parts,	3,764,335	6.64	50 49	190,055	755,285	3,009,050
Car construction,	3,172,113	5.59	57 43	182,175	310,611	2,861,502
Furniture,	2,892,600	5.10	36 86	106,593	346,700	2,545,900
Fixtures,	2,237,000	3.94	37 21	83,229	167,500	2,069,500
Boards,	1,070,000	1.89	29 38	31,440	.....	1,070,000
Boxes, cigar,	1,040,928	1.84	75 31	78,465	24,500	1,017,428
Agricultural implements,	757,500	1.23	34 59	26,205	33,000	724,500
Caskets and coffins,	748,000	1.32	32 10	24,008	432,000	316,000
Toys,	702,000	1.24	25 48	17,888	659,500	42,500
Excelsior,	688,000	1.21	15 00	10,030	688,000	.....
Machine construction,	640,800	1.13	42 86	27,463	29,800	611,000
Laundry appliances,	610,000	1.07	16 44	10,030	500,000	110,000
Refrigerators and kitchen cabinets,	566,200	1.00	28 27	16,009	363,000	203,200
Woodenware and novelties,	482,500	.85	29 11	14,045	27,500	455,000
Shuttles, spoils, and bobbins, ...	321,000	.51	36 50	11,715	25,000	296,000
Dairymen's, poulterers' and apiculturists' supplies,	220,000	.39	29 82	6,560	.....	220,000
Brushes,	157,500	.28	40 68	6,407	32,500	125,000
Instruments, musical,	135,100	.24	70 54	9,530	24,000	111,100
Plumbers' woodwork,	134,000	.24	40 00	5,360	.....	134,000
Pumps,	100,000	.18	45 00	4,500	.....	100,000
Frames and moulding, pictures, ...	87,000	.15	38 51	3,350	.....	87,000
Ship and boat building,	84,000	.15	58 07	4,878	2,500	81,500
Elevators,	82,600	.14	41 88	3,459	30,600	52,000
Pulleys and conveyors,	80,000	.14	28 75	2,300	10,000	70,000
Patterns and flasks,	46,500	.08	38 82	1,805	37,500	9,000
Clocks,	35,000	.06	33 57	1,175	.....	35,000
Boot and shoe findings,	30,000	.05	56 67	1,700	.....	30,000
Equipment, playground,	25,000	.04	36 00	900	12,500	12,500
Chairs and chair stocks,	24,600	.04	38 05	936	.....	24,600
Instruments, professional and scientific,	16,400	.03	73 78	1,210	.....	16,400
Manual training practical (sloyd),	16,250	.03	66 95	1,088	9,550	6,700
Mine equipment,	14,000	.02	22 50	315	14,000	.....
Machinery and apparatus, electric,	10,000	.02	55 60	556	.....	10,000
Weighing apparatus,	10,000	.02	25 00	250	10,000	.....
Gates and fencing,	5,000	.01	26 00	130	5,000	.....
Printing material,	5,000	.01	18 00	90	.....	5,000
Sporting and athletic goods,	5,000	.01	28 00	140	5,000	.....
Ladders,	4,000	.01	21 00	84	.....	4,000
Rollers and poles,	1,000	*	65 00	65	.....	1,000
Total,	56,720,991	100.00	\$32 62	\$1,850,151	13,013,636	43,707,355

*Less than 1-100 of 1 per cent.

MAPLES.

Three maples are cut for lumber in Pennsylvania, sugar maple, sometimes called hard maple (*Acer saccharum*), the red or soft maple (*Acer rubrum*), and the white or silvery maple (*Acer saccharinum*). Of these the sugar maple is commercially the most important and it is probably the most valuable wood produced in Pennsylvania. This is because of the abundance of maple sugar it produces, the choice figured woods known as bird's eye and curly maple, etc., and the many uses for which this wood alone is the most adaptable, owing to its combined qualities or strength, hardness, stiffness, and its ability to hold its shape after being properly seasoned. Forty-two industries report its use, which is a greater number than for any other wood named in this report. It is abundant on well-drained land, particularly in the northern, western, and middle portions of the State. Next to white oak, sugar maple was reported as meeting the greatest number of uses, and was the fourth important hardwood in the total quantity used. It also bears the distinction, among the woods that are used in quantities exceeding 5,000,000 feet, of furnishing the largest proportion of State-grown wood.

Table 22.—Consumption of Sugar Maple, year ending June, 1912.

Industry.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylv- ania.	Grown Out of Pennsylv- ania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Boxes and crates, packing,	11,647,000	21.19	\$16 43	\$191,340	3,282,500	8,364,500
Planing mill products,	9,681,890	17.62	23 75	229,963	8,673,090	1,008,800
Laundry appliances,	6,340,500	11.54	23 75	150,613	3,385,500	2,955,000
Chairs and chair stock,	5,348,100	9.73	18 54	99,180	4,746,500	601,600
Furniture,	4,743,900	8.63	26 72	126,632	3,640,100	1,103,800
Shuttles, spools, and bobbins, ..	2,528,000	4.60	24 85	62,816	1,870,000	658,000
Handles,	2,307,850	4.20	19 02	43,897	1,727,700	580,150
Car construction,	1,976,110	3.60	18 14	35,856	1,344,660	631,450
Brushes,	1,066,800	1.94	23 23	24,772	1,066,800	.....
Woodenware and novelties,	1,040,500	1.89	23 34	24,280	737,500	303,000
Agricultural implements,	1,032,600	1.88	28 04	28,952	385,500	667,100
Mine equipment,	790,200	1.44	18 67	14,751	790,200	.....
Toys,	762,500	1.39	25 31	19,300	712,500	50,000
Boards,	705,000	1.28	46 45	32,750	50,000	655,000
Instruments, musical,	647,800	1.18	32 20	20,857	225,300	422,500
Vehicles and vehicle parts, ...	625,200	1.14	28 67	17,940	314,200	311,600
Machinery and apparatus, elec- trical,	558,500	1.02	34 85	19,465	150,000	408,500
Baskets, fruit and vegetable, ..	549,000	1.00	18 15	9,963	549,000	.....
Pumps,	400,000	.72	17 00	6,800	400,000	.....
Fixtures,	366,000	.67	23 17	8,482	317,500	48,500
Machine construction,	288,700	.53	29 69	8,572	145,700	143,000
Ruthers' blocks and skewers, ..	270,000	.49	20 37	5,500	270,000	.....
Whips, canes, and umbrella sticks,	241,100	.44	17 57	4,237	241,100	.....
Weighing apparatus,	171,000	.31	33 13	5,665	21,000	150,000
Dairymen's, poulterers' and ap- parists' supplies,	152,950	.28	27 96	4,276	23,500	129,450
Elevators,	141,200	.26	49 74	7,023	81,200	60,000
Boot and shoe findings,	100,500	.18	55 86	5,614	.....	100,500
Sporting and athletic goods, ...	97,500	.17	36 14	3,524	47,500	50,000
Refrigerators and kitchen cab- inets,	80,750	.15	28 71	2,318	80,750	.....
Pulleys and conveyors,	68,000	.12	43 63	2,970	66,000	2,000

Table 22—Concluded.

Industry.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Patterns and flasks,	50,550	.09	47 46	2,399	38,850	11,700
Ladders,	50,000	.09	27 00	1,350	50,000	.....
Caskets and coffins,	35,000	.06	25 00	875	.....	35,000
Rollers and poles,	27,425	.06	16 59	455	27,000	425
Equipment, playground,	23,000	.04	26 96	620	3,000	20,000
Frames and moulding, picture, Ship and boat building,	20,000	.04	22 50	450	20,000	.....
Manual training practice (Sloyd),	3,500	.01	29 14	103	2,500	1,000
Instruments, professional and scientific,	3,250	.01	50 45	169	3,050	300
Printing material,	930	.....	40 00	37	500	430
.....	500	.....	80 00	40	500	.....
Plumbers' woodwork,	300	.....	30 00	9	.....	300
Miscellaneous,	11,500	.02	20 00	235	11,500	.....
Total,	54,955,805	100.00	\$22 29	\$1,225,049	35,482,200	19,473,605

Red and Silver Maple.

Red and silver maple both go in commerce under the name of soft maple. The former is cut from the hills and mountains of the State, where it grows abundantly and is associated with beech, birch, and hemlock, while the latter thrives best in bottomlands and along streams, in company with the willows, black ash, and river birch. The wood of these soft maples is similar to that of sugar maple except that it is lighter, softer, and slightly tougher. Relatively, they meet only a few uses and are distributed among only nineteen industries. Maple lumber, including all species, ranks next to oak in the hardwood cut of Pennsylvania.

Table 23.—Consumption of Red and Silver Maple, year ending June, 1912.

Industry.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Furniture,	1,478,500	25.89	\$25 49	\$37,682	730,500	748,000
Boxes and crates, packing,	1,267,000	22.18	12 38	15,685	872,000	395,000
Chairs and chair stock,	918,500	16.08	28 17	25,876	155,000	763,500
Toys,	450,000	7.88	24 00	10,800	450,000	.....
Shuttles, spools, and bobbins, ..	375,000	6.57	26 43	9,910	40,000	335,000
Fixtures,	260,000	4.55	15 09	3,900	260,000	.....
Woodenware and novelties,	210,525	3.68	14 43	3,038	210,525	.....
Brushes,	156,000	2.73	18 96	2,957	136,000	20,000
Baskets, fruit and vegetable, ..	145,000	2.54	20 00	2,900	.....	145,000
Whips, canes, and umbrella sticks,	107,000	1.87	26 45	2,830	2,000	105,000

Table 23—Concluded.

Industry.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Laundry appliances,	80,000	1.40	25 00	1,990	42,500	37,500
Planing mill products,	71,750	1.26	26 19	1,879	31,750	40,000
Vehicles and vehicle parts,	47,000	.82	26 13	1,228	47,000	.....
Instruments, musical,	44,000	.77	26 82	1,180	.....	44,000
Printing material,	25,000	.44	31 60	790	20,000	5,000
Dairymen's, poulterers' and apiarists' supplies,	15,000	.26	10 00	150	15,000	.....
Pulleys and conveyors,	10,000	.18	14 00	140	10,000	.....
Patterns and flasks,	1,000	.03	55 00	55	1,000	.....
Miscellaneous,	50,000	.88	14 00	700	50,000	.....
Total,	5,711,275	100.00	\$21 66	\$123,690	3,073,275	2,638,000

CHESTNUT.

(Castanea dentata).

Over 1,000 sawmills in Pennsylvania report the cut of chestnut, and the production of this lumber exceeds that of any other hardwood cut in the State. Manufacturers, classified among twenty-seven industries, report chestnut for nearly 200 separate and distinct uses. Though Pennsylvania is second in importance in the production of chestnut lumber and annually cuts nearly twice as much as the manufacturers consume, only forty per cent. of the total quantity purchased was home-grown wood. The wood is coarse straight grained, light weight, moderately strong and hard, very stiff and brittle, durable when exposed, easily seasoned, and holds nails well. The wood is also rich in tannin and is therefore largely used in making tannin extracts. Its other valuable qualities are ease in working, great porosity, stiffness, non-elasticity, light weight, and brittleness. It has an attractive grain and a beautiful figure, and therefore has lately grown in popularity for inside finish of houses and buildings. Nearly two-thirds of the reported usage by manufacturers in Pennsylvania is for these and other planing mill products. The largest demand for chestnut is for rough forest products, as posts, telegraph poles, cross ties, mine props and tanning extract. The growing tree is subject to attacks by boring insects, which make the wood usually defective. Large quantities of the chestnut lumber used in Pennsylvania, therefore, are of the low grade known as "sound wormy" which shows the galleries of insect larvae, but is otherwise sound. It is this grade which the box makers use in amounts equal to more than twenty-three per cent. of the total, and it is this grade that the furniture manufacturers and piano builders demand for veneer backing, being light, holding its shape well, and with a special affinity for glue, and is especially adapted for this purpose. The casket makers use chestnut ahead of any other wood as experience has proved that this wood is one of the most durable underground. The sound wormy grade is most frequently employed as the injury by the borers does not seem to affect particularly its lasting qualities.

In recent years, the chestnut bark disease that has killed chestnut trees in New York and southern New England has made great inroads on the stand

in Pennsylvania. The rapid spread of the infection and its devastation in the infected areas of the State has produced such an alarming situation that the Commonwealth of Pennsylvania adopted measures looking to the possible control of the disease. A chestnut tree killed by the blight is killed by the girdling of the trunk. The disease does not injure the wood although it penetrates a few annual rings. The problem of utilizing the blight killed wood, the Federal Government has ascertained, is merely a question of using dead timber. The wood generally answers for all purposes for which healthy chestnut is demanded, and recent official strength tests have proved that sound killed chestnut is fully as strong as live healthy wood. To owners of blight killed timber, the Forest Service has pointed out the necessity of its use within two years after death as subsequent to that period, deterioration, due to checking, insect injury and decay, is quite rapid.

Table 24.—Consumption of Chestnut, year ending June, 1912.

Industry.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Planing mill products,	17,409,350	33.92	\$37 65	\$655 450	5,815,700	11,593,650
Boxes and crates,	11,977,692	23.34	16 04	192,165	6,275,328	5,702,364
Furniture,	11,556,850	22.52	19 52	225,599	5,586,390	5,970,550
Caskets and coffins,	5,387,000	10.50	20 57	110,807	1,573,500	3,813,500
Fixtures,	1,803,350	3.51	25 16	45,364	1,114,250	639,100
Mine equipment,	749,405	1.46	15 42	11,557	749,405	.....
Instruments, musical,	671,900	1.31	24 81	16,669	327,000	344,900
Toys,	500,000	.97	21 00	10,500	500,000	.....
Chairs and chair stock,	480,000	.94	17 71	8,499	95,000	335,000
Agricultural implements,	140,000	.27	19 07	2,670	40,000	100,000
Patterns, and flasks,	128,200	.25	19 24	2,468	47,500	80,700
Car construction,	113,250	.22	21 04	2,383	113,250	.....
Baskets, fruit and vegetable, ..	100,000	.19	19 00	1,900	100,000	.....
Frames and moulding, picture, ..	93,000	.18	22 41	2,084	25,000	68,000
Machine construction,	73,000	.14	35 67	2,604	23,000	50,000
Trunks and valises,	37,500	.07	25 00	938	17,500	20,000
Vehicles and vehicle parts, ...	30,200	.06	19 77	597	18,200	12,000
Tanks and silos,	15,000	.03	20 00	300	15,000	.....
Refrigerators and kitchen cabinets,	11,800	.02	28 05	331	11,800	.....
Gates and fencing,	11,500	.02	25 39	292	6,500	5,000
Sporting and athletic goods, ..	10,000	.02	32 00	330	5,000	5,000
Manual training practice (sloyd),	7,000	.01	64 14	448	5,000	2,000
Excelsior,	5,000	.01	14 00	70	5,000	.....
Clocks,	5,000	.01	30 00	150	5,000	.....
Elevators,	4,000	.01	70 00	280	.....	4,000
Ship and boat building,	3,100	.01	27 10	84	3,100	.....
Laundry appliances,	3,000	.01	24 00	72	2,000	1,000
Total,	51,326,097	100.00	\$25 22	\$1,294,609	22,479,333	28,846,764

43.80% in. 56.20% out.

BEECH.

(Fagus atropunicea)=(F. grandifolia).

Considering that thirty-three industries demand beech for more than 230 distinct uses, it can properly be termed one of Pennsylvania's important hardwoods, though not many years ago it was considered by manufacturers of little value. There is but one species in Pennsylvania and its stand is abund-

ant, especially in the northeastern, northern, and western portions of the State, where are located most of the 800 or more mills that report cutting it. Pennsylvania produces more beech lumber than any other state east of the Ohio river, and in this respect stands third in importance in the United States. It is quite surprising that so large a quantity of low grade beech lumber, such as is used by the box makers, was shipped in, if one considers that the cut of this wood in Pennsylvania exceeds the consumption of home-grown wood by over 22,000,000 feet. The wood of the beech tree is not first class lumber like its associates, the maples and birches. It is usually cross-grained, not durable, difficult to season, and frequently warps and checks when in place, even after it has been thoroughly dried. It is, however, strong, hard, and moderately stiff, and these qualities combined, together with the fact that it is cheap, make it desirable for a great number of uses. It is especially adapted for turning stock and for that reason it is one of the leading woods appearing in the chair industry and in the making of brooms and mop handles. The planing mills use it largely for flooring, but for this purpose it is not in so great demand in this State as in the New England states, where a large quantity of beech shipped from Pennsylvania is used, being preferred to the New England wood owing to its better quality. The brush makers want large quantities of beech for scrubbing and other cheap brush blocks, while the woodenware and toy makers demand it in large quantities for many special uses. It is the most important wood for laundry appliances, especially for clothes pins, for which it is used probably in larger quantities in the country at large than any other wood.

Table 25.—Consumption of Beech, year ending June, 1912.

Industry.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.				
Boxes and crates, packing, ..	12,505,839	31.08	\$16 17	\$202,272	3,735,339	8,770,500
Chairs and chair stocks,	8,420,000	20.92	17 21	144,945	7,295,000	1,125,000
Woodenware and novelties,	3,639,000	9.04	20 46	74,446	3,356,000	283,000
Planing mill products,	2,461,750	6.12	16 35	40,250	1,972,250	489,500
Brushes,	1,931,000	4.80	18 87	36,430	1,931,000	.....
Handles,	1,752,300	4.35	17 31	30,412	1,302,800	449,500
Furniture,	1,453,000	3.61	16 23	23,584	1,397,000	56,000
Laundry appliances,	1,432,000	3.56	15 95	22,842	1,352,000	80,000
Car construction,	1,377,500	3.42	17 12	23,583	847,500	530,000
Frames and moulding, picture,	1,200,000	2.98	20 08	24,100	600,000	600,000
Baskets, fruit and vegetable,...	1,079,000	2.63	18 62	20,093	949,000	130,000
Mine equipment,	656,525	1.63	17 94	11,781	656,525	.....
Toys,	627,400	1.56	18 41	11,553	585,000	42,400
Vehicles and vehicle parts,....	587,883	1.46	21 97	12,916	537,883	50,000
Whips, canes, and umbrella sticks,	266,500	.66	21 91	5,838	252,000	14,500
Equipment, playground,	130,000	.32	29 46	3,830	130,000	.....
Excelsior,	116,500	.29	15 00	1,748	116,500	.....
Dairymen's, poulterers' and ap- arists' supplies,	100,000	.25	16 00	1,600	100,000	.....
Fixtures,	71,000	.18	21 85	1,551	60,000	11,000
Refrigerators and kitchen cab- inets,	55,000	.14	17 36	955	30,000	25,000

Table 25—Concluded.

Industry.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Pumps,	50,000	.12	15 00	750	50,000	.....
Agricultural implements,	42,000	.10	22 86	960	32,000	10,000
Ladders,	22,000	.05	18 27	402	22,000	.....
Instruments, musical,	20,000	.05	22 00	440	.....	20,000
Sporting and athletic goods,.....	20,000	.05	17 25	345	20,000	.....
Pulleys and conveyors,	15,000	.04	20 00	300	15,000	.....
Rollers and poles,	12,000	.03	14 00	168	12,000	.....
Machine construction,	11,000	.03	14 55	160	11,000	.....
Patterns and flasks,	10,000	.03	25 00	250	10,000	.....
Ships and boat building,	2,500	.01	26 00	65	1,500	1,000
Printing material,	2,000	.01	30 00	60	2,000	.....
Manual training practice (sloyd),	600	.....	28 33	17	600	.....
Miscellaneous,	175,003	.43	14 86	2,600	175,003	.....
Total,	40,244,300	100.00	\$17 42	\$701,244	27,556,900	12,687,400

RED GUM.

(Liquidambar styraciflua).

Red gum in late years has grown in commercial importance more than any other domestic wood. It was formerly considered of little value, owing to difficulty in seasoning; but with the coming of improved methods of kiln-drying, both for veneer and lumber, these obstacles have been overcome and the wood has become available for a great number of uses. It was reported in Pennsylvania by twenty-three industries. The red gum tree grows in Pennsylvania, especially in the southeastern and middle portions of the State, where its cut was reported by 130 mills. It is not related, as its common name indicates, to the other gums, the water gum, and black gum, the cotton or tupelo gum, though often growing with them in the southern extension of its range. The red gum has a starlike leaf and bears its numerous seeds in spiny, round balls. The black gum has an oval leaf, and bears a small bluish black drupe containing a single seed. The wood of the red gum is fairly strong, soft and tough. It has a slightly interlocked grain, a fine, uniform texture, and takes a good polish. The color of the wood is not uniform. The sapwood is almost white and on the market is sold separately as sap gum. The heartwood is generally a reddish light brown. In some trees it is uniformly dark, while in others the dark wood runs in irregular streaks mottling the wood and giving it a figure resembling Circassian walnut. Pennsylvania furniture makers use this wood in the largest quantities, finishing it often to imitate more expensive hardwoods, mahogany, walnut, quarter-sawed oak, and cherry.

Table 26.—Consumption of Red Gum, year ending June, 1912.

Industry.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.					Feet b. m.	Feet b. m.
Boxes and crates, packing, ...	12,806,084	56.01	16 68	\$213,611	.....	12,806,084
Chairs and chair stock,	4,326,000	18.92	25 97	112,328	.....	4,326,000
Furniture,	2,297,000	10.05	34 25	78,666	.....	2,297,000
Planing mill products,	1,610,300	7.04	31 31	50,422	.....	1,610,300
Boxes, cigar,	549,750	2.41	49 79	27,373	.....	549,750
Vehicles and vehicle parts, ...	315,500	1.38	32 37	10,212	500	315,000
Woodenware and novelties, ...	225,000	.98	23 50	5,287	.....	225,000
Handles,	195,000	.85	29 38	5,730	.....	195,000
Mine equipment,	150,000	.66	12 00	1,800	.....	150,000
Fixtures,	94,000	.41	44 00	4,136	.....	94,000
Instruments, musical,	50,000	.22	51 20	2,560	.....	50,000
Frames and moulding, picture, ...	50,000	.22	30 00	1,500	.....	50,000
Brushes,	37,000	.16	27 00	999	.....	37,000
Car construction,	35,140	.15	27 02	950	.....	35,140
Caskets and coffins,	30,000	.13	40 00	1,200	.....	30,000
Agricultural implements,	24,000	.11	36 00	864	.....	24,000
Trunks and valises,	20,000	.09	35 00	700	.....	20,000
Whips, canes, and umbrella sticks,	20,000	.09	50 00	1,000	.....	20,000
Pipes, tobacco,	12,000	.05	50 00	600	.....	12,000
Clocks,	10,000	.04	80 00	600	.....	10,000
Toys,	5,000	.03	25 00	125	5,000	.....
Refrigerators and kitchen cabinets,	2,900	.01	50 00	145	.....	2,900
Manual training practice (sloyd),	470	.....	72 34	34	.....	370
Total,	22,865,144	100.00	\$22 78	\$520,842	5,500	22,859,644

BASSWOOD.

(Tilia americana).

Probably a larger per cent. of the cut of basswood in Pennsylvania goes to the manufacturers than that of any other hardwood. Four hundred and thirty mills in 1912 report cutting over 10,000,000 feet, while the wood-using factories consumed almost 8,000,000 feet, making more than 200 distinct commodities. There is one species of basswood of commercial importance growing in Pennsylvania, and it is found in all parts of the State, but more abundantly on rich, well drained soils. It is a favorite shade tree and for that purpose is extensively planted. Lumbermen often refer to the tree as linden and call the lumber "linn," but throughout its range it is probably most commonly known as basswood. This is due to the "bast" or inner bark, which is of considerable commercial importance for making cords, ropes, and doormats. Especially in midsummer is the tree easily identified, when the fragrant yellow flowers attract the attention of the passer-by.

Basswood is the softest hardwood and in its qualities is similar to yellow poplar and aspen. This wood is stiff, light, weak, and non-durable, with an intermediate grain, wide sapwood scarcely distinguishable, and a lack of taste and odor. It is more easily worked than any of the other hardwoods, with the probable exception of yellow poplar, does not warp or check, is tough, and takes paint well. It is used by thirty-one of the wood-using factories, besides being preferred by slack coopers over all other woods for heading, particularly flour and sugar barrels.

Table 27.—Consumption of Basswood, year ending June, 1912.

Industry.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Furniture,	3,945,400	21.10	\$35 13	\$138,592	1,105,400	2,840,000
Boxes and crates, packing,	2,936,400	15.70	16 93	49,708	1,324,400	1,612,000
Planing mill products,	2,738,576	14.65	30 97	84,811	1,396,900	1,341,676
Toys,	1,404,000	7.51	40 80	57,286	560,000	844,000
Trunks and valises,	1,374,500	7.35	27 80	38,209	754,500	620,000
Woodenware and novelties,	944,000	5.05	24 26	22,905	228,500	715,500
Frames and moulding, picture, ..	902,000	4.82	23 09	20,825	352,000	550,000
Excelsior,	749,000	4.00	13 77	10,315	749,000	.....
Boxes, cigar,	495,000	2.65	64 95	32,150	.....	495,000
Vehicles and vehicle parts,	477,850	2.55	30 10	14,384	258,500	219,350
Laundry appliances,	437,000	2.34	32 52	14,210	108,500	328,500
Dairymen's, poulterers' and apiarists' supplies,	370,000	1.98	18 00	6,660	.....	370,000
Car construction,	366,010	1.96	40 74	14,911	140,214	225,796
Ladders,	275,000	1.47	29 18	8,025	150,000	125,000
Instruments, musical,	271,500	1.45	42 36	11,500	11,000	260,500
Fixtures,	269,100	1.44	33 92	9,128	176,100	93,000
Baskets, fruit and vegetable, ..	220,000	1.18	20 18	4,440	220,000	.....
Ship and boat building,	150,000	.80	16 30	2,400	150,000	.....
Agricultural implements,	80,000	.43	31 06	2,485	30,000	50,000
Brushes,	42,300	.22	34 96	1,479	42,300	.....
Handles,	41,200	.22	29 73	1,225	41,200	.....
Pulleys and conveyors,	40,000	.21	20 00	860	40,000	.....
Rollers and poles,	37,500	.20	20 00	750	37,500	.....
Boot and shoe findings,	35,500	.19	50 73	1,801	18,000	17,500
Chairs and chair stock,	33,000	.18	22 12	730	25,000	8,000
Refrigerators and kitchen cabinets,	21,600	.12	31 11	672	1,600	20,000
Manual training practice (sloyd),	14,400	.08	43 06	590	7,650	6,750
Whips, canes, and umbrella sticks,	12,500	.07	32 48	406	5,000	7,500
Machine construction,	8,500	.04	36 47	310	500	8,000
Clocks,	5,000	.03	60 00	300	.....	5,000
Machinery and apparatus, electrical,	2,000	.01	55 60	111	.....	2,000
Total,	18,698,836	100.00	\$29 53	\$552,118	7,933,764	10,765,072

BIRCHES.

Three species of birch are of commercial importance in Pennsylvania. They are sweet or cherry birch, in Pennsylvania often called black birch (*Betula lenta*), well distributed throughout the State; yellow birch (*Betula lutea*), found mainly on altitudes associated with beech, maple, ash, and elm; and that called red or river birch (*Betula nigra*), of little commercial importance, inhabiting the banks of streams and rivers in all parts of the State. In 1912, the cut of birch in Pennsylvania exceeded by nearly 8,000,000 feet the quantity of State-grown lumber reported by the manufacturers, these factories drawing forty-three per cent. of their requirements from the producing regions of other States, principally New York and Vermont. Sweet birch lumber can be identified by the fact that its sapwood is nearly white and its heartwood red or nearly black. It is a fine wood, hard and strong, easily worked, takes a high polish, due, it is claimed, to the bright lining of the wood cells, and takes stains readily, which allows its use in imitation of more

expensive cabinet woods. It has an intermediate grain, is hard, dense, heavy, moderately stiff, tough and durable, rather difficult to season, hard to split, and rather easy to work. Curly birch is an accidental structure in the wood, due to cross grain corresponding to the similarly figured maples and is highly prized by cabinet makers and manufacturers of high class furniture. Yellow birch is also an excellent wood. Much of it is marketed with sweet birch without distinction. In Pennsylvania it was not possible to determine to what extent the two woods were desired for similar purposes, or for what uses the manufacturers preferred the one to the other; so accordingly they have been presented in this report under one name.

In vehicle making birch bolts are used extensively in competition with elm for hubs, and it is in this industry that the red or river birch finds its chief market. Birch lumber cut from river birch is usually of low grade and most of that used in Pennsylvania was reported by the box makers, who used birch of all species in larger amounts than any other industry. The planing mills and fixture makers demanded birch for interior trim in imitation of mahogany, and the furniture makers called for it for the same reason because it is the nearest approach to mahogany of any of the domestic woods.

Table 28.—Consumption of Birch, year ending June, 1912.

Industry.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Boxes and crates, packing,	5,999,000	32.19	\$16 76	\$100,556	2,488,500	3,510,500
Planing mill products,	4,493,442	24.11	39 84	179,023	2,138,844	2,354,598
Vehicles and vehicle parts,	1,514,500	8.13	48 11	72,864	455,000	1,059,500
Furniture,	1,138,270	6.11	29 10	33,126	525,900	612,370
Laundry appliances,	1,090,000	5.85	12 72	13,860	1,070,000	20,000
Chairs and chair stock,	992,400	5.33	30 05	29,824	583,500	408,900
Fixtures,	832,300	4.47	36 60	30,461	438,500	393,800
Toys,	617,000	3.31	23 84	14,708	617,000	.....
Woodenware and novelties,	466,500	2.50	25 95	12,105	230,000	236,500
Mine equipment,	336,075	1.80	24 23	8,143	336,075	.....
Car construction,	312,845	1.68	28 86	9,029	231,045	81,800
Handles,	207,750	1.11	18 13	3,766	205,250	2,500
Dairymen's, poulterers' and ap- arists' supplies,	100,000	.54	18 00	1,800	100,000	.....
Plumbers' woodwork,	95,000	.51	30 95	2,940	75,000	20,000
Instruments, musical,	90,000	.48	23 89	2,150	50,000	40,000
Baskets, fruit and vegetable, ..	70,000	.38	22 43	1,570	70,000	.....
Refrigerators and kitchen cab- inets,	65,000	.35	25 15	1,635	30,000	35,000
Brushes,	51,000	.27	14 02	715	51,000	.....
Pumps,	50,000	.27	17 00	850	50,000	.....
Printing material,	30,000	.16	50 00	1,500	10,000	20,000
Agricultural implements,	20,000	.11	24 00	480	20,000	.....
Rollers and poles,	12,000	.06	14 00	168	12,000	.....
Pulleys and conveyors,	10,000	.05	20 00	200	10,000	.....
Frames and moulding, picture, ..	7,500	.04	75 00	562	.....	7,500
Clocks,	4,000	.02	45 00	180	.....	4,000
Machine construction,	3,000	.02	25 00	75	3,000	.....
Pipes, tobacco,	2,000	.01	50 00	100	.....	2,000
Caskets and coffins,	1,000	.01	24 00	24	1,000	.....
Miscellaneous,	25,000	.13	14 00	350	25,000	.....
Total,	18,635,582	100.00	\$28 05	\$522,774	9,826,614	8,808,968

THE HICKORIES.

Two industries in Pennsylvania, vehicle parts and handles, together use nearly five-sixths of the 18,000,000 feet of hickory going into products of final manufacture. The remainder is divided in varying small amounts among eighteen industries, of which car building, making of mine sprags, and machine construction are the principal ones. On account of the variety of special uses for which hickory is demanded, a large amount of waste is occasioned, both in the preparation of the raw material as well as in the finished commodity. This waste probably exceeds that of any other valuable hardwood.

Six species of hickory grow in Pennsylvania and some of them are found more or less generally throughout the State. In the tree they can be readily identified by their botanical characteristics, but when cut into lumber the species are difficult to distinguish. The information available to guide in their separation was so meager that they are therefore presented in this report under the generic name hickory. The growing scarcity of hickory, together with the fact that no suitable substitutes have been found for it in a number of its special uses, accounts for the high average price the manufacturers paid for it. Apart from its scarcity, the wood is a most valuable one, owing to its combination of qualities of extraordinary hardness, strength, toughness, and flexibility. No such combination exists in any other domestic hardwood. Further, it has a straight grain, is moderately elastic, hard to split, and very perishable; it is a difficult wood to season and to work and to be made to hold its shape.

Table 29.—Consumption of Hickory, year ending June, 1912.

Industry.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Vehicles and vehicle parts, ..	10,819,552	60.60	\$48 51	\$524,895	3,642,252	7,177,300
Handles,	3,973,350	22.26	31 97	127,045	2,599,300	1,374,050
Car construction,	1,115,306	6.25	24 50	27,325	343,697	771,609
Mine equipment,	816,363	4.57	13 51	11,031	816,363	.....
Machine construction,	695,000	3.91	27 27	19,063	643,000	56,000
Agricultural implements,	124,400	.70	33 41	4,156	99,400	25,000
Planing mill products,	80,100	.45	27 93	2,165	70,100	10,000
Shuttles, spools, and bobbins, ..	63,000	.35	46 58	2,960	30,000	33,000
Butchers' blocks and skewers, ..	50,000	.28	18 00	900	50,000	.....
Ship and boat building,	28,000	.16	65 00	1,820	26,500	1,500
Whips, canes, and umbrella sticks,	26,000	.15	55 85	1,452	.....	26,000
Ladders,	25,900	.14	18 00	450	25,000	.....
Chairs and chair stock,	15,000	.08	17 20	253	15,000	.....
Saddles and harness,	10,000	.06	60 00	600	.....	10,000
Rollers and poles,	2,500	.01	60 00	150	2,500	.....
Woodenware and novelties,	2,500	.01	60 00	150	2,500	.....
Fixtures,	1,000	.01	65 00	65	1,000	.....
Manual training practice (sloyd),	934	.01	70 66	64	234	700
Furniture,	750	.....	81 33	61	250	500
Printing material,	500	.....	50 00	25	500	.....
Total,	17,853,255	100.00	\$40 59	\$724,635	8,367,596	9,485,659

THE ASHES.

Ash is one of the most widely distributed of the North American trees. It ranges from the Rocky Mountain states eastward through every state but Maine, and the fact that 606 Pennsylvania sawmills in 1912 reported cutting this wood, indicates that the tree is also well distributed throughout this State. Manufacturers do not distinguish the species for particular uses but, like the oaks, they separate them into classes, white ash and black ash. In Pennsylvania the white ash (*Fraxinus americana*) and black ash (*Fraxinus nigra*) are the most important commercial species of ash growing within the State and they make up the bulk of the material which the Pennsylvania manufacturers consume. The white ash is one of Pennsylvania's valuable hardwoods. It possesses a coarse, straight grain, fine texture, is moderately hard and strong, besides being rather resilient and tough. However, it lacks durability. The manufacture of vehicle parts, handles, agricultural implements, boats, sporting goods, and framework of various kinds where the qualities of strength and toughness are desired call principally for white ash, both in Pennsylvania and the country at large.

The uses of black ash are quite different from those of the white ash because of its different qualities. It is much softer, not as strong or as elastic, and is more durable. Black ash has a pronounced attractive figure and is more desirable for decorative work. It is, therefore, called on to meet large demands for interior finish of houses, railroad and trolley cars. The lack of taste and odor makes ash valuable for containers of foodstuffs, such as butter tubs, woodenware, flour barrels, and boxes of various kinds. Only forty-six per cent. of the ash going into further manufacture was State-grown, in spite of the fact that the lumber cut exceeded by over 4,000,000 feet the amount of home-grown material used.

Table 30.—Consumption of Ash, year ending June, 1912.

Industry.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Car construction,	4,396,915	30.74	\$56 70	\$249,311	933,908	3,463,007
Vehicles and vehicle parts, ..	3,590,472	25.10	44 16	158,564	2,096,254	1,494,268
Handles,	1,969,750	13.77	28 45	56,032	1,130,750	839,000
Planing mill products,	791,315	5.53	51 89	41,062	538,165	258,150
Woodenware and novelties,	634,500	4.43	30 67	19,462	259,500	375,000
Agricultural implements,	599,100	4.19	38 73	23,202	103,100	496,000
Dairymen's, poulterers' and apiarists' supplies,	400,000	2.80	15 00	6,000	395,000	5,000
Ship and boat building,	388,700	2.72	41 47	16,118	262,700	126,000
Toys,	320,000	2.24	42 03	13,450	182,500	137,500
Furniture,	175,500	1.23	28 43	4,989	82,500	93,000
Plumbers' woodwork,	110,000	.77	34 00	3,740	.....	110,000
Chairs and chair stock,	104,300	.73	24 54	2,559	37,300	67,000
Saddles and harness,	100,000	.70	44 80	4,480	76,000	24,000
Elevators,	93,000	.65	71 17	6,619	48,600	49,400
Trunks and valises,	87,500	.61	36 42	3,187	87,500	.....
Machine construction,	83,000	.58	44 88	3,725	5,000	78,000
Equipment, playground,	75,000	.52	33 00	2,475	37,500	37,500
Boxes and crates, packing, ..	54,200	.38	23 51	1,274	53,500	700
Fixtures,	49,900	.35	58 62	2,925	41,000	8,900
Mine equipment,	43,425	.30	22.01	966	43,425	.....

Table 30—Concluded.

Industry.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Refrigerators and kitchen cabinets,	32,000	.22	38 19	1,222	4,000	28,000
Baskets, fruit and vegetable, ..	30,000	.21	21 00	650	30,000	.....
Sporting and athletic goods, ..	30,000	.21	66 83	2,005	30,000	.....
Machinery and apparatus, electrical,	25,000	.17	60 00	1,500	.....	25,000
Instruments, professional and scientific,	15,000	.10	58 67	880	5,000	10,000
Pulleys and conveyors,	15,000	.10	30 00	450	7,000	8,000
Brushes,	12,600	.09	34 29	432	12,600	.....
Frames and moulding, picture, ..	10,000	.07	35 00	350	10,000	.....
Rollers and poles,	6,150	.04	32 68	201	5,000	1,150
Instruments, musical,	5,300	.04	44 34	235	5,000	300
Ladders,	4,000	.03	70 00	280	4,000	.....
Manual training practice (sloyd),	1,100	.01	70 91	78	300	800
Laundry appliances,	1,000	.01	25 00	25	1,000	.....
Weighing apparatus,	900	.01	93 06	84	900	.....
Miscellaneous,	50,006	.35	25 00	1,250	50,000	.....
Total,	14,304,627	100.00	\$44 02	\$629,752	6,568,952	7,735,675

45.92% in. 54.08% out.

THE ELMs.

Only two species of elm were reported by the Pennsylvania wood users, white elm (*Ulmus americana*) and cork elm (*Ulmus racemosa*); but it is possible that small quantities of slippery elm (*Ulmus pubescens*)=(*U. fulva*) were used, but because it is cut in this State in only small quantities it is usually marketed mixed with white elm and, therefore, was not identified and reported separately. Cork elm is the most valuable of the three elms because the wood is most durable, but white elm in Pennsylvania is the most abundant species and composes the largest proportion of the 3,000,000 feet of elm that the Pennsylvania sawmills cut in 1912. Elm, irrespective of species, is one of the strongest and most elastic hardwoods growing in Pennsylvania. In addition to being heavy, tough, hard, and dense, it is hard to work and difficult to season. The two species reported are together demanded by 16 industries. The largest amount of the cork elm went to the vehicle maker, while the chair industry was foremost in demanding the white elm. The trunk makers also bid for a large amount of this wood for slat material.

Table 31.—Consumption of Elm*, year ending June, 1912.

Industry.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Chairs and chair stock,	6,213,500	59.85	\$26 76	\$166,243	62,000	6,151,500
Trunks and valises,	1,837,500	17.70	30 82	56,625	250,000	1,587,500
Dairymen's, poulterers' and ap- arists' supplies,	600,000	5.78	25 00	15,000	250,000	350,000
Woodenware and novelties, ...	500,000	4.83	23 00	14,000	.....	500,000
Vehicles and vehicle parts, ...	484,400	4.67	35 92	17,398	95,800	388,600
Boxes and crates, packing,	429,800	4.14	24 20	10,400	132,300	297,500
Baskets and veneer packages for fruit and vegetables,	115,000	1.11	21 87	2,515	115,000	.....
Car construction,	63,343	.61	49 43	3,131	.....	63,343
Agricultural implements,	50,000	.48	25 00	1,250	50,000	.....
Elevators,	32,500	.31	64 98	2,112	20,500	12,000
Toys,	25,000	.24	21 00	525	12,500	12,500
Patterns and flasks,	15,000	.14	33 00	495	.....	15,000
Mine equipment,	8,800	.08	26 14	230	8,800	.....
Planing mill products,	4,000	.04	23 00	92	4,000	.....
Machine construction,	2,000	.02	50 00	100	.....	2,000
Total,	10,380,843	100.00	\$27 95	\$290,116	1,000,900	9,379,943

9.64% in. 90.36% out.

*The white and cork elm groups have been combined in this table.
In Part II of this report the information is given separately.

COTTONWOOD.

(Populus deltoides).

Cottonwood belongs to a widely distributed tree family, which includes the willows, aspen, balm of gilead, and other poplars (not yellow poplar). The cottonwood referred to in this report is the *Populus deltoides*, the tree found in large sizes and most abundant in the lower Mississippi Valley. It grows in moist soil in almost all the states east of the Rocky Mountains. Owing to the difficulty in seasoning cottonwood, it is better adapted for veneer than lumber. Yellow and white cottonwood are often distinguished in trade. The former refers to the heartwood, the latter to the light colored sapwood of the tree. However, the amount consumed for veneer production in the United States is only about 10 per cent. of the lumber cut. The manufacturers of built up lumber used this wood in large amounts as veneer. On account of its qualities of toughness, flexibility, and its capacity for being easily worked, it is especially adapted for bent work as in vehicle bodies and auditorium chairs. It is also popular with trunk makers for trunk boxes and tops. The lumber serves many uses as a substitute for basswood and yellow poplar, and, like these woods, is light, weak, and non-durable; but of fine even texture and a lack of taste and odor. The last two named qualities commend it as a material for food containers, while for packing cases and crates its other excellent qualities, combined with its whitish color, make it especially desirable as a background for printing and stenciling. This tree is not commonly cut in Pennsylvania, which accounts for the fact that only about one and one-half per cent. of the total amount used was State-grown. Eleven industries

together demand over six and one-third million feet of cottonwood, of which 74 per cent. is used by the box industry, nearly 8 per cent. for laundry appliances, and 6 per cent. by the furniture makers.

Table 32.—Consumption of Cottonwood, year ending June, 1912.

Industry.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Boxes and crates, packing,	4,680,000	73.86	\$24 60	\$115,135	40,000	4,640,000
Laundry appliances,	500,000	7.89	32 90	16,450	.....	500,000
Furniture,	380,000	6.00	34 87	13,250	.....	380,000
Planing mill products,	330,000	5.21	25 36	8,370	.....	330,000
Trunks and valises,	177,350	2.80	37 95	6,731	.....	177,350
Refrigerators and kitchen cabinets,	150,000	2.37	32 00	4,800	.....	150,000
Vehicles and vehicle parts,	64,000	1.01	34 88	2,200	24,000	40,000
Fixtures,	40,000	.63	38 50	1,540	20,000	20,000
Sporting and athletic goods, ..	10,000	.16	32 00	320	.....	10,000
Dairymen's, poulterers' and apiarists' supplies,	2,500	.04	40 00	100	2,500	.....
Pulleys and conveyors,	2,000	.03	21 00	42	2,000	.....
Total,	6,335,850	100.00	\$26 6¢	\$168,988	88,500	6,247,350

THE GUMS.

Black gum is the common name given in various states to three trees, black or sour gum (*Nyssa sylvatica*), cotton gum or tupelo (*Nyssa aquatica*), and water gum (*Nyssa biflora*), all belonging to the dogwood family. Red gum, though it bears the name of "gum" does not belong to the same family and, therefore, has been discussed under a separate heading. One of the above named species, the black or sour gum, grows within the State. It is found in wet lowlands and along the slopes of the foothills and mountains. It is not abundant and only a little over 5 per cent. of the total of nearly 5,000,000 feet used by 11 industries is State-grown wood. It attracts attention by its bright green summer foliage, which in the autumn turns to brilliant yellow and red, and also by its clusters of two or three oblong berries of bluish black color and sour taste. The wood of this tree has an interlaced fiber and is difficult to split and work; hence it is valuable for certain special uses, such as vehicle hubs, pulleys, mine rollers, mauls, mallets, and cogs. In the South it is cut into veneer and goes into wooden dishes, berry cups, fruit baskets, and veneer boxes.

Table 33.—Consumption of Black Gum, year ending June, 1912.

Industry.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Boxes and crates, packing,....	3,089,800	62.33	\$15 36	\$47,463	.....	3,089,800
Mine equipment,.....	1,628,460	32.85	24 37	39,678	219,216	1,409,244
Vehicles and vehicle parts,....	181,800	3.67	37 57	6,831	31,500	150,300
Baskets, fruit and vegetable,..	20,000	.41	22 00	440	20,000	.....
Pulleys and conveyors,.....	14,000	.28	33 71	472	.....	14,000
Instruments, professional and scientific,.....	12,000	.24	52 83	634	2,000	10,000
Rollers and poles,.....	6,000	.12	20 00	120	.....	6,000
Ship and boat building,.....	3,000	.06	70 00	210	.....	3,000
Fixtures,.....	1,000	.02	28 00	28	.....	1,000
Car construction,.....	600	.01	58 00	35	.....	600
Patterns and flasks,.....	500	.01	24 00	12	.....	500
Total,.....	4,957,160	100.00	\$19 34	\$95,923	272,716	4,684,444

Cotton Gum (Nyssa aquatica).

Most of the cotton gum or tupelo lumber came from Virginia and the Carolinas. It grows only on the swamps and lowlands and in lumber can be distinguished from the black (sour) gum by its darker yellowish hue, its tendency to split straight, besides being soft and more easily worked. Nearly 6,000,000 feet of this wood is demanded by eight industries. The box makers use most of it. Cigar box material also claims a fairly large amount. The two industries together consume 92 per cent. of the total.

Table 34.—Consumption of Cotton Gum, year ending June, 1912.

Industry.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Boxes and crates,.....	3,458,722	58.05	\$14 13	\$48,873	.....	3,458,722
Boxes, cigar,.....	2,043,917	34.31	63 37	129,519	.....	2,043,917
Furniture,.....	236,500	3.97	33 54	7,933	.....	236,500
Planing mill products,.....	151,648	2.54	26 55	4,027	.....	151,648
Agricultural implements,.....	35,000	.59	36 00	1,260	.....	35,000
Instruments, musical,.....	20,000	.34	25 00	500	.....	20,000
Woodenware and novelties,.....	6,900	.12	20 00	138	.....	6,900
Toys,.....	5,000	.08	20 00	100	.....	5,000
Total,.....	5,957,687	100.00	\$32 29	\$192,350	.....	5,957,687

CHERRY.

(Prunus serotina).

In the lumber cut of cherry, Pennsylvania is second only to West Virginia. Notwithstanding the fact that the production of cherry in Pennsylvania is nearly 5,000,000 feet more than the consumption, one-third of the requirements of the manufacturers was supplied by the forests of other states. Black cherry is the only cherry species used commercially. Its technical quality is high in that it combines strength and hardness, a fine straight grain, compact structure, and stability. It also takes a fine polish and excels most other hardwoods in its capacity to hold its shape. It is this quality which commends it for electrotype backing. In Pennsylvania this is its chief use. The car manufacturers give it preference over any other domestic wood for the best grade interior finish of passenger coaches. It is a favorite with the fixture and furniture manufacturers. The qualities, in addition to those mentioned above, are durability, stiffness, density, and ease in splitting. It is somewhat brittle, with a fine, straight grain.

Table 35.—Consumption of Black Cherry, year ending June, 1912.

Industry.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Printing material,	1,166,800	42.84	\$29 14	\$34,003	634,000	532,800
Brushes,	482,900	17.73	25 43	12,282	482,900	.....
Car construction,	431,414	15.84	60 50	26,140	216,951	214,463
Pianoing mill products,	177,385	6.51	64 48	11,438	110,085	67,390
Fixtures,	128,700	4.73	66 14	8,512	83,250	45,450
Furniture,	113,900	4.18	34 74	3,957	105,600	8,300
Patterns and flasks,	86,894	3.19	71 58	6,220	54,644	32,250
Boxes and crates, packing,	70,000	2.57	19 00	1,330	70,000	.....
Caskets and coffins,	20,000	.73	60 00	1,200	20,000	.....
Instruments, professional and scientific,	10,000	.37	100 00	1,000	.....	10,000
Handles,	7,500	.28	50 00	375	2,500	5,000
Refrigerators and kitchen cabinets,	7,500	.28	62 50	469	7,500	.....
Weighing apparatus,	7,500	.28	27 90	202	7,500	.....
Instruments, musical,	4,400	.16	75 68	333	3,600	800
Plumbers' woodwork,	4,400	.16	94 55	416	400	4,000
Vehicles and vehicle parts,	2,250	.08	91 56	206	2,000	250
Manual training practice (sloyd),	1,850	.07	55 68	103	1,850	.....
Sporting and athletic goods, ..	100	.....	46 00	5	100	.....
Total,	2,723,493	100.00	\$39 73	\$108,191	1,802,880	920,613

BLACK WALNUT.

(Juglans nigra).

The cut of black walnut in Pennsylvania is equal to three times the total consumed by the factories and five times the quantity of the home grown wood that they report. Black walnut is the most expensive hardwood native to Pennsylvania and was demanded by 17 industries. It is very durable, easy to work, hard, porous, strong, stiff, heavy, stable in place, non-elastic, and with an intermediate straight grain. The makers of caskets and coffins used

the most, followed by the manufacturers of organs and furniture, using nearly equal quantities, and by 14 other industries demanding varying smaller amounts.

Table 36.—Consumption of Black Walnut, year ending June, 1912.

Industry.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Caskets and coffins,	214,000	27.35	\$59 50	\$12,732	182,000	32,000
Instruments, musical,	131,200	16.77	44 05	5,779	67,700	63,500
Furniture,	130,000	16.61	95 04	12,365	21,000	109,100
Planing mill products,	77,265	9.87	111 31	8,600	52,365	24,900
Car construction,	56,890	7.27	101 13	5,753	980	55,910
Chairs and chair stock,	50,000	6.39	66 08	3,304	44,000	6,000
Fixtures, musical,	35,860	4.58	82 31	2,973	28,860	7,000
Clocks,	21,000	2.68	50 95	1,070	21,000	.....
Patterns and flasks,	14,500	1.85	50 00	725	4,500	10,000
Frames and mouldings, picture,	10,500	1.34	80 67	847	4,500	6,000
Machinery and apparatus, elec- trical,	2,500	.32	40 00	100	2,500	.....
Vehicles and vehicle parts,	1,400	.18	91 42	128	1,100	300
Handles,	1,050	.14	81 90	86	1,050	.....
Brushes,	1,000	.13	80 00	80	1,000	.....
Manual training practice (sloyd),	850	.11	87 06	77	650	200
Plumbers' woodwork,	300	.04	35 00	10	300	.....
Miscellaneous,	34,200	4.37	71 81	2,456	10,200	24,000
Total,	782,615	100.00	\$72 94	\$57,085	443,705	338,910

SYCAMORE.

(*Platanus occidentalis*).

Not more than 4½ per cent. of the requirements of the Pennsylvania wood-users was drawn from the State-grown sycamore. This is not surprising, as this species is not an important lumber tree in this State. Sycamore's fine grain revealed by rift sawing and its rich color commend its use for cabinet work. It has a coarse, distinct grain, somewhat contorted, and is hard, heavy, stiff, hard to split, moderately strong and durable, difficult to season and to work, and unstable in holding its shape. Forty-two mills report it, but only in small quantities. Probably the most exacting use of this wood in the country at large is for butcher blocks, but in Pennsylvania none of the manufacturers report using it for that purpose. The chair makers demanded the most that was used, almost 72 per cent. of the total, while the rest was about equally distributed among five other industries, the brush makers being the most important.

Table 37.—Consumption of Sycamore, year ending June, 1912.

Industry.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.				
Chairs and chair stock,	500,000	71.73	\$25 00	\$12,500	.....	500,000
Brushes,	71,000	10.19	26 00	1,846	.....	71,000
Furniture,	66,170	9.49	43 89	2,904	3,000	63,170
Planing mill products,	23,300	4.06	45 72	1,294	17,000	11,300
Ship and boat building,	20,000	2.87	65 00	1,300	.....	20,000
Boxes and crates, packing,	11,603	1 66	16 00	186	11,603	.....
Total,	697,073	100.00	\$28 73	\$20,030	31,603	665,470

HORNBEAM.

(Ostrya virginiana).

Hornbeam is frequently called ironwood because of its great weight and strength. It has an intermediate grain, is somewhat contorted, is very hard and dense, tough, stiff, durable, and difficult to split, besides being heavy, difficult to season and hard to work, but capable of wearing smooth by use. The wood being heavy, tough, and resilient, is used extensively by the handle makers and the manufacturers of vehicle parts. Its other uses in this State are for mine sprags and for sides of cheese boxes. It is possible that the material reported for the last named use may have been blue beech (*Carpinus caroliniana*), which is also called ironwood and closely resembles hornbeam. Nearly three-fourths of the total amount of the material that is used was supplied by the State, while of that coming from a distance a part was supplied by Canadian forests.

Table 38.—Consumption of Hornbeam, year ending June, 1912.

Industry.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.				
Handles,	415,500	75.93	\$49 53	\$20,580	315,500	100,000
Vehicles and vehicle parts, ...	100,000	18.23	30 00	3,000	50,000	50,000
Mine equipment (sprags),	21,684	3.96	13 14	285	21,684	.....
Dairymen's, poulterers', and apiarists' supplies,	10,000	1.83	12 00	120	10,000	.....
Total,	547,184	100.00	\$43 83	\$23,985	397,184	150,000

BLACK LOCUST.

(*Robinia pseudacacia*=*R. Pseudo-Acacia*).

All the black locust used by the Pennsylvania manufacturers was grown in the State, and in quantity was equal to more than one-tenth of the total lumber cut of locust in the United States. This was because the wood is demanded for uses which usually require raw material in the forms of billets and bolts, and it is an exception that it leaves the sawmills in the form of planks or boards. Only three industries use this wood in Pennsylvania and two of them cut it into billet form. They are the makers of insulator pins, brackets, and mine sprags. The third industry, vehicle part manufacture, purchases locust in bolt form and uses it for wagon hubs. This species has the distinction of being the most durable native hardwood both in the open when exposed and in contact with the ground, thus accounting for its extensive demand for fence posts. It has a coarse, straight grain, is hard, porous, heavy, and tough, splits easily, holds its shape well, and easily turned.

Table 39.—Consumption of Black Locust, year ending June, 1912.

Industry.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Insulator pins and brackets,	463,500	91.63	\$23 90	\$11,076	463,500	.....
Mine equipment (sprags),	31,350	6.20	10 18	319	31,350	.....
Vehicles and vehicle parts,	11,000	2.17	18 73	206	11,000	.....
Total,	505,850	100.00	\$22 93	\$11,601	505,850	.....

CUCUMBER.

(*Magnolia acuminata*).

This tree frequents the mountain slopes and grows to large and symmetrical dimensions. It is a member of the magnolia family, which includes the yellow poplar. It derives its name from the similarity in form and appearance of its fruit cone to the cucumber. The appearance and technical quality of the wood so resemble yellow poplar and the uses of the two are so nearly identical that as a rule they are marketed together without distinction. Owing to this fact it is probable that the manufacturers use more cucumber than the table shows, and it also accounts for Pennsylvania's not being included with West Virginia and Virginia in the production of this kind of lumber. The principal industries using this wood are planing mill products and boxes.

Table 40.—Consumption of Cucumber, year ending June, 1912.

Industry.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Planing mill products,	267,300	76.07	\$27 00	\$7,217	255,300	42,000
Boxes and crates,	70,000	19.92	17 00	1,190	.....	70,000
Pulleys and conveyors,	10,000	2.85	18 00	180	10,000	.....
Vehicles and vehicle parts,	3,800	1.08	25 00	95	.....	3,800
Agricultural implements,	300	.08	30 00	9	300	.....
Total,	351,400	100.00	\$24 73	\$8,691	235,600	115,800

BUCKEYE.

Buckeye, like cucumber, often loses its identity and goes to market mixed with yellow poplar. It is called for separately by the manufacturers of artificial limbs to meet what may probably be termed its most exacting use, but for this purpose was not reported in Pennsylvania. The wood is light, soft, cross grained, compact, and difficult to split. The color is creamy white and so uniform that the sapwood can hardly be distinguished from the heartwood. Two species of buckeye are native to Pennsylvania, the fetid buckeye (*Aesculus glabra*) and the yellow or sweet buckeye (*Aesculus octandra*). The western part of this State is the eastern limit of both species and it is impossible to ascertain the quantity of each that the manufacturers use. This wood is more evenly distributed among the various classes of manufacture calling for it than any other shown in this report.

Table 41.—Consumption of Buckeye, year ending June, 1912.

Industry.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Laundry appliances,	125,000	38.56	\$28 00	\$3,500	125,000	.....
Woodenware and novelties,	83,703	25.82	25 00	2,093	.....	83,700
Boxes and crates, packing,	80,500	24.83	22 99	1,851	40,000	40,500
Planing mill products,	35,000	10.79	20 71	725	19,000	16,000
Total,	324,200	100.00	\$25 19	\$8,168	184,000	140,200

APPLEWOOD.

(Pyrus species).

This wood may be of many species and is consumed in larger quantities in Pennsylvania than in any other state in which reports similar to this have been made. It is demanded for a few special purposes, the manufacture of smoking pipes being the most important, while under the heading of printing material, it is used for wood type. As in other states, it is used for making carpenters' tools, particularly handsaw handles.

Table 42.—Consumption of Applewood, year ending June, 1912.

Industry.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Pipes, smoking,	121,435	70.42	\$52 42	\$6,372	61,435	60,000
Handles,	50,000	29.00	40 00	2,000	25,000	25,000
Handles,	1,000	.58	50 00	50	1,000	.....
Total,	172,435	100.00	\$48 84	\$8,422	87,435	85,000

DOGWOOD.

(Cornus florida).

Nearly all of the dogwood going into final manufacture in Pennsylvania was grown in the State. It is exceedingly hard, strong, of compact structure, and tough, and these qualities together with its ability to wear smooth give it preference over any other wood in the manufacture of shuttles, and commend it for mine sprags. These two industries use 95 per cent. of the total amount reported. Three other industries use the remainder.

Table 43.—Consumption of Dogwood, year ending June, 1912.

Industry.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Mine equipment (sprags),	139,083	84.74	\$15 73	\$2,188	139,083	.....
Shuttles, spools, and bobbins, ..	17,585	10.71	69 60	1,224	.....	17,585
Instruments, scientific and professional,	7,200	4.39	38 47	277	1,000	6,200
Handles,	230	.14	67 57	16	.....	230
Manual training practice (sloyd), ..	34	.03	90 00	3	34	.....
Total,	164,137	100.00	\$22 59	\$3,708	140,122	24,015

PERSIMMON.

(Diospyros virginiana).

The persimmon tree belongs to the ebony family which is confined largely to tropical regions. The wood has all the good qualities of ash, works more smoothly, and retains a friction polish. Besides it has a very fine, rather straight grain, and is hard, strong, tough, porous, very heavy, and splits easily. Persimmon has two important uses for which there is extensive demand, last-blocks for children's shoes, and shuttles used in textile mills. In the country at large, the greatest quantity probably goes to the latter industry, but in Pennsylvania the makers of boot and shoe findings used all but 12½ per cent. of the quantity consumed.

Table 44.—Consumption of Persimmon, year ending June, 1912.

Industry.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Boot and shoe findings,	99,000	87.60	\$59 19	\$5,860	.....	99,000
Shuttles, spools and bobbins, ..	7,010	6.20	60 06	421	.....	7,010
Handles,	7,000	6.20	54 00	378	.....	7,000
Total,	113,010	100.00	\$58 92	\$6,659	.....	113,010

BUTTERNUT.

(Juglans cinerea).

Butternut is relatively common on good soil in Pennsylvania. It is used by a greater number of industries in this State than in any other. Nearly 92 per cent. of the total quantity used in Pennsylvania is grown in the State. The most surprising fact in connection with the use of this wood is the consumption of butternut for excelsior at the low price of \$15 per thousand feet. The excelsior makers used more than one-third of all reported, while the fixture manufacturers, the ship builders, and the manufacturers of pulleys were the next in importance, these four industries together consuming 74 per cent. of the total. The rest went to four other industries in varying small amounts. Butternut is often called white walnut. Its qualities include porousness, brittleness, stiffness, lack of resiliency, capacity to split, easy to work, and it is considerably lighter, weaker, and less durable than black walnut.

Table 45.—Consumption of Butternut, year ending June, 1912.

Industry.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Excelsior,	30,000	34.56	\$15 00	\$450	30,000	.....
Fixtures,	13,500	15.55	44 30	598	13,500	.....
Ship and boat building,	10,000	11.52	80 00	800	7,000	3,000
Pulleys and conveyors,	10,000	11.52	20 00	200	10,000	.....
Planing mill products,	9,600	11.06	30 21	290	6,600	3,000
Patterns and flasks,	5,210	6.00	79 85	416	3,900	1,310
Boxes and crates, packing,	5,000	5.76	16 00	80	5,000	.....
Furniture,	3,500	4.03	26 61	93	3,500	.....
Total,	86,810	100.00	\$33 72	\$2,927	79,500	7,310

MINOR SPECIES.

Domestic woods used in only small amounts, and not of sufficient importance to discuss separately, are as follows: Holly (American), used by the novelty makers, brought in from the southern Mississippi Valley; State-grown aspen (popple), used for excelsior; willow for woodenware, likewise produced in the State; home-grown mountain laurel used by the furniture makers; and sassafras cut in Maryland and purchased by the ship builders.

FOREIGN WOODS.

This term is employed to cover all woods brought into Pennsylvania from foreign countries other than Canada. There are ten of them and Spanish cedar in quantity is the most important.

Only two states have shown so large a consumption of Spanish cedar as Pennsylvania. Nearly 6,000,000 feet is consumed annually and comes principally from the West Indies and Mexico. This tree is not a softwood like the native cedars, nor is it related. It has broad leaves, confining its range to the tropical countries. Its aromatic odor, pleasing color, and lightness, together with the fact that it holds its shape and is easily worked, make it the favorite cigar box wood. Boat builders and furniture makers in Pennsylvania also report this wood in small quantities.

Over 3,500,000 feet of mahogany is brought into the State each year. The furniture makers use the largest amount, although 17 other classes of manufacturers demand it for raw material, and seven of them in quantities exceeding 100,000 feet. The supply of true mahogany comes from Mexico, the West Indies, Central America, and a few states in South America, but it was not possible in any way to ascertain which of these countries supplied the Pennsylvania factories, as mahogany lumber is purchased from American dealers who import the logs and cut them in this country.

Ebony comes next as to quantity among the imported woods and surpasses the consumption of this wood in any other state. The most is used for umbrella handles although the demand for smoking pipe material is also considerable. There are many species of ebony and they are found in various countries. Probably the kind coming from Madagascar and India is used most commonly in this country.

Boxwood comes to this country from Turkey and the West Indies. From the high average price paid for that used in Pennsylvania, it is safe to conclude that most of it was Turkish wood which is much more costly. Boxwood was imported into this State to make shuttles for silk weaving and to furnish material for wood engravings.

Teakwood, strong and very hard, and with a smooth oily texture, is imported from Ceylon, Siam, and India, and in Pennsylvania the entire supply went to two industries, ship building and patterns.

Circassian walnut grows in the mountains in southern Russia near the Black Sea. While very expensive, it is held in high favor in this country for furniture, store, office, and bar fixtures, and cabinet work. It is nearly always used as veneer with a backing or core of an inexpensive native wood.

The olive wood went to the smoking pipe manufacturers. It was brought from France in the form of billets.

Rosewood was the highest priced wood that was purchased in the form of lumber by the Pennsylvania manufacturers. It is a native of Central America and the northern states of South America.

Lignum-vitae was imported in log or in bolt form from practically the same region as rosewood. It is a wood of special value on account of its extraordinary weight and strength. Bowling balls are turned from this wood after long and careful seasoning.

The eucalyptus used in Pennsylvania comes from Australia and goes to the furniture makers. The eucalyptus grown in the United States is not valued for so many uses as is the imported wood.

Description of Qualities.

Grain: Very coarse, coarse, intermediate, fine, very fine.

Width of sapwood: Very narrow, narrow, medium, wide.

Hardness: Very hard, hard, fairly* hard, soft, very soft.

Density: Dense, fairly dense, slightly porous, porous, very porous.

Weight: Very light, light, medium, moderately* heavy, heavy, very heavy.

Strength: Very strong, strong, moderately strong, weak.

Flexibility and stiffness: Very stiff, stiff, moderately stiff, fairly flexible, flexible, very flexible.

Elasticity: Very elastic, elastic, moderately elastic, non-elastic.

Toughness and Brittleness: Very tough, tough, moderately tough, slightly brittle, brittle, very brittle.

Tendency to Split: Splits easily, splits rather easily, hard to split, very hard to split.

Durability: Very durable, durable, moderately durable, perishable, very perishable.

Stability in Holding Shape: Stable, moderately stable, unstable, very unstable.

Working Quality: Very easy to work, easy to work, fairly hard to work, hard to work.

*Fairly and moderately have the same value in the scale of terms.

PART II.

INDUSTRIES.

The kinds of wood the Pennsylvania manufacturers demand, their botanical relations, their sources, and their qualities, have been discussed in Part I. In Part II are considered the factories using the different woods, and the processes of manufacture that they employ; the extent to which they call for them, and the uses to which they put them according to inherent qualities. For convenience the discussions are divided into classes called industries and those making similar or closely related commodities are grouped together. In Pennsylvania there are 51, and Table 46 following shows how the more than 1,100,000,000 feet of lumber yearly manufactured in the State is apportioned among them. The largest industry requires nearly 280,000,000 feet of raw material, 14 others more than 10,000,000 each, and the smallest less than 100,000. A few other industries which could not be separated because the factories composing them numbered fewer than three, have been grouped in one industry under miscellaneous. To maintain uniformity the same order in classification as has been adopted to other states has been followed in Pennsylvania. Their order has been arranged according to the total quantity used and is as follows:

Table 46.—Summary by Industries of Woods used in Pennsylvania, year ending June, 1912.

Industry.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.				
Planing mill products,	281,717,600	25.28	\$33 46	\$9,427,936	83,652,088	198,065,512
Boxes and crates, packing, ...	273,904,094	24.58	18 00	4,928,991	51,353,325	222,550,769
Car construction,	228,380,900	20.50	29 53	6,748,700	41,069,552	187,311,348
Furniture,	58,995,170	5.29	35 24	2,078,971	19,045,400	89,949,770
Chairs and chair stock,	33,117,000	2.97	25 80	854,412	14,406,600	18,710,400
Vehicles and vehicle parts, ..	31,801,509	2.85	42 63	1,355,655	13,482,774	18,318,735
Ship and boat building,	25,716,000	2.40	38 44	1,026,722	11,017,200	15,698,800
Caskets and coffins,	13,982,500	1.26	29 77	416,278	4,044,500	9,938,000
Mine equipment,	11,948,897	1.07	19 52	233,283	9,173,653	2,775,244
Fixtures,	11,888,220	1.07	42 25	502,323	3,685,310	8,202,910
Boards—cloth, hosiery, etc., ..	11,775,000	1.06	25 69	314,315	50,000	11,725,000
Patterns and flasks,	11,085,011	1.03	51 39	590,700	2,887,092	8,607,919
Handies,	11,014,907	.99	26 68	298,919	7,425,050	3,589,857
Laundry appliances,	10,795,700	.97	22 17	239,336	6,631,500	4,164,200
Boxes, cigar,	9,930,755	.89	92 77	921,242	24,500	9,906,255
Woodenware and novelties, ...	8,574,780	.77	23 57	202,141	5,328,622	3,246,155
Tanks and silos,	7,853,200	.71	36.07	283,240	150,000	7,703,200
Machine construction,	7,040,350	.63	29 33	206,508	3,858,200	3,182,150
Agricultural implements,	7,004,800	.63	32 89	230,387	2,134,000	4,870,800
Toys,	6,421,500	.58	28 37	182,193	5,004,300	1,417,200
Trunks and valises,	4,122,850	.37	29 72	122,520	1,238,000	2,884,850
Brushes,	4,087,090	.36	22 34	90,189	3,761,700	275,390
Shuttles, spools, and bobbins, ..	3,347,985	.30	27 14	90,888	1,970,000	1,377,985
Dairymen's, poulterers' and apiarists' supplies,	3,240,450	.29	23 82	77,188	1,326,000	1,914,450
Instruments, musical,	2,945,000	.26	39 38	115,982	748,200	2,196,800

Table 46—Concluded.

Industry.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Machinery and apparatus, electrical,	2,715,200	.24	31 54	85,633	456,100	2,259,100
Pumps,	2,682,000	.24	23 90	64,835	2,075,000	617,000
Baskets and veneer packages for fruit and vegetables,	2,683,000	.24	19 44	52,156	2,408,000	275,000
Frames and moulding, picture, Refrigerators and kitchen cabinets,	2,619,000	.24	25 00	65,480	1,040,500	1,578,500
	2,463,800	.22	30 73	75,720	1,002,250	1,461,550
Excelsior,	1,682,000	.15	14 28	24,016	1,682,000	.....
Equipment, playground,	1,507,300	.14	23 60	43,106	497,800	1,009,500
Printing material,	1,274,326	.11	31 27	39,853	668,000	606,326
Ladders,	1,108,500	.10	29 16	32,321	251,000	857,500
Elevators,	1,008,900	.09	42 08	42,459	245,100	763,800
Whips, canes, and umbrella sticks,	882,880	.08	63 90	56,412	500,100	382,780
Plumbers' woodwork,	584,250	.05	39 43	23,055	145,700	438,550
Insulator pins and brackets, ..	578,500	.05	21 65	12,526	578,500	.....
Butchers' blocks and skewers, ..	520,000	.05	20 77	10,800	520,000	.....
Weighing apparatus,	393,400	.04	31 93	12,561	39,400	354,000
Instruments, professional and scientific,	326,448	.03	57 44	18,750	8,500	317,948
Pulleys and conveyors,	294,500	.03	29 30	8,629	200,500	94,000
Boot and shoe findings,	265,000	.02	56 51	14,975	18,000	247,000
Pipes, tobacco,	227,515	.02	165 49	37,651	61,435	166,080
Sporting and athletic goods, ..	215,150	.02	33 76	8,339	139,100	76,050
Saddles and harness,	188,000	.02	55 32	10,400	136,000	52,000
Gates and fencing,	161,340	.01	22 58	3,643	16,500	144,840
Clocks,	139,500	.01	65 08	9,078	26,000	113,500
Rollers and curtain poles,	125,575	.01	19 77	2,483	115,000	10,575
Manual Training practice (sloyd),	95,945	.01	66 44	6,375	51,875	44,070
Miscellaneous,	7,416,353	.67	26 09	193,466	7,333,703	82,650
Total,	1,114,219,650	100.00	\$29 15	\$32,483,227	313,683,632	800,536,018

In the consumption of wood four classes of factories in Pennsylvania lead all other states: brushes, patterns and flasks, toys, and mine equipment; in seven others the State stood second; car construction, printing material, caskets and coffins, laundry appliances, playground equipment, machine construction, and tobacco pipes. The State was third in box making and the manufacture of wooden clock cases. Excelsior factories, manufacturers of insulator pins and brackets, and the makers of butcher blocks and skewers were the only industries procuring all of their wood from the forests of the State. Nineteen others use a larger amount of State-grown than shipped-in material, leaving 29 that find the major portion of their wood supply out of the State, every industry reported the purchase of some Pennsylvania wood. It is surprising that the box makers, who use only low grades, used more shipped-in material than any other industry, while on the other hand, the handle makers, who usually seek their raw material over a wide extent of territory, procured considerably over two-thirds of their needs within the State.

Nearly \$32,500,000 are annually expended by the Pennsylvania wood users for raw material. Not over 20 per cent. of this is paid for home-grown woods,

leaving not less than \$25,000,000, a large portion of which each year goes to other states. In a great many cases this purchase money could be expended at home, since it is quite evident that the State is not manufacturing as much of its annual cut as is possible. On the succeeding pages the several industries are considered separately in the order of the quantity of wood consumed.

PLANING MILL PRODUCTS.

The extent to which lumber is used in Pennsylvania in the manufacture of building materials is shown statistically in Table 47. This does not, of course, include large quantities of rough lumber used for construction which needs no further change than the hatchet, chisel, and saw to fit it to place on the building. The factories grouped into this industry include four classes. (1) Factories specializing in the manufacture of sash, doors, and blinds or any one of these commodities. Formerly these products were made by small mills operating in nearly every town and city in Pennsylvania doing a general planing mill business but within recent years specialty manufacturing in enormous quantities has demonstrated that these commodities can be manufactured, distributed, and sold cheaper than they can be made at home in small quantities. (2) Factories producing only planing mill products or the more universal commodities kept in stock like flooring, ceiling, siding, stock finish, etc. Planing mills operated in connection with large sawmills are the principal source of these commodities but portable mills having planers and local sash and door factories also produce large quantities. In this class are included mills specializing in the manufacture of hardwood flooring which in Pennsylvania is an important industry, also parquetry flooring. (3) There are planing mills and builders' factories engaged in the general planing mill business. This class is the most numerous and widely distributed over the State. They manufacture chiefly according to special design and usually for local consumption. Included in their production are special size sash, doors, blinds, and in small quantities floorings, ceiling, etc., besides material for window and door frames, stair work, cupboards, mantels, panel work, colonnades, grills, and all exterior and interior house finish. A number of factories belonging to this class are formidable industries, especially those located in cities. (4) Industries other than wood-using that maintain a woodworking shop equipped to manufacture various commodities like those mentioned above for their own needs and mainly for the repair and upkeep of their own plant. Steel mills, collieries, railroad companies, textile mills, and various other large manufacturing enterprises are examples.

Over 25 per cent. of the lumber cut of the United States is demanded for manufacturing products belonging to this industry and more wood and a greater number of kinds goes into this line of manufacture than into any other. It is not surprising, therefore, that these same facts apply to Pennsylvania and that in this report the planing mill industry as to quantity leads all others. The table following lists the kinds and amounts of woods used but in no manner does it represent all the lumber required in the State in this line.

Forty-four kinds of wood were reported by the factories grouped under this industry which is the largest number making up any of the forty-eight industries comprising this report. This can probably be explained by the many and varied uses of lumber for building purposes in which operations range as in Pennsylvania from the construction of a rude shanty to expensive palatial residences.

An examination of the list of woods in the table shows that a number of the species used in large amounts do not grow plentifully in the State. The Pacific coast states furnished a considerable quantity, including western white

pine, western yellow pine, redwood, Douglas fir, western red cedar, Sitka spruce, and sugar pine. The region of the southern states contributed large amounts, equivalent to 34 per cent. of all, including more particularly the several species of southern yellow pine lumber and cypress. The Ohio valley, the Lake states, and New England, sent in varying amounts, which explains the comparatively small quantity of home-grown woods used by the planing mills. It must be remembered, however, a large number of these species are not common lumber trees in Pennsylvania.

Only 28 per cent. of the total amount of lumber used was produced in the State. But of the species consumed that are plentifully cut in Pennsylvania, the reports show the demand for a high per cent. of home-grown woods. For instance, over 45 per cent. of the white pine, 67 per cent. of the hemlock, one-third of the chestnut, 80 per cent. of the sugar maple and beech, 60 per cent. of the birch, and half of the basswood reported by the planing mills, were cut from State timber, indicating the importance the forests bear to the development of the State. The planing mill industry is not only the most prominent wood consuming industry in the State but it appeals more widely to the interest of every class of citizens than any other. In order that the supply of lumber the State contributes for building material may be maintained and probably increased in the future, it is necessary to protect and improve the forests as far as possible. With this in view the Commonwealth has put into effect and has in operation a progressive forest policy which if given popular support will help to solve the problem of future lumber supply.

Table 47.—Wood for Planing Mill Products, year ending June, 1912.

Kind of Wood.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.				
White pine,	62,556,492	22.21	\$36 53	\$2,285,337	29,261,299	33,295,193
Shortleaf pine,	51,870,590	18.41	26 68	1,383,733	.....	51,870,590
Hemlock,	23,077,000	8.19	21 24	490,263	15,349,900	7,727,100
Longleaf pine,	19,612,698	6.96	29 39	578,370	.....	19,612,698
Cypress (bald),	18,790,200	6.67	39 68	745,612	.....	18,790,200
Chestnut,	17,409,350	6.18	37 65	655,450	5,815,700	11,593,650
Yellow poplar,	17,123,372	6.08	37 38	640,042	4,127,990	12,995,382
Red oak,	16,092,048	5.71	41 73	671,551	6,483,450	9,608,598
White oak,	13,714,723	4.87	46 78	641,582	4,325,950	9,388,773
Sugar maple,	9,681,890	3.44	23 75	229,968	8,673,090	1,008,800
Loblolly pine,	7,307,090	2.59	27 52	201,076	.....	7,307,090
Birch,	4,493,442	1.60	39 84	179,033	2,139,844	2,358,598
Western white pine,	2,914,500	1.03	39 55	115,281	.....	2,914,500
Pitch pine,	2,826,000	1.00	22 37	63,206	2,826,000	.....
Basswood,	2,738,576	.97	30 97	84,811	1,396,900	1,341,676
Beech,	2,461,750	.87	16 35	40,250	1,972,250	489,500
Spruce,	1,999,734	.71	29 96	59,904	176,350	1,823,384
Red gum,	1,610,300	.57	31 31	50,422	.....	1,610,300
Sugar pine,	1,122,000	.40	48 20	54,078	.....	1,122,000
Ash,	791,315	.28	51 89	41,062	533,165	258,150
Mahogany,	716,050	.25	159 92	114,512	.....	716,050
Norway pine,	526,000	.19	29 20	15,357	.....	526,000
Cottonwood,	330,000	.12	25 36	8,370	.....	330,000
Western yellow pine,	320,000	.11	34 94	11,180	.....	320,000
Cucumber,	267,300	.10	27 00	7,217	225,300	42,000

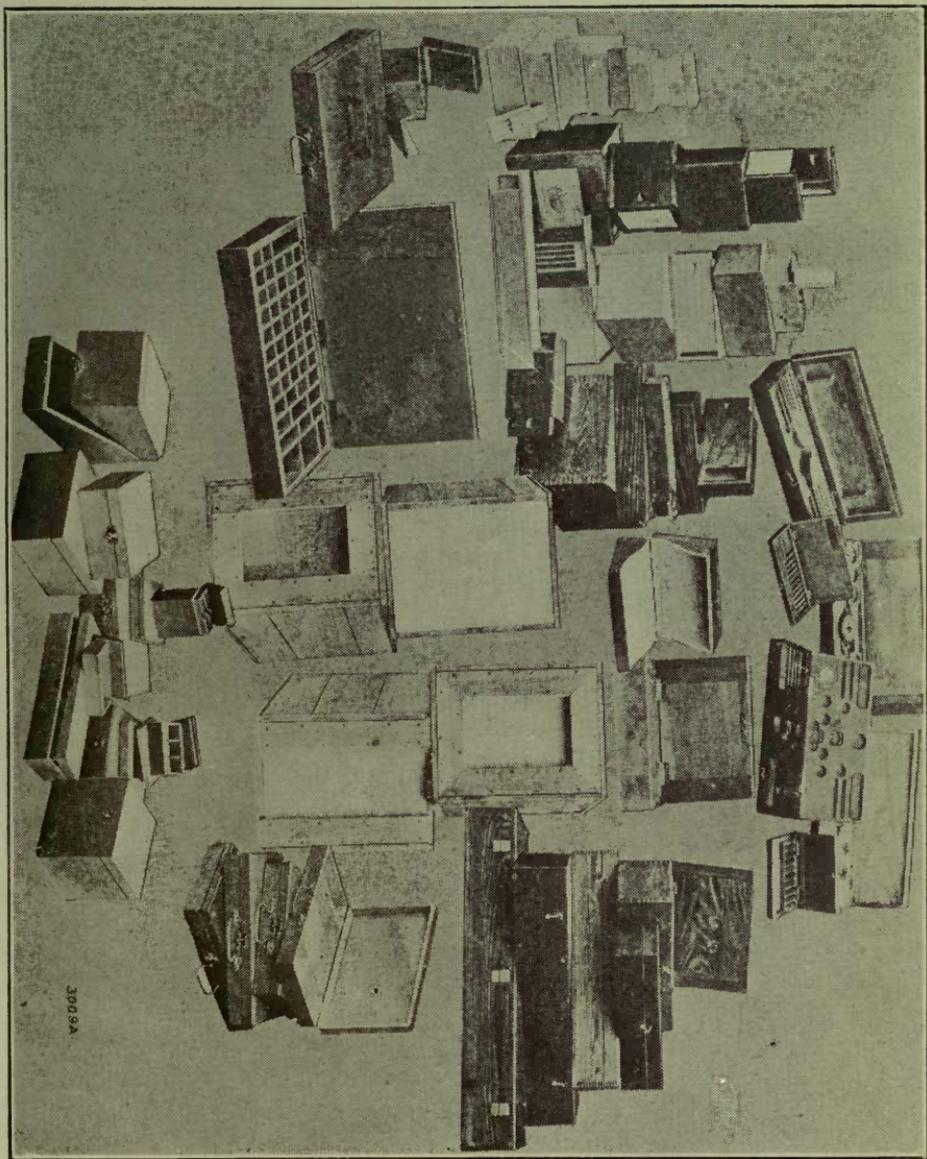


Fig. 2.—A collection of finished boxes, made in Pennsylvania.

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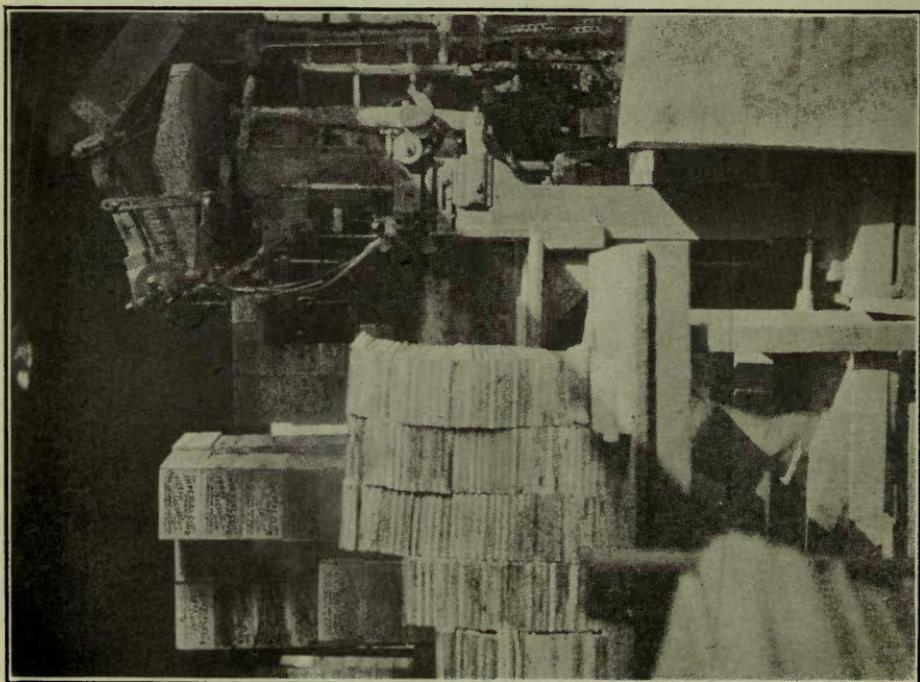


Fig. 3.—Box shooks and nailing machine in a Pennsylvania box factory.

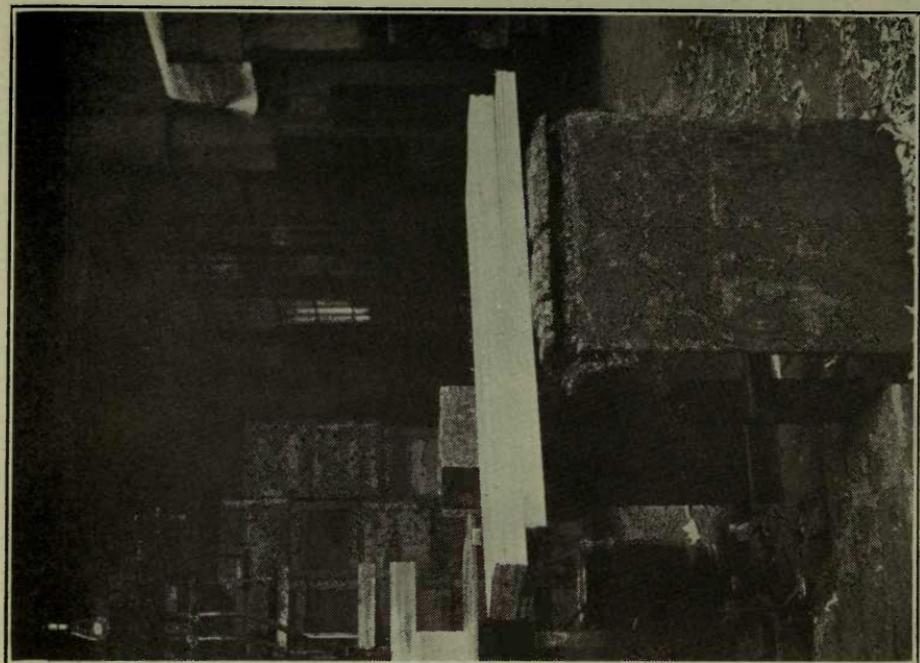


Fig. 4.—Interior of a small Philadelphia box factory. Boxes when nailed are used for city trade.

Table 47—Concluded.

Kind of Wood.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Red cedar,	213,000	.08	49 27	10,495	10,000	203,000
Redwood,	197,132	.07	49 19	9,697	.....	197,132
Cherry (black),	177,385	.06	64 48	11,438	110,085	67,300
Cotton gum,	151,648	.05	26 55	4,027	.....	151,648
Douglas fir,	108,500	.04	43 33	4,701	.....	108,500
Hickory,	80,100	.03	27 03	2,165	70,100	10,000
Black walnut,	77,265	.03	111 31	8,600	52,365	24,900
Red and silver maple,	71,750	.03	26 19	1,879	31,750	40,000
Scrub pine,	70,000	.03	20 50	1,435	25,000	45,000
Western red cedar,	55,000	.02	39 09	2,150	.....	55,000
Balsam fir,	40,000	.01	45 50	1,820	.....	40,000
Yellow buckeye,	35,000	.01	20 71	725	19,000	16,000
Tamarack,	30,000	.01	23 00	690	.....	30,000
Sycamore,	28,300	.01	45 72	1,294	17,000	11,300
Sitka spruce,	15,000	.01	35 40	531	.....	15,000
Butternut,	9,600	*	30 21	296	6,600	3,000
White elm,	4,000	*	23 00	92	4,000	.....
Southern white cedar,	1,000	*	120 00	120	.....	1,000
Circassian walnut,	500	*	250 00	125	.....	500
Total,	281,717,600	100.00	\$33 46	\$9,427,936	83,652,088	198,065,512

*Less than 1-100 of 1 per cent.

BOXES.

Next to building material, more wood goes for making boxes and crates in Pennsylvania than for any other use. Over six hundred factories reported the information collated in Table 48. Not more than half of these were regular box manufacturers, as is shown by the list of names in the appendix. There are included glass factories, steel mills, refractories, machinery manufacturers, makers of electrical apparatus, foundries, furniture makers, silk and textile mills, paper factories, large jobbing and department stores, etc., which maintain box departments for making packages and shipping containers to meet their own requirements. The uses of boxes are so numerous in Pennsylvania that it is not practical to attempt to mention or list them. Generally it can be said they are of two kinds, set-up boxes and box shooks. The former includes the nailed, the reinforced, the veneer, the locked corner, and dovetailed, or boxes that are sold ready to use. The nailed box is usually sold in the locality in which it is made. It is rarely shipped put together. The large number of this kind accounted for in Pennsylvania was principally in the large cities where there is an extensive demand or else near to factories and mills using the wooden packages. The reinforced box is a nailed box, the nailed joints and often the body of the box being reinforced with cleats, wire, or steel bands. These are used for shipping ponderous materials where the package is subjected to great strain. Of late this method has also become popular for containers for light materials, including large boxes for millinery, etc., when only very thin resawed material about three-eighths to one-fourth inch is used and the necessary strength supplied by the cleats. Reshippers belong to this class, most frequently reinforced with steel bands.

They are box crates for carrying back and forth bottled goods and are made of strong material. All that are used in Pennsylvania are not made in the State. Many are shipped in from Maryland, Delaware and Virginia.

The veneer box has recently made remarkable progress. The question of saving in weight and the revenue from the sale of second hand boxes, which lately is being given considerable attention by shippers, has helped the veneer package. The single ply box, wire bound, competes actively with the fiber shipping box but the progress these have made is not so surprising as that of the three ply veneer box. In these the sides, top, and bottom are panels built of three sheets of veneer with the grain transversing and well supported with cleats of thick material. The panels are not only strong and light in weight but the appearance of the single piece sides makes an attractive package. The glue pot enters as an important factor in their manufacture as a good glue joint is the most essential requirement, and, if assured, panel making is simple and makes both for economy and efficiency. Many more of these boxes are shipped into Pennsylvania knocked down than are made in the State. The panel makers are largely in the south where the stands of cheap veneer woods, principally the gums, are easily accessible.

White pine and basswood are the woods for dovetailed and locked corner boxes and large quantities are annually demanded for their making. These are small size containers but probably present the most attractive appearance of any form of wooden packages. They are used for articles of food, powdered substances, jewelry, etc., as the close joints make them more dust and moisture proof. The dovetailed box requires no gluing but the locked corner does. Both kinds are made in Pennsylvania, the latter in the largest quantities. Boxes with the bevel joint corner are not made any more in large quantities. Only a few manufacturers in Pennsylvania reported them.

Shooks are knocked down boxes sold conveniently bundled to facilitate their being assembled and nailed. Different from nailed boxes made and sold in the same region, shooks are manufactured close to the source of the raw material and sent over long distances to consuming centers. A large part of the boxes used in Pennsylvania, but not made there, are brought in in shook form. Shook making includes both shooks for boxes and knock-down crates. Rough lumber of any thickness or kind used to do for crating, and the lumber yard rather than the box factory was the source of the supply. Today the manufacturer shipping his wares in crates desires to express as much character in his package as do those using box containers. In consequence, the shook makers are called on for neat and attractively designed crates and like shooks they are sold with the several parts bundled together, due attention having been given to the size, kind, and thickness of the material in accordance with the weight and character of the goods to be shipped in them.

Another increasing use for crating is the growing tendency to crate articles of steel, iron, and other infrangible metals which heretofore were shipped unboxed. This more especially applies to Pennsylvania than any other state because of the number of industries manufacturing steel and iron products. Massive parts of machinery and electrical apparatus, sheet steel, engines and motors, parts of steel bridges, farm machinery, steam and hot water radiators, stoves and ranges, galvanized iron goods, steel frames for street cars, etc., are examples, and crating is intended more to prevent scarring the finish than to protect from breakage.

As Table 48 shows, the Pennsylvania box makers do not demand a few kinds of wood greatly in excess of others. Nor do they use State-grown woods in preference to lumber that comes from other timbered regions. There were 34 kinds of wood and the total of 11 were shipped in from other states. Of

these the principal were several species of southern pine, and the gums that come chiefly from Virginia and the Carolinas. The total quantity is equivalent to 65 per cent. of the total box material used. White pine, chestnut, hemlock, yellow poplar, and beech were in quantity the principal Pennsylvania woods reported, and cherry, sycamore, and butternut the only kinds reported as entirely home grown. Considering the cut of hemlock in the State, the amount used for boxes and crates was disappointing. But in this particular, this report should prove most useful as with the names and addresses of the box makers and of those using lumber for crating the opportunity is given for increasing the home market for the low grades of lumber cut in the State.

Woods are listed in the table that are rarely used for packing boxes. Their appearance can be accounted for by the fact that they are for novelties which are more or less fancy boxes like sewing cases, for toilet articles, utility boxes, shoe polishing outfits, and those more or less ornamental used in stores for keeping cutlery, jewelry, drugs, etc.

Table 48.—Wood for Packing Boxes and Crates, year ending June, 1912.

Kind of Wood.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Shortleaf pine,	52,719,727	19.25	\$18 00	\$949,003	.....	52,719,727
White pine,	51,583,373	18.83	21 03	1,084,714	19,390,373	32,193,000
Loblolly pine,	36,173,429	13.21	17 51	638,498	.....	36,173,429
Yellow poplar,	18,576,293	6.78	17 44	323,971	4,330,100	14,246,193
Spruce,	14,648,870	5.35	17 42	255,211	975,350	13,673,520
Red gum,	12,806,084	4.68	16 68	213,611	.....	12,806,084
Beech,	12,505,839	4.57	16 17	202,272	3,735,339	8,770,500
Chestnut,	11,977,692	4.37	16 04	192,165	6,275,328	5,702,364
Sugar maple,	11,647,000	4.25	16 43	191,340	3,282,500	8,364,500
Hemlock,	9,269,635	3.39	16 85	156,224	5,360,055	3,909,580
Red oak,	7,224,377	2.64	15 67	113,179	1,801,877	5,422,500
Pitch pine,	6,381,800	2.53	16 32	112,519	979,600	5,952,200
Birch,	5,999,000	2.19	16 76	100,556	2,488,500	3,510,500
Cottonwood,	4,680,000	1.71	24 60	115,135	40,000	4,640,000
Cotton gum,	3,458,722	1.26	14 13	48,873	.....	3,458,722
Black gum,	3,089,800	1.13	15 36	47,463	.....	3,089,800
Basswood,	2,936,400	1.07	16 93	49,708	1,324,400	1,612,000
Scrub pine,	2,251,400	.83	18 93	42,613	30,600	2,221,400
Cypress (bald),	1,719,250	.63	16 62	28,570	.....	1,719,250
Silver and red maple,	1,267,000	.46	12 38	15,685	872,000	395,000
Western hemlock,	500,000	.18	20 00	10,000	.....	500,000
Western yellow pine,	500,000	.18	20 00	10,000	.....	500,000
White oak,	380,500	.14	23 34	9,070	143,000	232,500
Longleaf pine,	241,800	.09	22 04	5,330	.....	241,800
White elm,	229,300	.08	23 50	5,400	32,300	147,500
Cork elm,	200,000	.07	25 00	5,000	50,000	150,000
Norway pine,	90,000	.03	20 00	1,800	.....	90,000
Yellow buckeye,	80,500	.03	22 99	1,851	40,000	40,500
Cherry (black),	70,000	.03	19 00	1,330	70,000	.....
Cucumber,	70,000	.03	17 00	1,190	.....	70,000
Ash,	54,200	.02	23 51	1,274	53,500	700
Sycamore,	11,603	*	16 00	186	11,603	.....
Butternut,	5,000	*	16 00	80	5,000	.....
Red cedar,	5,000	*	35 00	175	2,500	2,500
Total,	273,904,094	100.00	\$18 00	\$4,928,991	51,353,325	222,550,769

*Less than 1-100 of 1 per cent.

CAR CONSTRUCTION.

Formerly all rolling stock except locomotive engines were built of wood but in recent years cars made entirely of metal or of wood with steel underframe equipment have begun to be substituted both for freight and passenger cars; and in the increasing extent in which they are meeting the demand each year, it is safe to predict that the amount of wood used in this industry will show a rapid decline. In this connection it is interesting to note that the last session of Congress in the interest of public safety had four bills pending requiring replacement of wooden passenger cars with steel equipment on all railroads. This movement is largely in accord with the present policy of the railroads as recent statistics show that approximately 90 per cent. of the passenger cars ordered for future delivery were specified to be of steel construction.

Notwithstanding the increasing substitution of metal for wood in car building, lumber in large amounts is still in demand. In Pennsylvania 228,000,000 feet or more reported for building or repair of cars for 1911 made that industry as to consumption third in the State. The building of cars of all kinds is represented by Table 49. Electric cars for city and interurban transportation is a division of the industry which requires special mention as more wood is used for passenger vehicle equipment in this line than in any other. Vast amounts of lumber are required each year for building mine cars. The number of mining establishments appearing in the directory appended to this report indicates to what extent work of this kind is done by wood-using departments maintained in connection with mining operations. Only one other state exceeds Pennsylvania in the quantity of wood used for car construction. The order of the principal states and the amount consumed is as follows:

Illinois,	407,000,000 feet
Pennsylvania,	228,000,000 feet
New York,	77,000,000 feet
Indiana,	59,000,000 feet
Ohio,	56,000,000 feet
Missouri,	51,000,000 feet
Virginia,	51,000,000 feet

Twenty-nine woods were used by the car builders in Pennsylvania and long-leaf pine heads the list, contributing a little over one-third of the total. The superior tensile strength of this wood, its durable properties, and being easy to fit brings it first in demand by the car builder. If all the species of southern yellow pine were combined the amount would represent over one-half the car material reported and taking into consideration the needs of this industry in other states this wood is pre-eminently the principal wood for car construction. Lumber brought from the western states is not used so extensively in Pennsylvania as in other eastern states. Douglas fir and western white pine appear in the table but they were demanded in very limited quantities. The progress made of late in the use of steel underframes for cars of all kinds and especially gondolas and box cars has perhaps affected the use of oak more than any other wood as when these basal parts are made of wood, oak, preferably white and chestnut oak, are the kinds most extensively called for. The great strength of oak and its shock resisting capacity still brings it into wide use for car framing and such purposes, like draft timbers, tie beams, engine beams, platforms, truck parts, etc., and on account of its conspicuous figure, for interior finish of passenger and trolley cars. In this latter capacity it served with ash, birch, yellow poplar, cherry, mahogany, walnut, and red gum. Ash, poplar, and Douglas fir are the woods used in

building the principal parts of locomotive cabs. The floors of the cabs are of sugar maple, the bumpers, pilots, and other parts of the engines are made of white oak.

The annual drain on the forests of the State by the car builders amounts to over 41,000,000 feet. This is less than one-fourth of the total but compared with requirements of other states where the industry is important the quantity of home-grown car material used in Pennsylvania is the largest. Some part of the supply of 20 of the 29 woods were cut in the State. Oak, white pine, hemlock, maple, ash, and beech in the order named as to quantity being the most prominent while the statistics for other woods are as follows:

Table 49.—Wood for Car Construction, year ending June, 1912.

Kind of Wood.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Longleaf pine,	76,932,160	33.69	\$32 21	\$2,477,985	.....	76,932,160
White oak,	50,333,833	22.04	26 63	1,340,166	20,627,572	29,706,261
Shortleaf pine,	32,724,334	14.33	26 10	854,105	.....	32,724,334
Red oak,	31,059,530	13.60	25 35	787,322	9,462,220	21,597,310
White pine,	12,829,420	5.62	31 38	402,637	4,041,869	8,787,551
Loblolly pine,	4,827,625	2.11	25 98	125,422	.....	4,827,625
Ash,	4,396,915	1.92	56 70	249,311	933,908	3,463,007
Yellow poplar,	3,172,113	1.39	57 43	182,175	310,611	2,861,502
Hemlock,	2,006,075	.88	15 53	31,153	1,975,075	31,000
Sugar maple,	1,976,110	.87	18 14	35,856	1,344,660	631,450
Norway pine,	1,518,300	.66	28 97	43,985	25,000	1,493,300
Beech,	1,377,500	.60	17 12	23,583	847,500	530,000
Spruce,	1,367,636	.60	26 35	36,032	189,700	1,177,936
Hickory,	1,115,306	.49	24 50	27,325	343,697	771,609
Pitch pine,	458,600	.20	16 10	7,383	214,800	243,800
Cherry (black),	431,414	.19	60 59	26,140	216,951	214,463
Basswood,	366,010	.16	40 74	14,911	140,214	225,796
Cypress (bald),	352,800	.15	37 93	13,380	.....	352,800
Birch,	312,845	.14	28 86	9,029	221,045	81,800
Mahogany,	230,718	.10	131 88	30,428	.....	230,718
Chestnut,	113,250	.05	21 04	2,383	113,250	.....
Redwood,	100,000	.04	36 00	3,600	.....	100,000
Western white pine,	87,500	.04	54 99	4,812	.....	87,500
Douglas fir,	70,238	.03	45 55	3,199	.....	70,238
Scrub pine,	64,695	.03	23 32	1,509	50,500	14,195
White elm,	63,343	.03	49 43	3,131	.....	63,343
Black walnut,	56,890	.02	101 13	5,753	980	55,910
Red gum,	35,140	.02	27 02	950	.....	35,140
Black gum,	600	*	58 00	35	.....	600
Total,	228,380,900	100.00	\$29 53	\$6,743,700	41,069,552	187,311,348

*Less than 1-100 of 1 per cent.

FURNITURE.

Pennsylvania in the quantity of wood consumed does not compare with a number of other states in the manufacture of furniture, but this industry is one of the oldest in the State and includes in its production the highest grades of furniture and therefore is of considerable economic importance. Furniture can be divided into two general classes: (1) Articles of utility like refrigerators, kitchen cabinets, provision safes, cupboards, etc. These are not a part of the industry here considered, but like chairs have been presented under a separate classification. (2) Commodities where the appearance is as important as durability. In a large number of instances a piece

of furniture is not only pleasing to the eye in its ornamental appointments but from a practical point of view is made of the most suitable material for the purpose. Wood, on account of its natural, attractive grain will be the regular furniture material as long as hardwood timber lasts, and at present there is almost as wide a choice of material in this line as there is lumber available for more common uses. Of the 35 woods listed in Table 50 some part of 22 are wholly or in part decorative woods. Painted or enameled furniture is again coming into favor and in Pennsylvania a considerable quantity of the softer hardwoods was reported for this line of work.

Among the products included in this industry are bedroom furniture, chiffoniers and bureaus, dining tables and buffets, parlor outfits including upholstered furniture, hall appointments, desks, china closets, and book cases. Many of the woods reported went only into parts of furniture not visible, such as coring, frames, brackets, reinforcements, drawer slides, bottoms, and table slides.

Of the exterior woods for the cheaper grades of furniture, solid woods with pronounced grain are most available like red and white oak, ash, chestnut, red gum, butternut, etc. The more expensive work is usually backed with a fairly strong wood adaptable to glue, stable when in place and finished with veneer. This method produces the most pleasing and attractive effects and a permanence rarely to be achieved by the use of solid woods. Indeed it is a rare occasion when the expensive woods such as mahogany, Circassian walnut, rosewood, bird's eye maple, black walnut, etc., are used in solid pieces. Veneer is purchased from the veneer mills according to surface measure, the sheets ranging from 1/24 to 1/8 inch in thickness. The foreign woods are imported in the form of logs and flitches and are cut to veneer by mills in this country. Cores or backing for veneer are made of solid and built-up lumber purchased ready-made with several layers of cheap domestic woods glued with grains transversing. This material has the advantage of being freer from warping tendencies than lumber, besides being lighter, having exceptional strength, and not liable to split. A number of the most particular uses of the several woods shown in the table for furniture have been arranged in the following order:

BEDROOM FURNITURE.

Rails.

White oak.
Red oak.
Circassian walnut.
Mahogany.
Sweet birch.
Sugar maple.
Black walnut.
Sycamore.
Yellow poplar.
Cherry.
Red gum.

Panels.

White oak.
Sweet birch.
Black walnut.
Red oak.
Sycamore.
Circassian walnut.
Sugar maple.
Mahogany.
Yellow poplar.
Cherry.
Red gum.

Posts.

Black walnut.
Red oak.
Sycamore.
Mahogany.
Sugar maple.
Sweet birch.
Red gum.
White oak.
Circassian walnut.
Cherry.

Drawer fronts.

White oak.
Sweet birch.
Black walnut.
Sycamore.
Circassian walnut.
Sugar maple.
Red oak.
Mahogany.
Yellow poplar.
Cherry.
Red gum.

BED ROOM FURNITURE—Concluded.

Drawer sides and ends.

Yellow poplar.
Chestnut.
Beech.
Cherry.
White pine.
Red gum.
Sweet birch.
Basswood.

Mirror frames.

Sycamore.
Sugar maple.
White oak.
Mahogany.
Black walnut.
Circassian walnut.
Yellow poplar.
Cherry.
Red gum.

Drawer bottoms.

Yellow poplar.
Sycamore.
Basswood.
Cotton gum.
Beech.
Red gum.
Cottonwood.

Backing.

Yellow poplar.
Chestnut.
White pine.
Red gum.
Soft maple.

Drawer slides.

Sugar maple.
Hickory.

Bed slats.

Loblolly pine.
Sweet birch.
Sugar maple.
White ash.
Shortleaf pine.

UPHOLSTERED FURNITURE.

Frames (hidæen work).

Basswood.
Soft maple.
Longleaf pine.
White oak.
Chestnut.
Shortleaf pine.

White oak.
Red oak.
Black walnut.
Red gum.

Special furniture.

Eucalyptus.
Rosewood.
Red cedar.
Spanish cedar.

Frames (exterior).

Mahogany.
Sweet birch.

BUFFETS, CHINA CLOSETS, CRYSTAL CABINETS, AND SIDEBOARDS.

Tops.

Black walnut.
White oak.
Red oak.
Mahogany.
Sweet birch.

Sweet birch.
Black walnut.

Doors and door frames.

Black walnut.
Mahogany.
White oak.
Red oak.
Sweet birch.

Rails.

White oak.
Red oak.
Black walnut.
Mahogany.
Sweet birch.

Bottoms.

Basswood.
White oak.
Red oak.
Sugar maple.

Backing.

Chestnut.
Basswood.
Yellow poplar.
Red gum.
Soft maple.
White pine.

Inlaid work.

Mountain laurel.
Sumach.

Posts.

White oak.
Red oak.
Mahogany.

Shelves.

Sweet birch.
White pine.
Yellow poplar.

BOOKCASES, DESKS AND MAGAZINE RACKS.

Tops.

Black walnut.
 White oak.
 Red oak.
 Mahogany.
 Sweet birch.
 Red gum.
 Circassian walnut.
 Yellow poplar.

Panels.

Red gum.
 Red oak.
 Mahogany.
 Circassian walnut.
 Sweet birch.
 White oak.
 Black walnut.

Posts.

Mahogany.
 Red oak.
 White oak.
 Black walnut.
 Red gum.
 Sweet birch.
 Circassian walnut.

Doors and drop lids.

Sweet birch.
 Circassian walnut.
 Mahogany.
 Black walnut.
 White oak.
 Red oak.

Backing.

Chestnut.
 Basswood.
 Yellow poplar.
 Red gum.
 Soft maple.
 White pine.

Bottoms.

Basswood.
 White oak.
 Red oak.
 Sugar maple.
 Yellow poplar.

Shelves.

Sweet birch.
 White pine.
 Basswood.
 Yellow poplar.

LIBRARY AND DINING ROOM TABLES.

Tops.

White oak.
 Chestnut.
 Sweet birch.
 Red gum.
 Butternut.

Legs.

White oak.
 Sweet birch.
 Red gum.
 Mexican mahogany.
 Sugar maple.

Pedestals.

White oak.
 Red oak.
 Mahogany.
 Sweet birch.
 Yellow poplar.

Slides.

Sugar maple.
 Beech.

Table leaves.

White oak.
 Red oak.
 Mahogany.
 Sweet birch.
 Butternut.

Rails.

White oak.
 Red oak.
 Mahogany.
 Sweet birch.
 Red gum.
 Butternut.

Table 50.—Wood for Furniture, year ending June, 1912.

Kind of Wood.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.		Grown Out of Pennsylvania.	
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.		
Red oak,	16,091,700	27.28	\$35 73	\$574,997	2,443,600	13,648,100		
Chestnut,	11,556,850	19.59	19 52	225,599	5,586,300	5,970,550		
White oak,	10,133,050	17.18	47 30	479,283	2,771,050	7,362,000		
Sugar maple,	4,743,900	8.04	26 72	126,632	3,640,100	1,108,800		
Basswood,	3,945,400	6.69	35 13	138,592	1,105,400	2,840,000		
Yellow poplar,	2,892,000	4.90	36 86	106,593	346,700	2,545,300		
Red gum,	2,297,000	3.89	34 25	78,666	.....	2,297,000		
Red and silver maple,	1,478,500	2.51	25 49	37,682	730,500	748,000		
Beech,	1,453,000	2.46	16 23	25,582	1,397,000	56,000		
Mahogany,	1,145,650	1.94	116 42	133,378	.....	1,145,650		
Birch,	1,138,270	1.93	29 10	33,126	525,900	612,370		
Cottonwood,	380,000	.64	34 87	13,250	.....	380,000		
White pine,	298,700	.51	44 32	13,239	281,500	17,200		
Cotton gum,	236,500	.40	33 54	7,933	.....	236,500		
Red cedar,	178,100	.30	60 81	10,830	.....	178,100		
Ash,	175,500	.30	28 43	4,989	82,500	93,000		
Shortleaf pine,	141,000	.24	23 92	3,374	.....	141,000		
Longleaf pine,	138,500	.23	31 83	4,408	.....	138,500		
Black walnut,	130,100	.22	95 04	12,365	21,000	109,100		
Cherry (black),	113,900	.19	34 74	3,957	105,600	8,300		
Circassian walnut,	92,840	.16	364 08	33,801	.....	92,840		
Cypress (bald),	80,500	.14	43 19	3,477	.....	80,500		
Sycamore,	66,170	.11	43 89	2,904	3,000	63,170		
Loblolly pine,	58,000	.10	22 79	1,322	.....	58,000		
Western yellow pine,	10,000	.02	45 00	450	.....	10,000		
Rosewood,	5,180	.01	500 00	2,590	.....	5,180		
Eucalyptus,	5,000	.01	260 00	1,300	.....	5,000		
Butternut,	3,500	.01	26 61	93	3,500	.....	
Spanish cedar,	2,500	*	80 00	200	.....	2,500		
Southern white cedar,	1,300	*	120 00	156	.....	1,300		
Mountain laurel,	1,000	*	40 00	40	1,000	.....	
Hickory,	750	*	81 33	61	250	.....	500	
Sumach,	500	*	80 00	40	500	.....	
Teak,	190	*	200 00	38	.....	190		
Satinwood,	120	*	200 00	24	.....	120		
Total,	58,995,170	100.00	\$35 24	\$2,078,971	19,045,400	39,949,770		

*Less than 1-100 of 1 per cent.

CHAIRS.

Pennsylvania is one of the three leading states in the manufacture of chairs. Over 30,000,000 feet of wood is annually required for their manufacture and of this amount considerably over half is furnished by the forests of the State. The order of the first six states in quantity of wood consumed for chairs is as follows: Wisconsin, North Carolina, Pennsylvania, Massachusetts, New York, and Vermont. It may occur to some that chairs should be grouped with furniture but in Pennsylvania as in other states their manufacture is essentially a distinct industry, generally the form of the raw material is different, the processes of manufacture are in nowise similar, and the products are marketed separately.

Dimension stock is the form of raw material that is utilized in the chair industry perhaps to a greater extent than any other. Sawmills cutting hardwoods and factories using them, principally beech, birch, and maple, often operate as a side line the bolting of low grades and waste into these squares.

Many go as far as to turn the dimensions on lathes after bolting and sell them in that form to chair factories ready to assemble. In the case of the lumbermen, frequently small crooked logs, tops, wind shakes, cut offs, which can be worked for sale in no other way, are thus disposed of. The chair makers, therefore, play an important part not only in lending to the industrial development of the State but also to the movement of conservation in their efforts to encourage utilization or waste. One manufacturer purchases hardwood slabs and edgings from a nearby sawmill and transports this material to his factory for turning handles and chair stock. Another purchases part of the refuse of hardwood stave manufacturers, selects the core and other large pieces, and converts them into chair dowels and rungs.

Chair dimensions include stock of various sizes and kinds for the large number of different designs the chair manufacturers turn out. Table 51 shows the number and kinds of woods that were used in Pennsylvania. Not all chair material is in dimensions by any means. Because seats and backs are altogether cut out of plank ranging from 1½ inches to 2½ inches thick and because the factories are not able to secure enough dimension and turned material to meet their requirements, they are compelled to buy large quantities of plank and rip them up into squares for posts, pillars, spindles, rounds, dowels, etc. The chair stock is always seasoned before used, but those producing squares and turned stock often use unseasoned wood allowing it to air-dry under cover after being manufactured. To prevent loss caution is taken to make allowance for shrinkage and the producer is particular to see to it that the chair stock is straight grained, practically free from defects, and accurately manufactured to conform to specifications.

Perhaps the largest part of the wood used in Pennsylvania is required for turned chairs but quantities are also demanded for straight line designs where the parts are cut considerably wider than they are thick. The demand for these in late years has been on the increase and has led up to the mission patterns in which the stock is still wider and heavier.

Unlike the parts of turned chairs, the manufacturers do not buy their material for the square designs to any extent in the form of dimensions but usually cut them from plank. This is unfortunate because the sawmills have a considerable amount of waste which it is practical to cut into dimension stuff suitable for this line of manufacture. Millmen should note this opportunity and consider negotiations for furnishing this material from waste; and, on the other hand, the economy to the manufacturers should induce the latter to consider the advisability of making overtures to the millmen. Oak, both red and white, ash, and chestnut are the principal woods for chairs of square and mission designs. Other woods like red gum, birch, and elm are used and a figure is stamped on them resembling oak, mahogany, and other woods. That the better grades of chairs are made in Pennsylvania as well as cheaper ones, is evident by the quantity of mahogany brought into the State each year to meet the demand. Birch is most used for imitating mahogany. Woods used for various parts of chairs are as follows:

CHAIRS.

Arms.

Mahogany.
Red gum.
Soft maple.
White oak.

Bent arms.

Elm.

Backs.

Birch.
Elm.
Mahogany.
Red gum.
Red oak.
Soft maple.
White oak.
Yellow poplar.

CHAIRS—Continued.

Camp chairs and stools.

Beech.
Birch.
Sugar maple.

Chair frames, upholstered.

Chestnut.
Red oak.
Soft maple
Sugar maple.
White oak.

Dowels.

Beech.
Birch.
Soft maple.
Sugar maple.

Fancy chairs.

Mahogany.
Sycamore.
Walnut, black.

Pillars.

Beech.
Birch.
Sugar maple.
White oak.

Posts.

Beech.
Birch.
Mahogany.
Sugar maple.
Red oak.
White ash.
White oak.

Rockers.

Elm.
Sugar maple.
White ash.
White oak.

Rolling chair parts.

Hickory.
Red oak.
Sugar maple.
White oak.

Rounds.

Beech.
Birch.
Hickory.
White oak.
White ash.

Seat frames.

Red oak.

Seats.

Elm.
Mahogany.
Red gum.
Red oak.
Soft maple.
White oak.
Yellow poplar.

Split seats.

Hickory.

Split backs.

Hickory.

Legs.

Beech.
Birch.
Mahogany.
Sugar maple.
Red oak.
White oak.

Mission chairs.

Red oak.
White oak.

Panels.

Mahogany.

Piano stools and benches.

Birch.
Mahogany.
Sugar maple.
White oak.

Spindles.

Beech.
Birch.
Sugar maple.
White ash.

Stretchers.

Beech.
Birch.
Sugar maple.
White ash.

Built-up chair stock, veneer.

Basswood.
Birch.
Chestnut.
Mahogany.
Red gum.
Red oak.
Soft maple.
Sugar maple.
Walnut, Circassian.
White ash.
White oak.

Table 51.—Wood for Chairs, year ending June, 1912.

Kind of Wood.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Beech,	8,420,000	25.43	\$17 21	\$144,945	7,295,000	1,125,000
White elm,	6,213,500	18.76	26 76	166,243	62,000	6,151,500
Sugar maple,	5,348,100	16.15	18 54	99,180	4,746,500	601,600
Red gum,	4,326,000	13.06	25 97	112,323	.....	4,326,000
Red oak,	2,997,200	9.05	33 96	101,785	1,066,500	1,930,700
White oak,	2,228,800	6.73	42 10	93,837	281,800	1,947,000
Birch,	992,400	3.00	30 05	29,324	583,500	408,900
Red and silver maple,	918,500	2.77	28 17	25,876	155,000	763,500
Sycamore,	500,000	1.51	25 00	12,500	.....	500,000
Chestnut,	480,000	1.45	17 71	8,499	95,000	385,000
Mahogany,	461,800	1.39	110 11	50,848	.....	461,800
Ash,	104,300	.32	24 54	2,559	37,300	67,000
Black walnut,	50,000	.15	66 08	3,304	44,000	6,000
Basswood,	33,000	.01	22 12	730	25,000	8,000
Yellow poplar,	24,600	.07	38 05	936	.....	24,600
Hickory,	15,000	.05	17 20	258	75,000	.....
Circassian walnut,	3,800	.01	200 00	760	.....	3,800
Total,	33,117,000	100.00	\$25 80	\$854,412	14,406,600	18,710,400

VEHICLES AND VEHICLE PARTS.

The statistics presented in Table 52 represent the wood used both for motor and horse drawn vehicles. Though there is considerable material used in the manufacture of motor cars including both pleasure cars and commercial trucks, fully 90 per cent. of the material reported went into the latter. The rapid growth of the automobile industry has greatly increased the demand for the vehicle woods, but, according to reports, has not made a corresponding reduction in the demand for horse drawn vehicles. In fact a number of Pennsylvania manufacturers, especially wagon makers, remarked upon the increased production of horse drawn vehicles in the last five years; and those that formerly specialized in building buggies and wagons and now are engaged in making autos have in most cases not relinquished the manufacture of the horse vehicle but have increased their facilities and manufacture both kinds.

Often carriage manufacturers are practically nothing more than assemblers of parts. They buy the wheels and other portions of the running gears and the bodies and tops already manufactured and enter into production only as finishers. In the same way wheelwrights and repair shops that are distributed in nearly every village and town throughout Pennsylvania purchase much of their material like spokes, rims, hubs, hounds, and fellos ready to use. Information was not solicited from these classes of establishments as the scope of the investigation excludes them.

The number of manufacturers making vehicle parts is large in Pennsylvania and the quantity of wood they consumed represents the largest proportion of that shown in the table. Most of this class report making only one commodity as hubs, spokes, rims, poles or shafts. A few, however, specialize in manufacturing two, but in no instance were there reported as many as three.

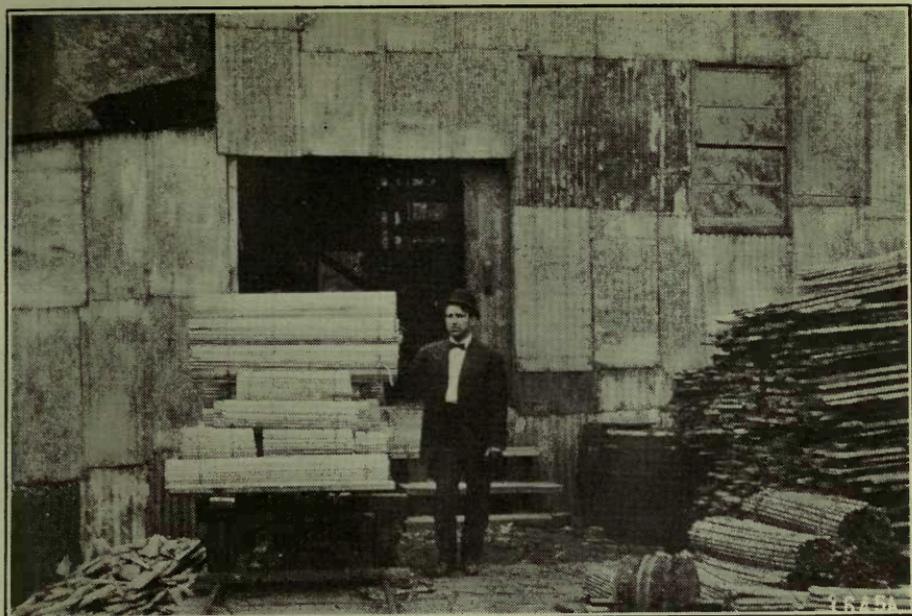


Fig. 5.—Utilization of mill waste. Rough squares are bolted from slabs and edgings, and turned into chair stock.

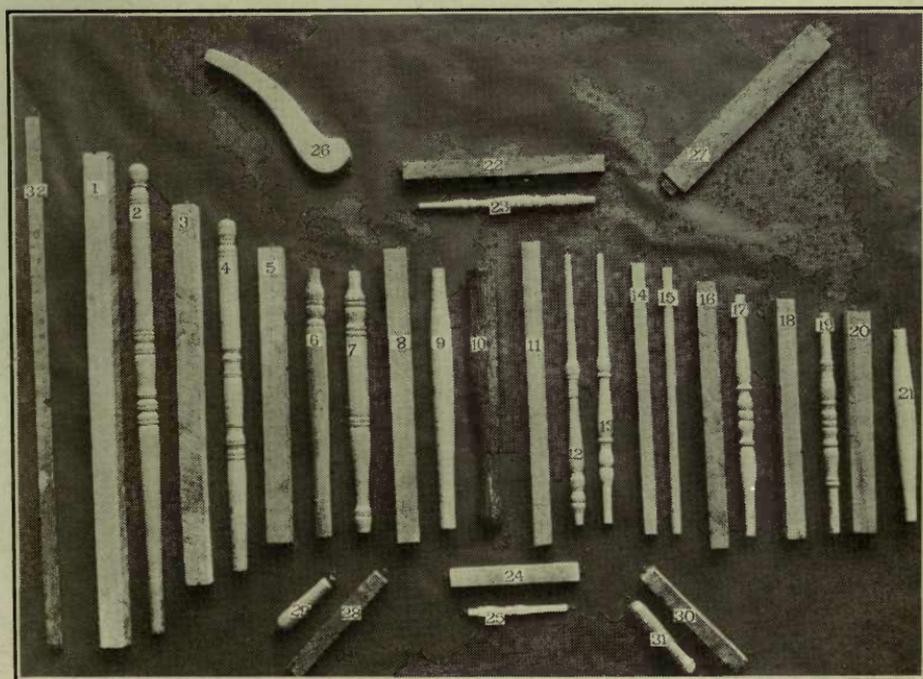


Fig. 6.—Chair parts and the squares or dimension stock from which they are made.

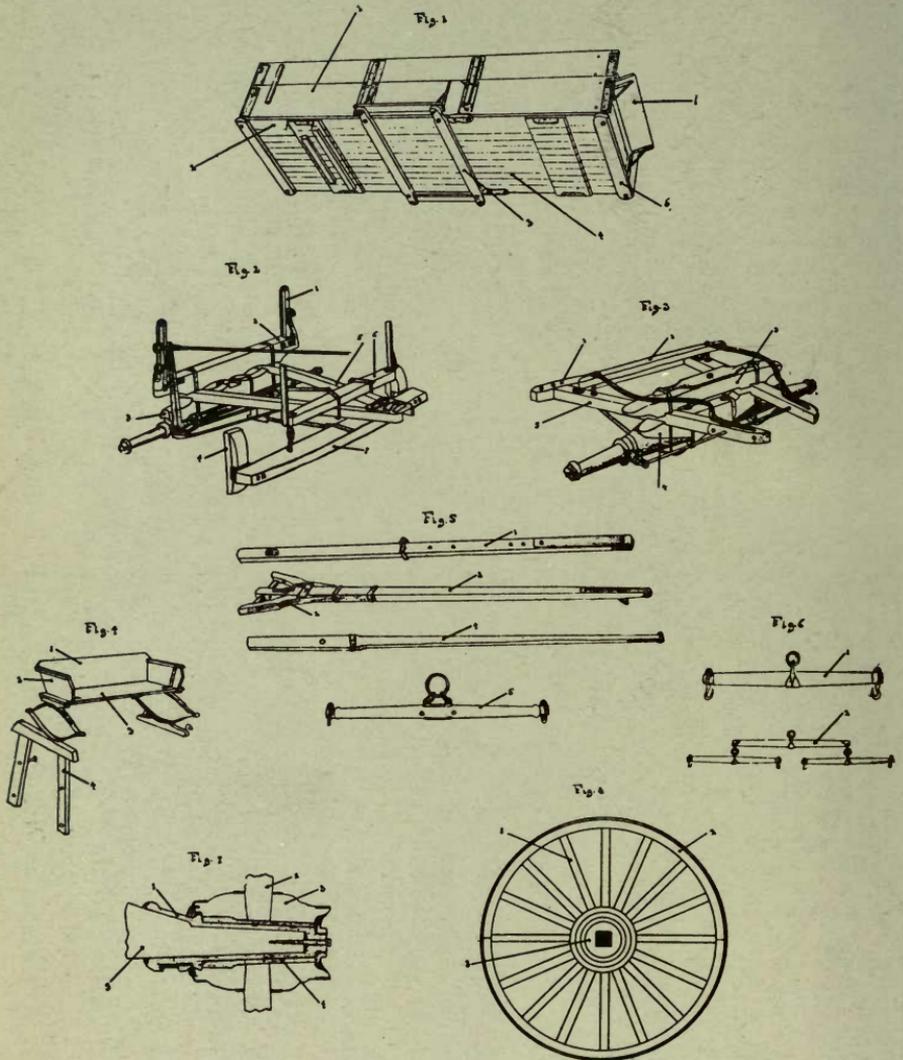


Fig. 7. Parts of a farm wagon, and the woods used.

DESCRIPTION OF FIGURE 7.

FARM WAGON.

Fig. 1. Wagon Body.

1. Wagon box: Longleaf Pine, Yellow Poplar, Cottonwood, Red Gum, White Pine.
2. Sills: White Oak, Red Oak, Sugar Maple, White Ash.
3. Braces: Red Oak, White Oak, Longleaf Pine, Shortleaf Pine, White Ash.
4. Wagon bed: Longleaf Pine, Loblolly Pine, White Oak, Red Oak, Pitch Pine, Spruce, Sugar Maple, White Ash.
5. Cross sill: White Oak, Red Oak, Sugar Maple, White Ash.
6. Foot rest: Longleaf Pine, Shortleaf Pine, Loblolly Pine, White Oak, Red Oak.

4. Riser: White Oak, Red Oak, White Ash, Sugar Maple.

Fig. 5.

1. Reach: White Oak, Red Oak, White Ash, Hickory.
2. Tongue hounds: Hickory, White Oak, White Ash.
3. Drop tongue, { White Oak.
White Ash.
4. Coach tongue, { Hickory.
Longleaf Pine.
5. Neck Yoke: White Oak, White Ash, Red Oak, Hornbeam, Hickory.

Fig. 2. Rear Gear.

1. Stakes, { White Oak.
2. Bolsters, { Red Oak.
3. Axle bed or axle cap, { Sugar Maple.
4. Brake block, { Black Birch.
5. Rear hounds, { Hickory.
6. Hound bar, { Hornbeam.
7. Brake bar, { White Ash.

Fig. 6.

1. Singletree, { White Oak.
2. Doubletree, { Red Oak.
White Ash.
Hornbeam.
Hickory.

Fig. 3. Front Gear.

1. Yoke, { White Oak.
2. Hound bar, { Red Oak.
3. Bolster, { Sugar Maple.
4. Axle, { Black Birch.
5. Front hounds, { Hickory.
Hornbeam.
White Ash.

Fig 7. Axle and Hub.

1. Skein.
2. Spoke.
3. Hub.
4. Hub boxing.
5. Axle.

Fig. 4. Seat.

1. Back board, { White Oak.
2. Side boards, { Red Oak.
3. Bottom boards, { White Pine.
Yellow Pine.
Shortleaf Pine.

Fig. 8. Wheel.

1. Spoke: White Ash, White Oak, Red Oak, Hickory.
2. Felloe or rim: White Oak, Red Oak, White Ash.
3. Hub: White Oak, Red Oak, White Elm, Rock Elm, Locust, Black Gum, Sugar Maple, Osage Orange.

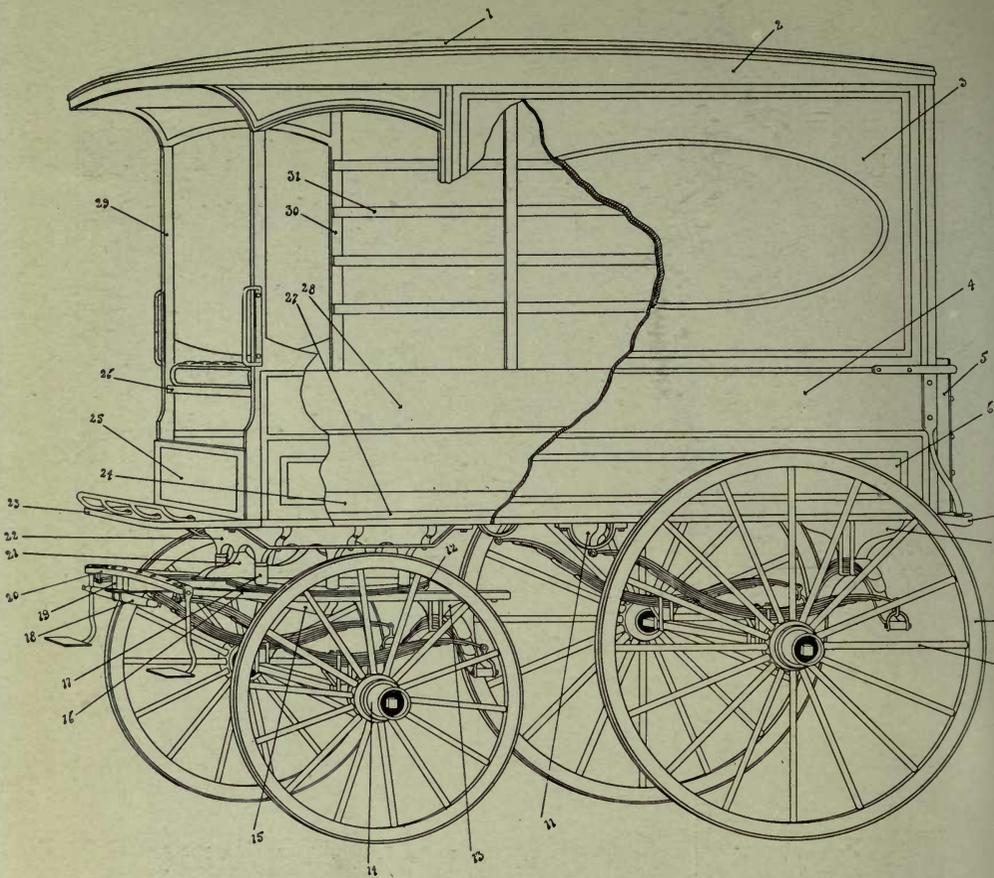


Fig. 8. Showing parts of delivery wagon, and woods used.

PLATFORM DELIVERY WAGON.

- | | |
|---|---|
| 1. Top strips or slats: White Ash, Basswood,
White Pine, Yellow Poplar, Sweet Birch. | 18. Singletree: Hickory, White Ash. |
| 2. Top rail: White Ash, White Oak. | 19. Hounds or pole futchels: Hickory, White Ash. |
| 3. Upper panel: Yellow Poplar. | 20. Splinter or drawbar: Hickory, White Ash. |
| 4. Belt or belt panel: White Ash, White Oak. | 21. Upper head block or fifth wheel futchel:
Hickory, White Ash. |
| 5. Drop gate: White Ash, White Oak, Red Oak. | 22. Fifth wheel bars or transom bars: Hickory,
White Ash. |
| 6. Lower panel or lower side board: White Oak,
White Ash. | 23. Footboard or heel board: White Oak, White
Ash. |
| 7. Stay bar or rear end crossbar: White Oak,
Red Oak, White Ash. | 24. Wagon bed: White Pine, Longleaf Pine,
White Ash, Yellow Poplar, White Oak. |
| 8. Hind spring bar or rear spring crossbar:
Hickory, White Ash. | 25. Front panel or cross board: Yellow Poplar,
White Oak, Red Oak, White Ash. |
| 9. Felloe or rim: Hickory, White Ash. | 26. Seat board: White Pine, White Ash, Long-
leaf Pine, White Oak. |
| 10. Spoke: Hickory, White Ash. | 27. Sill: White Oak, White Ash. |
| 11. Shackle bar or front spring crossbar:
Hickory, White Ash. | 28. Lining: Yellow Poplar, White Pine, Long-
leaf Pine, Red Oak. |
| 12. Fifth wheel circles: Hickory, White Ash. | 29. Corner posts or pillars: White Oak, White
Ash. |
| 13. Spring yoke or spring head block: Hickory,
White Ash. | 30. Side pillars: White Oak, White Ash. |
| 14. Hub: Black Gum, Rock Elm, Black Locust. | 31. Side slats or rails: White Oak, White Ash. |
| 15. Lower head block: Hickory, White Ash. | 32. Rear end posts: White Oak, White Ash. |
| 16. Side futchel: Hickory, White Ash. | |
| 17. Fifth wheel spools: Hickory, White Ash. | |

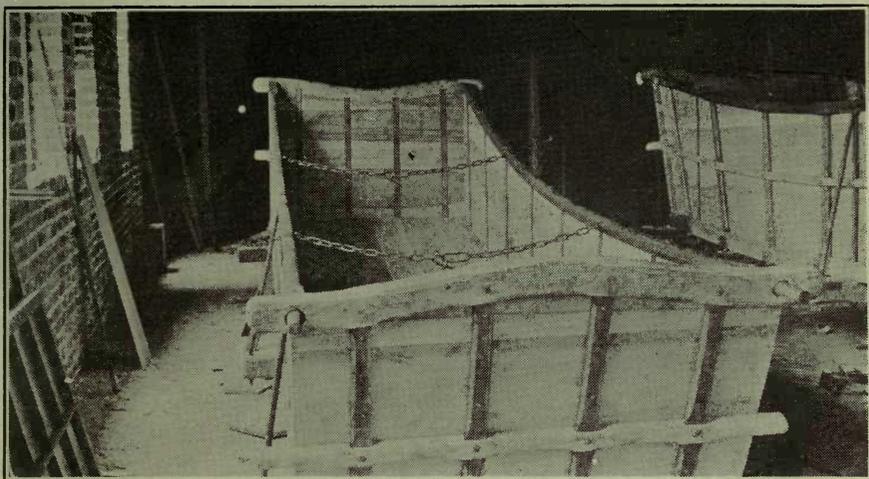


Fig. 9.—Body of an old-time Conestoga wagon. This style of wagon is still being manufactured in Pennsylvania.

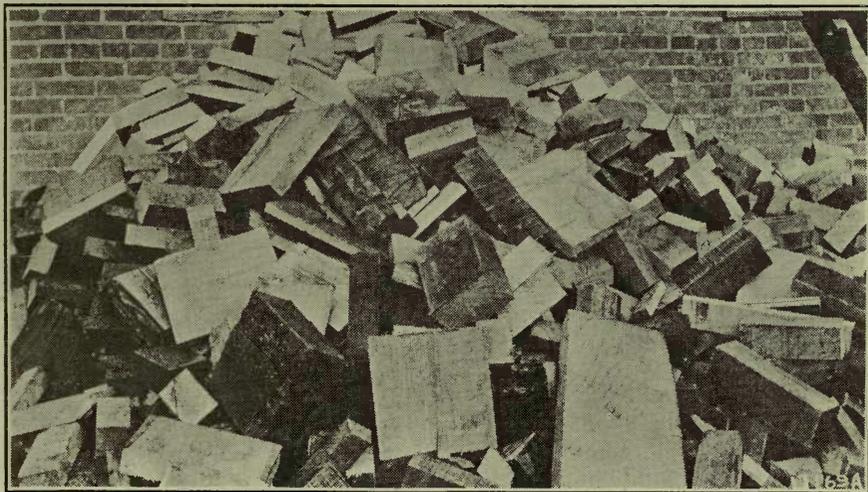


Fig. 10.—Hickory, oak and pine waste of a large Pennsylvania wagon manufacturer being sold for fuel. Much of this is suitable for small commodities made from this wood.

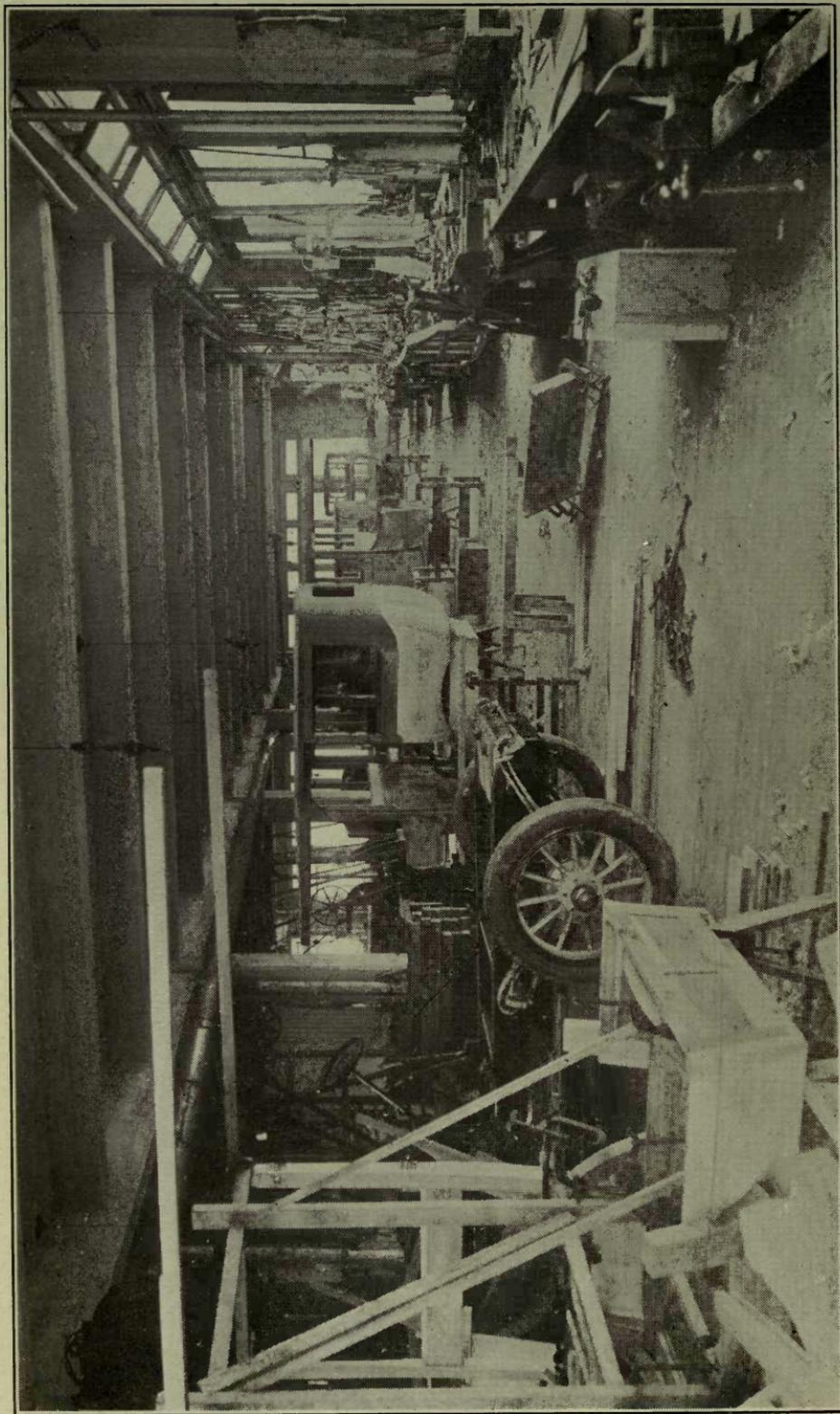


Fig. 11.—Manufacture of limousine bodies. Panel work of yellow poplar.

Thirty-two kinds of wood are used by the vehicle industry. That so many kinds are required is surprising, but this can probably be accounted for by the search being made for substitutes which has brought species heretofore little used into this industry for experimentation. For instance, elm was formerly the chief hub wood, but now birch has proved practical and large quantities are consumed by the hub makers. Yellow locust and black gum are also extensively used. Hickory was the principal spoke wood but now vast amounts of white and red oak are demanded; while yellow poplar does better than any other wood for bodies, large quantities of cottonwood and red gum are taking its place and some manufacturers prefer these because they do not split so easily and are susceptible of taking a higher polish. White ash is chiefly used at the present time for vehicle bows but it is not so well adapted to this use as hickory, white oak, or cork elm.

Hickory is the premier wood in vehicle making and white oak the next. The use of both of these is confined mainly to the production of gear parts. In the manufacture of heavy wagons, which is one of the most important divisions of this industry in Pennsylvania, white oak and red oak, the latter to a much less extent, are in the greatest demand. Yellow poplar, which comes third in the list, indicates the high grades of vehicle made in the State, as only the high priced carriages, delivery wagons, and automobiles can afford this wood on account of its cost. In the manufacture of automobile bodies and to a small extent for horse drawn vehicles metal has proved a formidable competitor of wood, but the fact that it is used for cheaper grades indicates that the use of wood gives better results. Next to yellow poplar, ash entered into body construction more than any other wood and in some states in which studies similar to this have been made the quantity used in this line exceeds that of yellow poplar. In Pennsylvania ash stands fourth. All of the rich cabinet woods reported were employed by the automobile body makers.

Table 52.—Wood for Vehicles and Vehicle Parts, year ending June, 1912.

Kind of Wood.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Hickory,	10,819,552	34.02	\$48 51	\$524,895	3,642,252	7,177,300
White oak,	10,819,552	34.02	\$48 51	\$524,895	4,378,300	2,500,000
Yellow poplar,	3,764,335	11.84	50 49	190,055	755,285	3,009,050
Ash,	3,590,472	11.29	44 16	158,564	2,096,204	1,494,268
Birch,	1,514,500	4.76	48 11	72,864	455,000	1,059,500
Red oak,	994,900	3.13	28 43	28,285	589,800	405,100
Sugar maple,	625,800	1.97	28 67	17,940	314,200	311,600
Beech,	587,883	1.85	21 97	12,916	537,883	50,000
Longleaf pine,	576,550	1.81	34 33	19,791	.....	576,550
Basswood,	477,850	1.50	30 10	14,384	258,500	219,350
Shortleaf pine,	467,200	1.47	26 67	12,461	.....	467,200
Cork elm,	390,900	1.23	36 30	14,190	25,300	365,600
Red gum,	315,500	.99	32 37	10,212	500	315,000
Black gum,	181,800	.57	37 57	6,831	31,500	150,300
White pine,	140,550	.44	34 62	4,866	118,050	22,500

SHIPS, YACHTS, AND RIVER CRAFT—Concluded.

Cabins (Exterior).

White pine.
 Yellow poplar.
 Hemlock.
 Douglas fir.
 Cypress.
 Longleaf pine.

Spars.

Spruce.
 Hemlock.
 Douglas fir.

CANAL BOATS.

Cabins.

White pine.
 Yellow poplar.
 Hemlock.
 Longleaf pine.

Keels.

White pine.
 White oak.
 Cypress.
 Douglas fir.
 Red oak.

Frames.

White oak.
 Red oak.
 Hemlock.

Knees.

White oak.
 White ash.
 Red oak.

Decking.

Longleaf pine.
 Hemlock.

Planking.

Hemlock.
 Longleaf pine.
 Douglas fir.

Stern Posts.

White oak.

BARGES, SCOWS, AND FLATS.

Frames.

White oak.
 Red oak.
 Longleaf pine.

Douglas fir.
 Red oak.

Bottom Boards.

White pine.
 Spruce.

Planking.

White pine.
 Spruce.
 Douglas fir.
 Red oak.

MOTOR BOATS.

Stems.

White oak.
 White ash.

Deck Beams.

White oak.
 Red oak.

Keels.

White oak.
 White ash.

Ribs.

White oak.
 Red oak.
 White ash.

Stern Posts.

White oak.
 White ash.

Coaming.

White ash.
 White oak.

Decking.

Mahogany.
 White cedar.
 Spanish cedar.
 Cypress.
 White oak.

Planking.

Cypress.
 White cedar.

*Not reported.

scows, and barges are entirely of wood, and the same is true of small sail boats, canoes, launches, and other pleasure craft.

This industry not only supplies a large part of the local demand but boats built in Pennsylvania are sold world wide. Other states have more extensive harbor facilities, water fronts, and inland waterways than Pennsylvania, but are not comparable in the size and importance of their shipbuilding industry. In fact only one state surpasses Pennsylvania in the quantity of lumber consumed for boat building. New York in 1912 used 37,700,500 feet while other states in order for quantity are as follows:

Pennsylvania,	27,635,000
New Jersey,	13,341,000
Virginia,	11,138,000
Delaware,	7,679,000
Connecticut,	7,084,354

The uses of wood in boat building are multitudinous. In an ordinary schooner made of wood there are 500 different parts separately named. A large number of them require lumber with special qualities, which probably accounts for the long list of woods shown in Table 53. It is impossible to undertake to specify here the different woods for all parts of the many kinds of boats produced in the State but a few of the principal uses of lumber were mentioned by the boat builders and from their reports the following list has been arranged:

SHIPS, YACHTS, AND RIVER CRAFT.

Frames.

White oak.
Red oak.
Hemlock.

Keels.

White pine.
White oak.
Cypress.
Hemlock.
Red oak.

Knees.

White oak.
White ash.
Sassafras.
Tamarack.

Paddle Wheels.

White oak.
Yellow poplar.

Stern Posts.

White oak.
Tamarack.

Rudders.

White oak.
White pine.
Cypress.

Planking.

Cypress.
White pine.
Shortleaf pine.
Douglas fir.
Spruce.

Decking.

Cypress.
White pine.
Hemlock.
Douglas fir.

Rails.

Teakwood.
Mahogany.
White ash.
White oak.
Longleaf pine.
Hickory.

Masts.

Spruce.
Hemlock.
Douglas fir.

Booms.

Spruce.
Hemlock.
Douglas fir.
Shortleaf pine.
Longleaf pine.

Cabins (Interior).

Chestnut.
Mahogany.
Teakwood.
White ash.
Sweet birch.
Sycamore.
Cypress.
*Black walnut.
*Circassian walnut.
Butternut.

SHIPS, YACHTS, AND RIVER CRAFT—Concluded.

Cabins (Exterior).

White pine.
 Yellow poplar.
 Hemlock.
 Douglas fir.
 Cypress.
 Longleaf pine.

Spars.

Spruce.
 Hemlock.
 Douglas fir.

CANAL BOATS.

Cabins.

White pine.
 Yellow poplar.
 Hemlock.
 Longleaf pine.

Keels.

White pine.
 White oak.
 Cypress.
 Douglas fir.
 Red oak.

Frames.

White oak.
 Red oak.
 Hemlock.

Knees.

White oak.
 White ash.
 Red oak.

Decking.

Longleaf pine.
 Hemlock.

Planking.

Hemlock.
 Longleaf pine.
 Douglas fir.

Stern Posts.

White oak.

BARGES, SCOWS, AND FLATS.

Frames.

White oak.
 Red oak.
 Longleaf pine.

Douglas fir.
 Red oak.

Bottom Boards.

White pine.
 Spruce.

Planking.

White pine.
 Spruce.
 Douglas fir.
 Red oak.

MOTOR BOATS.

Stems.

White oak.
 White ash.

Deck Beams.

White oak.
 Red oak.

Keels.

White oak.
 White ash.

Ribs.

White oak.
 Red oak.
 White ash.

Stern Posts.

White oak.
 White ash.

Coaming.

White ash.
 White oak.

Decking.

Mahogany.
 White cedar.
 Spanish cedar.
 Cypress.
 White oak.

Planking.

Cypress.
 White cedar.

*Not reported.

CANOES AND SKIFFS.

Gunwales.

Spruce.
Mahogany.

Paddles.

Spruce.
Sugar maple.

Planking.

White cedar.
Spruce.
Spanish cedar.

Ribs.

White cedar.
Spanish cedar.
White ash.

Decks.

White ash.
Sweet birch.
Sugar maple.
Mahogany.

ROW BOATS.

Bottom Boards.

Shortleaf pine.
Douglas fir.
Spruce.
White pine.
Cypress.

Sides.

White pine.
Douglas fir.
Hemlock.
Spruce.

Oars.

Spruce.
White ash.

Stern Posts.

White oak.
Red oak.
Longleaf pine.

Transoms .

Shortleaf pine.
Spruce.
Hemlock.
White pine.

Seats.

White pine.
Longleaf pine.
Shortleaf pine.
Hemlock.

Longleaf pine is the principal species for shipbuilding. It is listed ahead of all other woods, not only in Pennsylvania but in all the important boat building states. Douglas fir is brought from the Pacific coast states especially for parts, as is seen above, requiring timbers of large dimensions and long lengths. It is easily worked, holds its shape, and, similar to longleaf pine, possesses great tensile strength and elasticity. The Pennsylvania ship builders demand more of this wood than is shown by the same industry in any other state. The same is true of hemlock and this is quite significant in that it serves principally for bottoms, planking, and other parts of river crafts for which white pine heretofore has been most extensively used. White pine still meets a portion of the ship builders' demands, irrespective of its growing price. Of the total amount used, 65 per cent. was reported as home grown. Mahogany, teak and Spanish cedar were the only foreign woods reported.

Table 53.—Wood for Ship and Boat Building, year ending June, 1912.

Kind of Wood.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.				
Longleaf pine,	5,286,000	19.79	\$37 56	\$198,520	.....	5,286,000
White pine,	4,544,650	17.01	46 85	212,928	2,733,150	1,811,500
Hemlock,	4,343,000	16.26	25 92	112,551	4,217,000	126,000
White oak,	3,871,400	14.49	34 73	134,436	2,230,900	1,640,500
Douglas fir,	2,521,000	9.44	42 41	106,926	.....	2,521,000
Red oak,	2,434,000	9.11	35 24	85,770	1,180,000	1,254,000
Southern white cedar,	1,081,000	4.05	56 40	60,970	.....	1,081,000
Spruce,	1,013,000	3.79	31 06	31,464	200,000	813,000
Shortleaf pine,	480,800	1.80	28 74	13,820	.....	480,800
Ash,	388,700	1.45	41 47	16,118	262,700	126,000
Cypress (bald),	287,000	1.07	55 64	15,970	.....	287,000
Basswood,	150,000	.56	16 00	2,400	150,000	.....
Yellow poplar,	84,000	.31	58 07	4,878	2,500	81,500
Teak,	64,000	.24	190 66	12,202	.....	64,000
Mahogany,	57,000	.21	164 89	9,370	.....	57,000
Hickory,	28,000	.10	65 00	1,820	26,500	1,500
Sycamore,	20,000	.08	65 00	1,300	.....	20,000
Redwood,	20,000	.08	52 30	1,046	.....	20,000
Tamarack,	10,300	.04	45 73	471	300	10,000
Spanish cedar,	10,000	.04	250 00	2,500	.....	10,000
Butternut,	10,000	.04	80 00	800	7,000	3,000
Sugar maple,	3,500	.01	29 14	102	2,500	1,000
Chestnut,	3,100	.01	27 10	84	3,100	.....
Black gum,	3,000	.01	70 00	210	.....	3,000
Beech,	2,500	.01	26 00	65	1,500	1,000
Sassafras,	50	*	25 00	1	50	.....
Total,	26,716,000	100.00	\$38 44	\$1,026,722	11,017,200	15,698,800

*Less than 1-100 of 1 per cent.

CASKETS AND COFFINS.

This industry includes, in addition to caskets and coffins, outer or rough boxes and shipping cases. Caskets are the burial cases more universally used. Coffins, at one time in greater demand, are now but relatively seldom employed. They are irregular in form, widest at the part corresponding to the shoulders, narrowing slightly towards the head, and considerably at the feet. The statistics for Pennsylvania show not over 5 per cent. of the wood demanded by the manufacturers was for coffins. More than this amount is used, however, since many coffins are handmade. They are manufactured by cabinetmakers who cater for local trade in all small towns throughout the State. The quantity of wood used by one is small, but for a thickly populated state like Pennsylvania the aggregate consumption would amount to considerable, although it was found impracticable to collect statistics so widely scattered. Black walnut for many years has been the principal coffin wood and it is still called on for the better grades. Cheap coffins are of woods that are soft, easily worked, and at the same time adaptable to stain and polish. Yellow poplar is more used than any other kind for both factory and hand made coffins. In the southern states cypress is the leading coffin material, on the Pacific coast western red cedar, and in the Lake states basswood.

Twelve woods were reported by casket makers. They range from high priced mahogany down to low grades of chestnut and white pine. These burial cases are varied in design, some have an octagonal appearance—the corners instead of being rectangular are cut off and squared. Some have rounded corners, and others are uniformly rectangular. Nearly all are cloth covered and though this permits the use of the lower grades, the lumber selected is free from the defects which would likely affect the strength and durability of the casket. Chestnut is the most used casket wood in all states because it has proved especially durable under ground, and it possesses the combined qualities of lightness and strength, cheapness, and an affinity for glue that holds the cloth. Some of the chestnut used in casket manufacture is of the best, but the largest part is the “sound wormy” grade. As far as durability is concerned this grade is sufficient and the fact that it is perforated with the small worm holes averaging the size of a pin head is an advantage rather than a detriment, as in covering the casket these holes afford an additional hold for the glue. Other woods generally competing as casket material are yellow poplar, red oak, white cedar, cypress, red cedar, white pine, walnut, red gum, white oak, sugar maple, and mahogany. All of them go for cloth covered caskets and some answer for burial cases finished with natural appearance where the wood selected has a handsome grain and is susceptible to the highest polish, similar to that on piano cases. High priced caskets are of this kind and in addition the most expensive are richly carved. The Pennsylvania manufacturers use quartered red oak and white oak, mahogany, and walnut for making these and also to a limited extent red gum, which, from the price paid, must have been selected to imitate Circassian walnut.

The lumber used for outer cases, sometimes called rough boxes, and for shipping cases to protect the coffin or casket in transit, is made of similar woods, but the latter are more carefully manufactured, stronger and neater in appearance. At their destination they serve as rough boxes to receive the casket when put into the ground. White pine in Pennsylvania meets most of the demand and yellow poplar next. Other species reported were western white pine, red cedar, hemlock, chestnut, red oak, and mahogany.

Table 54.—Wood for Caskets and Coffins, year ending June, 1912.

Kind of Wood.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Chestnut,	5,387,000	38.53	\$20 57	\$110,807	1,573,500	3,813,500
White pine,	4,793,000	34.28	23 90	138,495	703,500	4,089,500
Hemlock,	1,000,000	7.15	28 00	28,000	1,000,000	.....
Yellow poplar,	748,000	5.35	32 10	24,008	432,000	316,000
Red oak,	665,000	4.76	40 44	26,890	55,000	610,000
White oak,	523,500	3.74	62 20	32,562	77,500	446,000
Mahogany,	331,000	2.37	76 30	25,255	.....	331,000
Black walnut,	214,000	1.53	59 50	12,732	182,000	32,000
Red cedar,	169,000	1.21	66 72	11,275	.....	169,000
Sugar maple,	35,000	.25	25 00	875	.....	35,000

Table 54—Concluded.

Kind of Wood.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Red gum,	30,000	.22	40 00	1,200	.....	30,000
Western white pine,	20,000	.14	42 50	850	.....	20,000
Redwood,	20,000	.14	54 00	1,080	.....	20,000
Cherry (black),	20,000	.14	60 00	1,200	20,000	.....
Cypress (bald),	20,000	.14	40 00	800	.....	20,000
Longleaf pine,	6,000	.04	37 50	225	.....	6,000
Birch,	1,000	.01	24 00	24	1,000	.....
Total,	13,982,500	100.00	\$29 77	\$416,278	4,044,500	9,938,000

MINE EQUIPMENT.

In conjunction with the operation of coal mining, there is usually maintained a wood-working department for the manufacture and repair of all wooden equipment required in connection with the work. Table 55 includes all the kinds of material used for these various purposes except that used in the rough, as props, lagging, caps, segments, sills, etc. In the interior of the mines lumber goes for uses in connection with ventilation schemes; brattices, doors, airways, manways, and for pit railing, etc. On the breakers in collieries it is used for tipple parts, drum bands, chutes, screens, scraper lines, flights, etc., besides it answers for parts of haulage systems, slope rollers for example, and for sprags and various other less important commodities. The lumber used for mine cars and their repair has been included as shown above, under car construction, while that going into manufactured parts for houses, buildings, and other building operations was listed with similar material under the planing mill industry. The available statistics reported by both anthracite and bituminous operations in Pennsylvania are as follows:

Table 55.—Wood for Mine Equipment, year ending June, 1912.

Kind of Wood.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Hemlock,	2,260,750	18.92	\$20 82	\$47,066	2,260,750	.....
White oak,	2,019,927	16.91	18 22	36,805	2,019,927	.....
Black gum,	1,628,460	13.63	24 37	39,678	219,216	1,409,244
Hickory,	816,363	6.83	13 51	11,081	816,363	.....
Red oak,	807,845	6.76	14 73	11,892	807,845	.....

Table 55—Concluded.

Kind of Wood.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Sugar maple,	790,200	6.61	18 67	14,751	790,200	.....
Chestnut,	749,405	6.27	15 42	11,557	749,405	.....
Beech,	656,525	5.50	17 49	11,781	656,525	.....
Shortleaf pine,	567,000	4.75	21 14	11,983	.....	567,000
Longleaf pine,	423,000	3.54	26 39	11,163	.....	423,000
Birch,	336,075	2.81	24 23	8,143	336,075	.....
Pitch pine,	246,000	2.06	23 07	5,675	246,000	.....
White pine,	239,000	2.00	23 70	5,665	13,000	226,000
Red gum,	150,000	1.26	12 00	1,800	.....	150,000
Dogwood,	139,088	1.16	15 73	2,188	139,088	.....
Ash,	43,425	.36	22 01	956	43,425	.....
Locust,	31,350	.26	10 18	319	31,350	.....
Hornbeam,	21,684	.18	13 14	285	21,684	.....
Yellow poplar,	14,000	.12	22 50	315	14,000	.....
Cork elm,	8,800	.07	26.14	230	8,800	.....
Total,	11,948,897	100.00	\$19 52	\$233,283	9,173,653	2,775,244

Two commodities included in the above table deserve special mention and to show the kinds of wood used in making them, separate statistics have been arranged and are presented in the supplemental tables, 55a, mine rollers, and 55b, sprags.

MINE ROLLERS.

Table 55a shows seven woods going into slope rollers. They aggregate nearly 2,500,000 feet of material used annually, but this does not represent wood for rollers that are manufactured elsewhere and brought to the State ready for use. Slope mining in recent years is being superseded by the shaft method and with the change is a corresponding decline in the demand for rollers or pulleys used on the slope to prevent abrasion of the cable against the ground. Two-thirds of the roller material is black gum. That obtained from timber cut in the State is mostly the species, *Nyssa sylvatica*, but that coming from a distance, usually in the form of bolts, is a mixture of the above named species with water gum (*Nyssa biflora*), and a small amount probably of tupelo (*Nyssa aquatica*). Black gum is frequently the common name for all three. The first two species are the most desirable for rollers because of their interlaced fiber that will not splinter nor roughen but wears smooth to a polish by use. Further than this, the woods possess the superior qualities of hardness and toughness, and on account of their abundance, especially in the southern states, are the lowest priced hardwoods. Maple is especially adapted for slope rollers, but owing to its growing scarcity and high price black gum has largely superseded it. Formerly maple was the most used wood for the purpose, but the table shows that the demand for it at present is only one-sixth of that of black gum.

Veneer cores, the symmetrically round pieces left after the veneer has been removed by the rotary cut process, are now being used for making mine rollers, when the species is one of the black gums. These cores are an off-

fall that represents to a large degree a complete waste and the fact that they are suitable for this line of manufacture should certainly be a means of utilizing a large quantity of this discarded material.

Table 55a.—Wood for Mine Rollers, year ending June, 1912.

Kind of Wood.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Black gum,	1,623,960	66.54	\$24 38	\$39,588	219,216	1,404,744
Sugar maple,	277,200	11.36	26 99	7,482	277,200	.....
White oak,	212,080	8.69	30 57	6,488	212,080	.....
Birch,	183,200	7.51	30 70	5,624	183,200	.....
Beech,	123,200	5.05	30 84	3,799	123,200	.....
Yellow poplar,	12,000	.49	18 75	225	12,000	.....
Cork elm,	8,800	.36	26 14	230	8,800	.....
Total,	2,440,440	100.00	\$25 99	\$63,431	1,035,696	1,404,744

SPRAGS.

This is a second division of this industry which deserves special attention, not that it represents a commodity that is important in the amount of wood consumed nor economically prominent in the operation of large factories and the use of skilled labor, but because it serves to illustrate the tendency in Pennsylvania towards waste utilization.

A sprag is a cylindrical wooden commodity pointed at each end, about 21 inches long, ranging in thickness from 2½ to 3¼ inches and is used in coal mining operations for checking and regulating the speed of a mine car as it runs in and out of the laterals leading to the shafts. The speed of the car is checked by locking one of its wheels. This occurs when the sprag, having been cast between the spokes of the rotating wheel, strikes against the car still.

Mine cars are not equipped with brakes like freight cars and upon the sprag often depends the safety of the car and more often a train when running downgrade. Sprags must therefore necessarily be very strong and many companies are particular in the specifications of their orders for manufacturing them. Small sprags of not proper thickness are a slight economy, if any, as the frequent breakages entail considerable waste. Also the species of wood used for making them, if not of the requisite strength, hardness, and durability, would in nowise pay in service the expenses of making the sprags.

This industry excludes the softwoods and a number of soft hardwoods, like aspen, yellow poplar, basswood, etc. Chestnut is not suitable owing to lack of sufficient strength, though if easily available and very cheap, it is used to a limited extent. The most practical sprag woods, listed according to amounts, are given in Table 55b following:

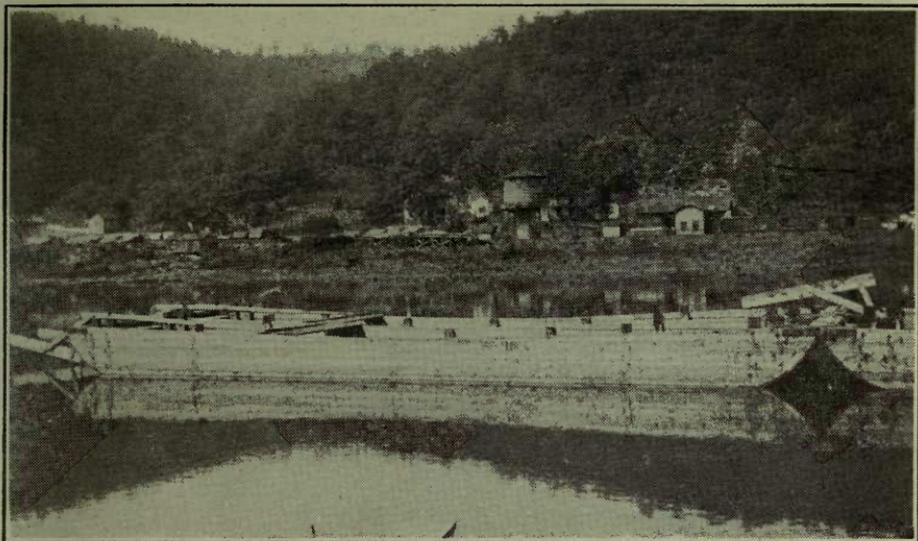


Fig. 12.—River scows after being launched, and ready to be taken to market down the Allegheny River.



Fig. 13.—Racing shell being built by a Pennsylvania manufacturer for the University of Pennsylvania.



Fig. 14.—Manufacture of mine sprags in Northern Pennsylvania.

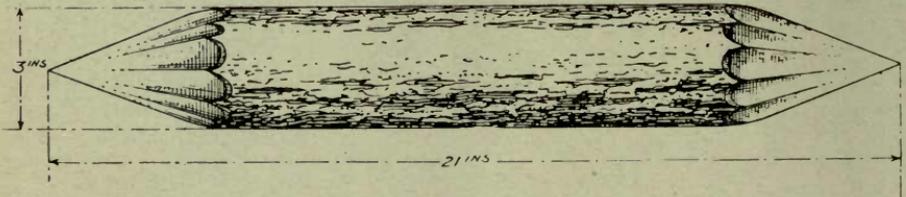


Fig. 15.—Drawing showing standard dimensions of a mine sprag.

Table 55b.—Wood for Sprags, year ending June, 1912.

Kind of Wood.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
White oak,	1,091,847	34.27	\$14 00	\$15,286	1,091,847	.....
Hickory,	816,363	25.62	13 51	11,081	816,363	.....
Red oak,	612,845	19.23	14 18	8,701	612,845	.....
Sugar maple,	304,200	9.55	13 55	4,121	304,200	.....
Dogwood,	139,088	4.37	15 73	2,188	139,088	.....
Beech,	92,325	2.90	10 71	989	92,325	.....
Ash,	37,425	1.17	21 54	806	37,425	.....
Locust,	31,350	.98	10 18	319	31,350	.....
Chestnut,	23,205	.73	16 42	381	23,205	.....
Hornbeam (ironwood),	21,684	.68	13 14	285	21,684	.....
Birch,	10,875	.34	14 62	159	10,875	.....
Black gum,	4,500	.14	20 00	90	.....	4,500
Hemlock,	750	.02	13 33	10	750	.....
Total,	3,186,457	100.00	\$13 92	\$44,366	3,181,957	4,500

Over 3,000,000 feet of wood is required annually for making sprags in Pennsylvania. This is not representative of all the material that is used as many of these commodities are made by hand and concerning which it is impossible to get information; others are made elsewhere and shipped in for use in Pennsylvania collieries.

Sprags at present are almost entirely made from young timber, pole size; coppice oak and maple being cut for this purpose. This is often a sacrifice of valuable second growth timber since it is practicable to make this commodity from material considered as waste. In that connection the present report may aid in bringing about the utilization of woods waste, like tops, limbs, cut offs, fire killed poles, etc., the most difficult to market of all the off-fall from lumber operations.

In this connection the Department of Forestry of Pennsylvania recently made a valuable experiment, an outline of the results of which will prove of considerable importance not only to mining companies and others owning their own timber, but to all interested in forest conservation.

During the winters of 1911-12 fire killed a stand of oak and chestnut coppice 14 years old on 75 acres in one of the State Forests in the northeastern part of Pennsylvania. This timber was not merchantable because of the size and distance from market. The Department of Forestry conceived the idea of its sale in the form of sprags and accordingly arrangements were made with an owner of a sprag machine to move onto the tract and use all suitable timber for making this commodity. A contract was made for manufacturing and delivering the finished product to the nearest shipping point for \$9.30 which included, owing to distance, a cost of \$4 for wagon transportation. Eleven dollars was the price received for the finished sprags at the siding, leaving a balance of \$1.70 a thousand pieces for stumpage. The Department of Forestry scored a success in the undertaking partly because of the revenue received from the fire killed timber, otherwise a waste; also by

this operation a vast amount of what would otherwise have been debris was removed from the woods, assuring less of a tangle when the trees fell and thus allowing a closer fall to the ground and quicker decomposition.

Ten years ago sprags were made with ax and knife, 200 per day being the most one man could produce. Repeated efforts were made to eliminate the manual work by the invention of machinery, but it was not until four years ago that a manufacturer made a successful device which, with the work of two men, enables a possible daily output of from eight to nine thousand sprags. In ordinary commercial runs, however, the average production with this machine is probably not over half the capacity.

FIXTURES.

The fixture manufacturers make certain lines of commodities so closely related to similar ones grouped under the furniture and planing mill industries, that it is difficult at times to determine under which classification they properly belong.

Generally fixtures include furnishings for offices, stores, lodge rooms, saloons, banks, hotel lobbies, lunch rooms, courthouses, churches, dentists' and surgeons' cabinets, account registers, cash registers, index files, and other similar commodities. The materials for making these are distinguished from that going into high class inside house finish such as mantels, colonnades, cabinet work, and general mill work. The latter are stationary, while fixtures are readily portable. From furniture woods they are separated according to the uses of the finished products. Office desks, book cases, store tables, etc., belong to furnishings of business headquarters while commodities of the same name for residences go in the furniture class. Large manufacturers specialize in one or the other lines but in small cities and towns where the local demand does not justify specialization the fixture makers and the planing mills manufacture products belonging to both industries.

Nearly the same woods are employed for fixtures as for furniture but a larger part of the fixture material is of the higher grades. In both industries the woods can be put into two classes, for outside finish and for interior or hidden work. Veneers enter largely into the former class and are growing in favor, chestnut being the favorite backing or core material. For painted work or store counters, bar tops, display racks, show window platforms, and other fixture parts, it is necessary to use solid wood instead of cheaper woods overlaid with veneer. This accounts for the average prices of the woods listed in Table 56 being higher than in the furniture industry.

Yellow poplar, white oak, red oak, and chestnut supply the largest portion of the fixture material in Pennsylvania. Seventy-five per cent. of the quantity used is of these four kinds. Yellow poplar serves both for exterior and interior work. Its adaptability to hold paint and stains, its soft texture and even straight grain make it an easy material to smooth and commend it probably above any other wood for both exterior enameled work and for drawer bottoms, reinforcements, hidden parts of show cases, shelving, interior of wall cases, partitions, etc.

Oak with its ornamental figure is universally the premier fixture wood as it is the foremost furniture wood. Both classes of oaks, red and white, are in demand, and together the amount is greater than that of any other of the woods the Pennsylvania fixture makers purchase. A large part of oak is quartered stock which merely designates the method of sawing. It is the same as rift sawed and arises from first cutting the log into quarters and the quarters into boards, the saw crossing the circles of growth at or nearly at right angles. Oak shows more figure when the log is sliced ordinarily into

boards but the pleasing effect of rift sawing is more in favor and besides being desired by the fixture makers on account of minimum shrinkage and warp. Birch is ahead of any other domestic wood for imitating mahogany. The heartwood of the tree is used for this work. The sapwood has a much lighter color but like the heartwood is specially adapted to take stain and receive and hold a soft brilliant polish. Besides mahogany, birch can readily be stained to imitate cherry, Circassian walnut, fumed oak, bog oak, black walnut, and other pleasing effects. The figure of curly birch is especially attractive and it brings high prices, going into the highest grades of fixtures. Other finishing woods are mahogany, sugar maple, including large quantities of bird's eye maple, cherry, red gum, black walnut, butternut, and Circassian walnut. The last named is the most expensive wood and goes only into the most expensive work. Red gum and butternut are frequently found richly mottled and in some respects resembling Circassian walnut. For that reason they are most frequently used of any domestic wood to be finished in imitation of this foreign wood.

This industry calls on the State for only a limited portion of its raw material. Only a little more than one-third of the total was reported as home cut and of the entire amount of eleven of the woods shipped in from other states, two-thirds were oak and yellow poplar which being demanded in high grades made it necessary to obtain a large portion in regions where the virgin stands of these species are the most abundant. States in the southern Appalachians furnished most of this material. Of the woods listed in the fixture table that are abundantly cut in Pennsylvania the chestnut, birch, sugar maple, basswood, cherry, beech, ash, black walnut, and butternut, most of the supply used was State-grown. The fixture manufacturers, therefore, like the other class of manufacturers using home-grown material should be vitally interested in conservation and the movement looking to the State's future timber supply.

Table 56.—Wood for Fixtures, year ending June, 1912.

Kind of Wood.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Yellow poplar,	2,237,000	18.82	\$37 21	\$83,229	167,500	2,069,500
White oak,	2,127,110	17.89	59 79	127,184	303,800	1,823,510
Red oak,	2,100,950	17.67	41 36	86,902	509,500	1,591,450
Chestnut,	1,803,350	15.17	25 16	45,364	1,114,250	689,100
Birch,	832,300	7.00	36 60	30,461	433,500	393,800
White pine,	452,450	3.81	45 64	20,649	100,450	352,000
Sugar maple,	366,000	3.08	23 17	8,482	317,500	48,500
Mahogany,	332,400	2.80	135 11	44,910	.....	332,400
Basswood,	269,100	2.27	33 92	9,128	176,100	93,000
Red and silver maple,	260,000	2.19	15 00	3,900	260,000	.....
Shortleaf pine,	256,000	2.15	25 92	6,635	.....	256,000
Loblolly pine,	153,000	1.29	32 17	3,392	.....	153,000
Cherry (black),	128,700	1.08	66 14	8,512	83,250	45,450
Cypress (bald),	111,800	.94	37 38	4,179	.....	111,800
Red gum,	94,000	.79	44 00	4,136	.....	94,000
Beech,	71,000	.60	21 85	1,551	60,000	11,000
Ash,	49,900	.42	58 62	2,925	41,000	8,900
Hemlock,	44,300	.37	26 64	1,180	30,300	14,000
Cottonwood,	40,000	.34	38 50	1,540	20,000	20,000
Longleaf pine,	39,500	.33	32 41	1,280	.....	39,500

Table 56—Concluded.

Kind of Wood.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Black walnut,	35,860	.30	82 91	2,973	28,860	7,000
Sugar pine,	25,000	.21	65 00	1,625	.....	25,000
Western white pine,	20,500	.17	46 78	959	.....	20,500
Pitch pine,	20,000	.17	16 00	320	20,000	.....
Butternut,	13,500	.11	44 30	598	13,500	.....
Spruce,	1,500	.01	42 00	63	.....	1,500
Black gum,	1,000	.01	28 00	28	.....	1,000
Hickory,	1,000	.01	65 00	65	1,000	.....
Redwood,	500	*	55 00	28	.....	500
Circassian walnut,	500	*	250 00	125	.....	500
Total,	11,888,220	100.00	\$42 25	\$502,323	3,685,310	8,202,910

*Less than 1-100 of 1 per cent.

CLOTH, HOSIERY BOARDS, ETC.

Cloth boards, commonly called wrapping boards, upon which to wind woolen and other textile goods, hosiery boards used in stocking factories and stores, hammer boards for beating brass and other sheet metals, and lap boards used by the seamstress, are the commodities which have been classed under Table 57. The largest part of the total was for cloth boards and the species used were loblolly pine, shortleaf pine, yellow poplar, and white pine. The size of cloth boards varies from 6 to 8 inches wide and from 16 to 20 inches long and one-fourth to five-eighths of an inch thick.

Sugar maple supplies the entire demand for hosiery boards or driers. They are made of $\frac{1}{4}$ inch material which is strong, dense and not liable to roughen up or splinter. Yellow poplar sufficed for sewing or lap boards and for stocking forms. Because maple does not split easily and is strong and hard, it is preferred of all woods for hammer boards. Considerable material is used in Pennsylvania for the manufacture of ironing and sleeve boards, meat, pastry, and steak boards or planks, but these have been listed and referred to under the industry entitled "Woodenware."

Table 57—Wood for Boards, Cloth, Hosiery, etc., year ending June, 1912.

Kind of Wood.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Shortleaf pine,	8,000,000	67.94	\$25 00	\$200,000	.....	8,000,000
Yellow poplar,	1,070,000	9.09	29 38	31,440	.....	1,070,000
White pine,	1,000,000	8.49	32 00	32,000	.....	1,000,000
Loblolly pine,	1,000,000	8.49	18 13	18,125	.....	1,000,000
Sugar maple,	705,000	5.99	46 45	32,750	50,000	655,000
Total,	11,775,000	100.00	\$26 69	\$314,315	50,000	11,725,000

PATTERNS AND FLASKS.

Table 58 shows that nearly eleven and a half million feet of lumber are required annually in Pennsylvania for making patterns, flasks, and for other needs of the moulders and foundrymen. Of this amount nearly 80 per cent. is white pine. All of this did not go for patterns, since white pine was demanded for flasks in greater amounts than was any other wood. It is, however, the predominant pattern wood not alone in Pennsylvania, but throughout the country at large. Its suitability is due above all to its susceptibility to hold shape under atmospheric changes, to its grain being close, straight, and even, with obscure figure, to its being easily worked, and at the same time not so soft as to be injured by rough usage, and to its being light in weight and easily portable. Since the pattern must be designed in the exact shape and dimensions of the article to be moulded, the highest grades of lumber are required, and, in many cases, material of considerable width is required and is usually often quarter-sawed, which will not warp as easily as straight sawn lumber cut without regard to grain. These are the factors which have increased the cost of this species to the point of creating a demand for a substitute wood. Thus far no kind of wood experimented upon has been equal to white pine. It will be noticed that the western white pine cut in the Rocky Mountains appears in the table and also the sugar pine of California. Neither of these woods can be distinguished at sight from the eastern white pine. The western white pine is heavier than the eastern, and the sugar pine more resinous. The kinds of wood used for patterns in Pennsylvania are as follows:

White pine.	Yellow poplar.
Cherry.	White oak.
Mahogany.	Black walnut.
Sugar maple.	Butternut.
Sugar pine.	Teak.
Western white pine.	Silver maple.
Redwood.	

Standard patterns, or patterns used often and therefore submitted to considerable wear, are made as durable as possible. For these very hard dense wood is required and mahogany, cherry, butternut, sugar maple, black walnut, and teak wood—the latter a foreign wood—are the ones used in Pennsylvania. Large patterns, like those for moulding massive machine parts can not with economy be used entirely of these woods. Only the parts that come in direct contact with the sand, where the greatest wear is, are made of hardwoods, the inside or filler being of a softer, cheaper wood, and one more easily worked, such as white pine, sugar pine, yellow poplar, or redwood. Mahogany is the best of the hardwoods for patterns, though cherry is the favorite of the domestic woods. These are of even straight grain and less liable to shrink and swell when enclosed in the matrices of damp sand. In addition they stand well the ramming, knocking, and rough usage a standard pattern receives. Sugar maple would be more used than it is were it not for its tendency to warp. Being hard, of straight, compact structure, with a capacity to wear smooth, and easily worked, it otherwise possesses excellent qualities for pattern material.

For flasks lower grades of lumber are required than for patterns. Flasks serve as the frame or box, holding the sand in which to make the mould. A two-part flask is used when the pattern is in two pieces, one resting upon the other, the upper part is the cope, the lower the nowel. Flask material does not last long, its destruction being due more to frequent burning than to the general rough wear. The firing results from intense heat of the sand after the molten metal is poured into the mould. Buckets of water are conveniently

at hand to extinguish a blaze as soon as it is discovered. Wood slow to take fire is the best flask material, though choice is usually limited to kinds near at hand or that are cheap. Redwood, when not too costly is preferred, because it is generally conceded to be more fireproof than any other domestic wood. Coating the inside of flasks with a fireproof chemical has been tried recently as an experiment. Flask woods in order of their importance in Pennsylvania are as follows:

White pine.	White oak.
Loblolly pine.	Pitch pine.
Hemlock.	Norway pine.
Shortleaf pine.	Sugar maple.
Longleaf pine.	White elm.
Yellow poplar.	Red oak.
Spruce.	Beech.
Chestnut.	

The Pennsylvania forests furnished only one-fourth of the total pattern material used. This was probably due to the diminishing stand of white pine timber in the State of the size demanded by the high grade lumber pattern makers. Nearly seven-ninths of all that was used was shipped in from West Virginia, the Great Lakes region, and western states.

Table 58.—Wood for Patterns and Flasks, year ending June, 1912.

Kind of Wood.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
White pine,	9,141,449	79.53	\$56 09	\$512,735	2,276,198	6,865,251
Loblolly pine,	579,000	5.04	20 27	11,738	.....	579,000
Hemlock,	291,500	2.54	18 37	5,356	291,500	.....
Shortleaf pine,	242,012	2.11	20 89	5,056	.....	242,012
Longleaf pine,	234,000	2.04	20 70	4,844	.....	234,000
Spruce,	223,988	1.95	33 63	7,533	44,000	179,988
Redwood,	136,000	1.18	60.74	8,260	.....	136,000
Chestnut,	128,200	1.11	19.24	2,466	47,500	80,700
Cherry (black),	86,894	.76	71 53	6,220	54,644	32,250
Mahogany,	86,268	.75	124 92	10,777	.....	86,268
Sugar maple,	50,550	.44	47 46	2,399	38,850	11,700
Sugar pine,	50,000	.43	85 00	4,250	.....	50,000
Yellow poplar,	46,500	.40	33 82	1,805	37,500	9,000
Pitch pine,	44,000	.38	20 84	917	41,500	2,500
Norway pine,	43,040	.37	28 00	1,205	.....	43,040
Western white pine,	28,000	.24	56 93	1,594	.....	28,000
White oak,	24,000	.21	39 50	948	24,000	.....
White elm,	15,000	.13	33 00	495	.....	15,000
Black walnut,	14,500	.13	50 00	725	4,500	10,000
Red oak,	12,000	.10	25 00	300	12,000	.....
Beech,	10,000	.09	25 00	250	10,000	.....
Butternut,	5,210	.05	79 85	416	3,900	1,310
Teak,	1,400	.01	250 00	350	.....	1,400
Red and silver maple,	1,000	.01	55 00	55	1,000	.....
Black gum,	500	*	24 00	12	.....	500
Total,	11,495,011	100.00	\$51 39	\$590,706	2,887,092	8,607,919

*Less than 1-100 of 1 per cent.

HANDLES.

Other states take precedence over Pennsylvania in the quantity of wood annually consumed in the manufacture of handles, but it is probable that none surpasses it in the different kinds of handles made. The principal ones reported have been listed and the woods from which they are made arranged in order of quantity as follows:

Axe Handles.

White ash.
Hickory.
White oak.

Brick Trowel Handles.

Dogwood.
Persimmon.

Broom Handles.

Basswood.
Beech.
Sugar maple.
Birch.

Butcher Knife Handles.

Birch.
Beech.
Sugar maple.

Cant Hook Handles.

Sugar maple.
Hornbeam.
Hickory.

Carrying Poles.

Hornbeam.
Hickory.

Chisel Handles.

Hickory.

Coal Pick Handles.

White oak.
Sugar maple.
White ash.
Sweet birch.
Hickory.

Concrete Rammer Handles

Hickory.
Hornbeam.

Crosscut Saw Handles.

Beech.
Sugar maple.
Hickory.

Door Knobs.

Sugar maple.

D-Fork Handles.

White ash.

D-Shovel Handles.

White ash.
Sugar maple.

Fork Handles.

White ash.
Cherry.

Grab Maul Handles.

Hornbeam.
Hickory.

Hammer Handles.

White ash.
Hickory.

Hatchet Handles.

Hickory.
White ash.

Hay Knife Handles.

White ash.

Hoe Handles.

White ash.
Sugar maple.
Beech.
Birch.

Instrument Handles.

Rosewood.
Ebony.

Jack Handles.

Hickory.
Sugar maple.

Mallet Handles.

Dogwood.
Hornbeam.
Hickory.

Maul Handles.

Hickory.

Mop Handles.

Beech.
Sugar maple.
Birch.
Basswood.

Peavey Handles.

Hornbeam.
Hickory.

Pick Handles.

Hickory.
White oak.
Hornbeam.

Pipe Wrench Handles.

Basswood.

Plastering Trowel Handles.

Basswood.

Pole Brush Handles.

Basswood.

White ash.

Shortleaf pine.

Rake Handles.

Sugar maple.

Beech.

Birch.

Ash.

Saddler's Tool Handles.

Black walnut.

Sad Iron Handles.

Red gum.

Sand Rammer Handles.

Hickory.

Hornbeam.

Saw Frames.

Red Oak.

Birch.

Sugar maple.

Saw Handles.

Red gum.

Sweet birch.

Applewood.

Beech.

Spade Handles.

White ash.

Black ash.

Spud Handles.

Hickory.

Hornbeam.

Sugar maple.

Beech.

Stomper Handles.

Hornbeam.

Hickory.

Street Brooms.

Beech.

Sugar maple.

Hickory.

Track Tool Handles.

White oak.

Hickory.

Sugar maple.

White ash.

Hickory is unquestionably the best wood used for long-handle tools, including the maul, axe, striking hammer, sledge, and track tools used on railroads for construction work and for maintenance of way. Besides exceptional strength, this wood possesses other important qualities for handle material,—weight, stiffness, shock-resisting ability, and susceptibility to wear smooth by use. Manufacturers of this class of handles usually specialize in this line, since the processes of manufacture and the machinery required are distinct from those employed in making other classes. Hickory is becoming scarcer each year, and this fact has induced a number of northern handle makers to move southward nearer to the source of the largest supply. Not a few firms, however, continue to maintain factories in the north and to ship billets, bolts, and rough-turned handle stock from the south to the north as far as Connecticut and New Hampshire.

It is interesting to note from the following table that the Pennsylvania hickory handle manufacturers procure 66 per cent. of their raw material from the State. It would be well for farmers and timber owners in Pennsylvania who own stands of hickory to understand the increasing demand for the wood for handles and that second-growth hickory is preferred. This tree is not a rapid grower but it is not so slow as many other trees and it will soon prove a good investment to preserve stands of second-growth hickory to aid their development, and to cut the timber only as it becomes large enough for handle bolts. The list given below shows the kinds of wood which are being tried as substitutes for hickory in handle making, white oak, cow oak, swamp oak, sugar maple, hornbeam, and ash being the principal ones. For coal-pick handles these woods are suitable and most largely used, there being less strain as to strength and shock-resisting than if used for the more strenuous work of the pick, axe, and maul.

The manufacture of fork and garden tool handles is another distinct class of this industry. What hickory is for the axe, pick, and sledge, white ash is to this class, namely, the pitch-fork and hay-fork, the long handle and D-shovel, and the hoe, rake, etc. Stiffness, toughness, and strength without excessive weight are the properties which commend ash for this use. It is surprising that the handle manufacturers demanding this wood procure only 58 per cent. of their requirements from State-grown woods. This condition offers another opportunity to timber owners to encourage the growing of ash for handle stock, to meet the demand of the increasing home market. In forest management ash is an important tree. It is a fairly rapid grower and is not particular as to situation, as are many other trees.

Other woods serve with ash for meeting the demand for this class of handles, but they are used in considerably smaller quantities. In the order of their importance, they are sugar maple, beech, birch, and cherry. In other states elm, sycamore, and soft maple are included.

More wood in Pennsylvania is required for broom and mop handles than for any other class, and like hickory handles, the manufacturer makes no other kinds. The maples, chiefly sugar maple, the birches and beech because they turn well and wear smooth in use, and to a less extent, basswood, red gum, ash, and sycamore, are the broom and mop handle woods; and all of them are reported being used in Pennsylvania. Sugar maple is preferred and only a few years ago was most used. Its demand for other uses at higher prices is probably the chief cause for bringing birch into first place. High grade material is required for broom handles and squares are usually cut direct from the log, the less desirable being put into mop handles. Mop handle squares were found being bolted in Pennsylvania from slabs and edgings of sawmills cutting beech, birch, and maple.

For handles where weight is not an objection and strength is the foremost consideration, hornbeam or ironwood has been found very satisfactory. Cant hook and peavey handles, stomper and rammer handles are examples.

Applewood is very well adapted for handsaw handles, being hard, sufficiently strong, of uniform texture, and susceptible of high polish. The attractive uniform color has caused it to become the principal wood for better grades of handles. Red gum, cherry, and sweet birch have proved satisfactory for saw handles, but more because they can be finished to resemble applewood closely than because of any other special quality which they possess. Beech furnishes the material for cheaper grades. Its color is against it and also the fact that it is not capable of high polish, but its toughness and greater strength and ability to wear smooth probably make it nearly equal to applewood. Other woods used for saw handles but not reported in Pennsylvania are mahogany and black walnut. Saw frames for buck saws are of red oak, birch, and maple and handles of crosscut saws are of sugar maple, hickory, and beech.

The bricklayers' trowels have handles of dogwood and persimmon. These woods are dense in structure and among the hardest domestic woods and therefore best stand the wear for use as a hammer for imbedding the brick into mortar after placing it. The plaster trowels are made of basswood. Being porous this wood absorbs the moisture from the wet hand of the mechanic and it is claimed does not slime. In the New England states popple or aspen is used for the same reason.

Table 59.—Wood for Handles, year ending June, 1912.

Kind of Wood.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.		Grown Out of Pennsylvania.	
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.		
Hickory,	3,973,350	36.07	\$31 97	\$127,045	2,599,300	1,374,050		
Sugar maple,	2,307,850	20.95	19 02	43,897	1,727,700	580,150		
Ash,	1,969,750	17.88	28 45	56,032	1,130,750	839,000		
Beech,	1,752,300	15.91	17 31	30,412	1,302,800	449,500		
Hornbeam,	415,500	3.77	49 53	20,580	315,500	100,000		
Birch,	207,750	1.89	18 13	3,766	205,250	2,500		
Red gum,	195,000	1.77	29 38	5,730	.....	195,000		
White oak,	59,000	.54	27 42	1,618	59,000	.....	
Appelwood,	50,000	.45	40 00	2,000	25,000	25,000		
Basswood,	41,200	.38	29 73	1,225	41,200	.....	
Red oak,	15,000	.14	17 50	263	15,000	.....	
Shortleaf pine,	12,000	.11	30 00	360	.....	12,000		
Cherry (black)	7,500	.07	50 00	375	2,500	5,000		
Persimmon,	7,000	.06	54 00	378	.....	7,000		
Black walnut,	1,050	.01	81 90	86	1,050	.....	
Ebony,	327	*	305 81	100	.....	327		
Dogwood,	230	*	67 57	16	.....	230		
Rosewood,	100	*	360 00	36	.....	100		
Total,	11,014,907	100.00	\$26 68	\$293,919	7,425,050	3,589,857		

*Less than 1-100 of 1 per cent.

LAUNDRY APPLIANCES.

The fourteen woods demanded by the Pennsylvania manufacturers for making laundry accessories are listed in Table 60 following and they aggregate a cut of over nine million feet. Four woods, sugar maple, beech, birch, and yellow poplar, contributed nearly 70 per cent. of the total. Of these sugar maple is the most important, in quantity furnishing more than one-half of the entire demand. Four woods were cut entirely outside of the State but nearly three-fourths of the aggregate employed grew in Pennsylvania, showing to what extent this industry is dependent upon the forest resources of the State and why manufacturers should be interested in the movement to protect and improve the forests.

Clothespins are the smallest commodity grouped under this heading but they are not the least important as more wood is used for their manufacture than for any other laundry product. Over four million feet is the amount annually required. Fine grained beech and sugar maple in nearly equal quantities were the principal woods used. The other kinds include birch and yellow poplar. The last named and maple also are used for making clip pins, which are two wooden scales held together by a wire spring. The woods used in Pennsylvania as clothespin material are the same as those used in other states except in Virginia where the manufacturers report black gum, both the water gum and cotton gum varieties, which in those parts are indiscriminately called black gum. Three processes are necessary in the manufacture of clothespins, (1) the rough billets are turned to proper form, (2) they are put through another machine which slits them, (3) they are finally consigned into revolving cylinders to be tumbled or smoothed by abrasion.

Ironing boards and stands are an important part of this industry and the woods used are selected according to their fitness for the several parts. The frames or the collapsible stand upon which the boards rest require a strong wood and one that turns readily. Sugar maple and beech are reported in Pennsylvania while in Michigan elm and yellow birch joined with these in furnishing this material. Ironing boards are preferably of a wood that is soft and easily smoothed and one that in the presence of high temperature holds its shape well. It should be made of light weight wood so as to be easily portable. Cottonwood answers well but buckeye, basswood, yellow poplar, and white pine are probably the favorites. Besides regular-size ironing boards, these woods were also reported for skirt and sleeve boards used for specialty work.

Beech, birch, and maple, because they are strong, tough, and not easily split, were reported for making clothes racks, sometimes called horses, and for clothes driers. Light weight wood like basswood or aspen were used for the stringers. The racks are made of turned stock and fold together like a screen. The driers are revolving reels through the arms of which wire is strung for hanging clothes. These include the ones that are temporarily attachable to back porches of apartment buildings and also the kinds that are placed in back yards. Adjustable curtain stretchers used in laundering lace and other thin fabric window curtains are included in this industry. Basswood was the only wood used while a large amount of loblolly pine was called on for clothes props.

Mangles are ironing machines used for domestic purposes in ironing flat work such as table and bed linen, towels, handkerchiefs, etc. In appearance they resemble clothes wringers, having their rolls operating at a tangent. Some of them are intended only for cold ironing or smoothing. In these the rolls are of wood and the pressure of the rolls alone does the work giving the clothes the same smooth appearance as if hot ironed. In Pennsylvania they are made alone of sugar maple but the Michigan report also shows beech and elm though in much smaller quantities. Machines are also made for hot ironing and in these the upper roll is hollow metal heated while the lower one is wood covered with padding and a top dress of muslin. Mangle rollers vary in size from 3½ inches in diameter and 20 inches long to 6 inches diameter and 24 inches long.

Washing machines are of various designs and shapes, some in box form, some conical shape similar to a wash tub, and others are cylindrical. The last named is the design used in steam laundries. Cypress is more suitable than any other wood for washing machine bodies because it is less liable to warp and more durable in situations of alternating moisture and dryness. Ash and to a small extent white pine were also reported. Of the Pacific coast woods, redwood seems to give the best result. On account of the strength of sugar maple it was called on for the legs of washing machines; and beaters or agitators which work inside of the machine to turn the clothes in washing are made of beech or maple.

The reasons which commend cypress for washing machines make it the principal wood for wash tubs. In Michigan spruce was the favorite wood while the Illinois manufacturers used cypress, cotton gum, and red gum in the order named. The increasing use of these woods, especially cotton gum, which is tupelo, is worthy of note.

For washboards, the manufacturers require woods that are light in color, especially for the print board, which is stenciled. Yellow poplar alone is called on in this State but in Ohio, Illinois, and Michigan, basswood, cottonwood, and cotton gum were demanded. Washboard sides or posts are

made from beech and sugar maple. The former is more extensively used. The rubbing surface at one time was made of maple and beech, but now metal or glass rubs have been substituted.

Table 60.—Wood for Laundry Appliances, year ending June, 1912.

Kind of Wood.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Sugar maple,	6,340,500	58.73	\$23 75	\$150,613	3,355,500	2,955,000
Beech,	1,432,000	13.26	15 95	22,842	1,352,000	80,000
Birch,	1,090,000	10.10	12 72	13,860	1,070,000	20,000
Yellow poplar,	610,000	5.65	16 44	10,030	500,000	110,000
Cottonwood,	500,000	4.63	32 90	16,450	.....	500,000
Basswood,	437,000	4.05	32 52	14,210	108,500	328,500
Yellow buckeye,	125,000	1.16	23 00	3,500	125,000	.....
Red and silver maple,	80,000	.74	25 00	1,990	42,500	37,500
White pine,	78,200	.72	35 92	2,809	25,000	53,200
Cypress (bald),	39,000	.36	39 10	1,525	.....	39,000
White oak,	30,000	.28	23 50	705	10,000	20,000
Red oak,	30,000	.28	23 50	705	10,000	20,000
Chestnut,	3,000	.03	24 00	72	2,000	1,000
Ash,	1,000	.01	25 00	25	1,000	.....
Total,	10,795,700	100.00	\$22 17	\$239,336	6,631,500	4,164,200

CIGAR BOXES.

Cigar boxes are the only wooden tobacco containers made in Pennsylvania and the woods required solely for this purpose are listed in Table 61. In a number of southern states, plug and twist tobacco boxes were included with cigar box lumber and the factories known as the tobacco box industry. Cigar box material is bought as thin lumber and veneer, the former usually 5-32 of an inch in thickness. This material, as is customary in commerce, was reported in terms of superficial feet. To make it comparable with the other tables of this report, however, it was reduced to board measure and valued on that basis. For this reason the cost of the material may appear somewhat high, especially since the cost of manufacture has not been eliminated nor has any allowance been made for waste. The prices range from \$20 to \$30 per thousand feet surface measure for Spanish cedar, \$12.50 to \$16.50 for yellow poplar and basswood and \$14 to \$17.50 for cotton gum and red gum.

Though the eastern part of Pennsylvania raises the best grades of leaf tobacco, the center of the cigar box industry is not located there but in the Pittsburgh region where the manufacture of stogies and cigars has gained a reputation.

Spanish cedar, it is claimed, gives a delicate odor to the cigars which is attributed to no other wood. This accounts for the fact that it is the principal cigar box wood not only in Pennsylvania but in the country at large. Spanish cedar is native to the West Indies and Central America and is brought to this country in log form to be manufactured. It is a broad leaved tree and not a relative of the domestic cedars or junipers which are conifers.

Not all of the Spanish cedar goes into cigar boxes as thin lumber. Much of it is veneer glued to a native wood that is thicker and this two-ply stock supplies a large part of the demand of the cigar box material and at a price considerably below that asked for Spanish cedar lumber. Yellow poplar, cotton gum, basswood, and red gum are the domestic woods which furnish most of the veneer backing. Yellow poplar is used in larger quantities in Pennsylvania than the combined amounts of the three other woods, probably because western Pennsylvania is near to the center of the yellow poplar lumber producing region. This region, together with a part of Pennsylvania, includes mainly West Virginia, eastern Kentucky, Tennessee, and southern Ohio. Tupelo or cotton gum and red gum are equally well suited for built-up material. They work easily and with the recent improvement in kiln drying veneer the objection formerly made to their tendency to twist and warp has been largely overcome. The decreasing supply of yellow poplar and its large demand for many other uses are bringing cotton and red gum rapidly to the front for this line of manufacture.

The domestic woods used are not all overlaid with Spanish cedar veneer. They are extensively cut to full thickness for boxes of solid lumber. To give these woods a cigar box appearance, which means to make it resemble Spanish cedar, the process of stamping is resorted to and improvements in this line give it an effect which makes it difficult without close inspection to distinguish the imitations from the cedar. Where domestic woods are independently used, most often the inside of the box is covered with litho paper, advertising the name of the cigar and maker. Waste in cigar box manufacture is largely utilized; the ends and sides can be made from what is left after cutting the tops and bottoms.

Table 61.—Wood for Cigar Boxes, year ending June, 1912.

Kind of Wood.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.				
Spanish cedar,	5,800,160	58.41	\$112 71	\$653,735	.....	5,800,160
Cotton gum,	2,043,917	20.58	63 37	129,519	.....	2,043,917
Yellow poplar,	1,041,928	10.49	75 31	78,465	24,500	1,017,428
Red gum,	549,750	5.54	49 79	27,373	.....	549,750
Basswood,	495,000	4.98	64.95	32,150	.....	495,000
Total,	9,930,755	100.00	\$92 77	\$921,242	24,500	9,906,255

WOODENWARE AND NOVELTIES.

The commodities produced by the factories grouped under this industry are many and varied. This accounts for the twenty different woods listed in Table 62, including small quantities of two foreign woods, rosewood and lignum-vitae. The total consumption of wood in this industry was over eight and one-half million feet annually and beech, mostly home-grown, was used in quantities greater than the total of any other five woods listed. Basswood represented the greatest amount of shipped-in material, a little over three-fourths of it coming from New York and West Virginia.

Woodenware refers to useful household articles, such as pails, buckets, freezers, hose reels, snow shovels, rat and mouse traps, comb boxes, broom holders, and towel racks, and also to utensils important in the equipment of kitchens, such as pastry and pie boards, meat boards, rolling pins, slaw cutters, fish and steak planks, lemon squeezers, potato mashers, etc. A portion of the pails made by this industry in Pennsylvania is for candy packages. Though these may more properly belong to the box industry, they have been included here with other pails and buckets, the method of manufacture being identical and the same factories making both styles. While white pine is the favorite wood for pail staves in Pennsylvania, as it is in nearly all other states where this industry is important, a few of the softer hardwoods like basswood, yellow poplar, buckeye, and willow are also employed. Bales or handles of buckets are rarely made by the pail manufacturer. The variety wood-workers or manufacturers specializing in all kinds of turnings furnish them. Beech, birch, and maple are used in the largest quantities.

Mouse traps belong to this industry. They are made of beech, yellow poplar, red gum, sugar maple, and white elm in the order named, and over 1,500,000 feet of these woods are annually required for their making. Sugar maple and holly were used for rolling pins, the latter being shipped from Arkansas and being desired because of its density, toughness, whitish color, and its capacity to turn well. Beech being strong and not imparting a taste went for lemon squeezers except for the bowls which required a harder, denser wood. Lignum-vitae, sent in from the West Indies, was found most suitable and is used for expensive squeezers while glass bowls answered for cheaper ones.

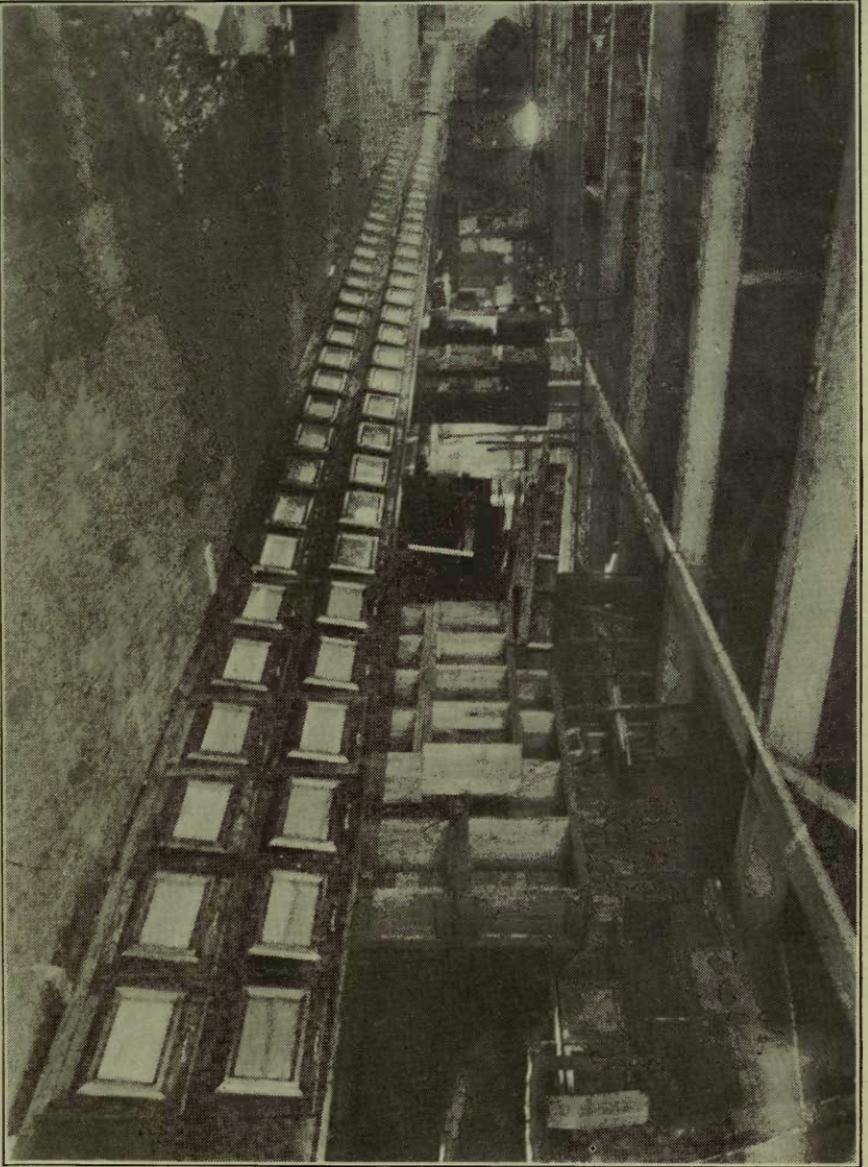
Planks for cooking planked fish and steaks have been made for years from one wood, principally white oak. Originally a common surfaced oak board met the demand but now they are manufactured in various shapes and sizes to fit the holders into which they are placed for service. To keep the essences from running off the plank they are frequently grooved which adds also to their appearance when not in use. Rosewood was the only foreign wood reported for toddy sticks but sugar maple and beech are most commonly used.

Novelties are of so many different kinds that space here will not allow an attempt to name them. Novelty makers themselves can hardly list all the different articles they make because they produce specialties of all kinds, mostly to order, and usually have no standard lines. Those marked with an * in the legend of the accompanying illustration will give an idea of the class of commodities included as novelties.

Table 62.—Wood for Woodenware and Novelties, year ending June, 1912.

Kind of Wood.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Beech,	3,639,000	42.44	\$20 46	\$74,446	3,356,000	283,000
Sugar maple,	1,040,500	12.13	23 34	24,280	737,500	303,000
Basswood,	944,000	11.01	24 26	22,905	228,500	715,500
Ash,	634,500	7.40	30 67	19,462	259,500	375,000
White elm,	500,000	5.83	28 00	14,000	.....	500,000

Fig. 16.—Tier bins for a provision store, just completed by a fixture manufacturer of Pittsburgh.



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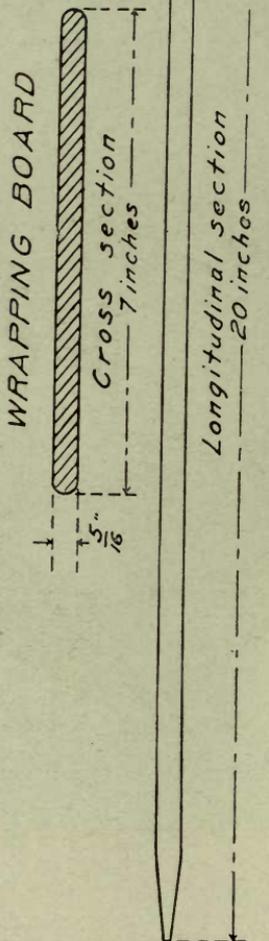
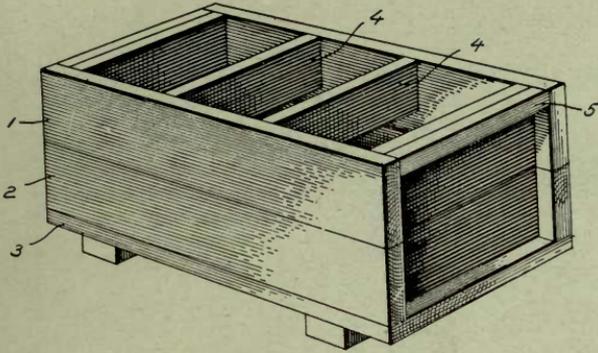
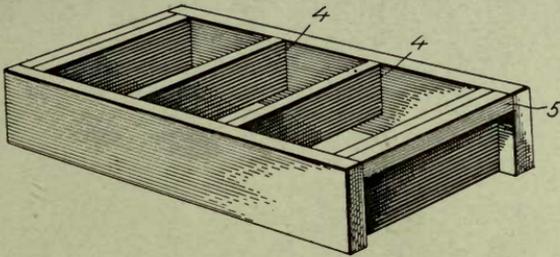


Fig. 17.—Drawing showing standard dimensions of a wrapping board.

I Complete Flask.



II Cope



III Nowel

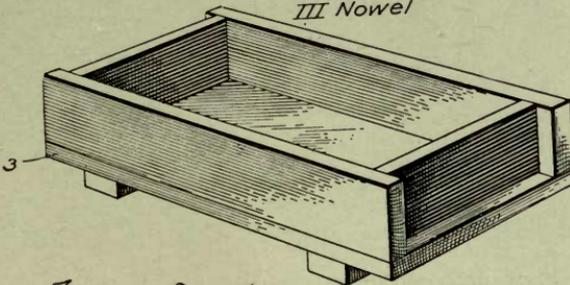


Fig. 19 - Foundry Flasks

Fig. I - 1. Cope
2. Nowel
3. Bottom board
4. Cope bars
5. Handles

Fig II - 4. Cope bars
5. Handles

Fig III - 3 Bottom board



Fig. 19.—Sixty different kinds of novelties made by one manufacturer of Pennsylvania.

DESCRIPTION OF FIGURE 19.

- *1. Plumber's turnpin—dogwood.
2. File handle—black walnut.
3. Candlestick—soft maple.
4. Drift plug (plumber's)—dogwood.
- *5. Banner pole emblem—yellow poplar.
- *6. Banner pole emblem—yellow poplar.
7. Turned handles, bench tools—sugar maple.
8. Rolling pin—sugar maple.
9. Bench rammer, foundry tool, made from 10.
10. Rough square—sugar maple.
11. Ten pin, made from 10.
13. Duck pin, made from 12.
15. Indian club made from 14 (rough square)—yellow poplar.
- *16. Gavel—rosewood.
17. Tinner's mallet—lignum-vitae.
18. Carpenter's mallet—dogwood, maple handle.
19. Dental mallet—dogwood.
- *20. Flag pole top—sugar maple.
21. Foundry mallet—dogwood, maple handle.
22. Spoons—soft maple.
- *23. Baseboard, mounting used by taxidermist—red oak.
- *24. Watch case frame—yellow poplar.
25. Plasterer's houck—sugar maple.
28. Bung starter, made from rough square 27—dogwood.
- *29. Candle pedestal—yellow poplar.
- *31. Policeman's club—rosewood, made from rough square 30.
- *33. Watchman's billy—mahogany, made from rough square 32.
34. Spigots—red cedar.
35. Spigot, oil barrels—red cedar, two unfinished parts.
- *36. Fid (rope slicer)—hickory.
37. Air pump handle—hickory.
38. Large and small plumber's dressers—lignum-vitae.
39. Bottle corker—sugar maple.
- *40. Lemon squeezer—sugar maple with cup and filler—lignum vitae.
42. Bolt—lignum-vitae.
45. Ten pin ball made from 42.
- *46. Bull's eye used as a rope tie on ships—lignum vitae.
47. Electrical apparatus part, 9 layers glued—mahogany.
- *48. Gavel—ebony.
- *49. Alms plate—black walnut.
- 50, 51 and 52. Coopersmith's mallet—dogwood and water gum, hickory handle.
57. Bolt—water gum.
60. Maul—hickory, handle made from 57.
61. Maul—hickory, handle made from 62.
62. Bolt—water gum.
67. Maul—hickory, handle with bark made from 62.
68. Kraut stamper—sugar maple, handle made from 70.
70. Bolt—water gum.
- *71. Pedestal for loving cup—red gum.
- *98. Candlestick—mahogany.

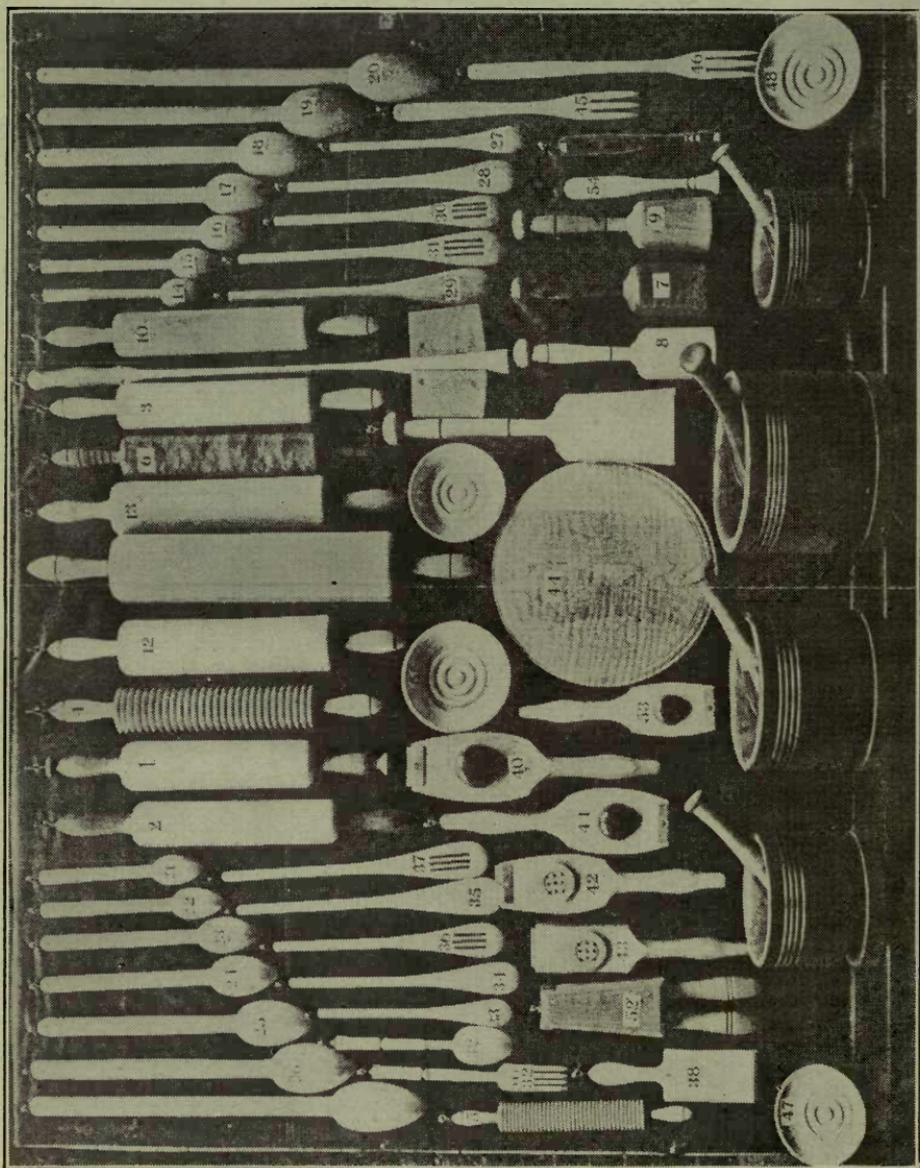


Fig. 20.—Product of a woodenware manufacturer of Philadelphia.

Table 62—Concluded.

Kind of Wood.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in	Grown Out
	Feet b. m.	Per cent.			Pennsylvania.	of Pennsylvania.
					Feet b. m.	Feet b. m.
Yellow poplar,	482,500	5.63	29 11	14,045	27,500	455,000
Birch,	466,500	5.44	25 95	12,105	230,000	236,500
Red gum,	225,000	2.62	18 50	5,237	.....	225,000
White pine,	225,000	2.62	11 78	2,650	225,000	.....
Red and silver maple,	210,525	2.45	14 43	3,038	210,525	.....
Yellow buckeye,	83,700	.98	25 00	2,092	.....	83,700
Holly (American),	60,000	.70	100 00	6,000	.....	60,000
White oak,	26,300	.31	31 64	832	25,800	500
Willow,	25,000	.29	13 00	325	25,000	.....
Cotton gum,	6,900	.08	20 00	138	.....	6,900
Hickory,	2,500	.03	60 00	150	2,500	.....
Spruce,	1,000	.01	43 00	43	.....	1,000
Red oak,	800	.01	40 00	32	800	.....
Rosewood,	555	.01	245 05	136	.....	555
Lignum-vitæ,	500	.01	350 00	175	.....	500
Total,	8,574,780	100.00	\$23 57	\$202,141	5,328,625	3,246,155

TANKS, VATS, AND SILOS.

The market for wooden tanks is broadening in spite of the fact that metal tanks are used to a considerable extent. In no other line is there a greater increase in demand for this commodity than by factories where tanks are needed to furnish water for manufacturing and engineering purposes. They are usually elevated to the top of the factory buildings, but most frequently on towers varying in height according to the pressure desired. Water tanks along railroads are in this class and southern white cedar, cypress, white pine, and longleaf pine, in the order of quantity, are the woods used for the staves. Shortleaf pine and hemlock went for tank covers. Tank staves are made of heavy material, the thickness varying according to the size and use of the tanks. Often the staves are as much as three inches thick and they must of necessity be made of the best grade of lumber since tanks are subject to strong pressure besides continued atmospheric changes, and the influence of water and other liquids has a deteriorating effect.

In selecting material for tank and vat staves the manufacturer is guided mainly by the use to which the finished commodity is to be put, as there are qualities in the several woods which commend them for certain kinds. The distillers and vinegar makers prefer yellow poplar for keeping-vats, but yellow poplar in some localities is too costly and its place has been taken by cypress and white pine. Brewery vats are usually of cypress and white oak. These woods are durable and strong and have no effects upon the taste and odor of the contents. Where a tank is closed and fermentation active or where one of extra resisting power is needed, white oak is preferred because close grained, heavy, and strong. Southern white cedar is also a favorite and though not so strong as white oak, when used it is strongly reinforced.

Vats for the manufacture of oleomargarine are of white pine, cypress, and Douglas fir, while those in pickle factories are generally cypress, Douglas fir, and longleaf pine. Individual oil tanks call for white pine, white oak,

and chestnut. The use of the last named wood is interesting since Pennsylvania is the only state in which this wood has been reported for tank staves. It may be in the future that it will be called on more generally for this use owing to its being cheaper than most other tank woods and being sufficiently strong and durable. The tanners are not particular as to the kinds of woods used for their tanks, durability and strength being the principal considerations. Cypress and southern white cedar were the most prominent, the latter because of durability being the best qualified.

The silo is given a place in this industry because generally it resembles a tank both when built and in its component parts and occasionally makers of tank stock also manufacture silos. The processes of manufacture of both, though not identical, are similar. The up-to-date farmer regards the silo as an almost indispensable part of his equipment as it furnishes a means of having succulent forage during the winter season. The demand for silos is growing rapidly and large quantities of high grade lumber go for their making. Longleaf pine, Douglas fir, cypress, red or Norway pine, and white pine are the silo woods the Pennsylvania manufacturers report. White pine is probably the best known, as it has been used longer than any other and is the only home grown pine reported. Its high price probably accounts for its use only in small quantities. Because cypress is durable in damp situations, it is regarded one of the best silo materials and in some localities is preferred even above white pine. Next to southern white cedar it will outlast any other wood for silos. Longleaf pine from the South and Douglas fir from Idaho and Oregon are extensively used and are favored because staves can be made from them in sufficient lengths for one piece staves. Silos of this character are more easily erected than when the staves are in two or three pieces. These woods do not twist or warp; they are close-grained, strong, unaffected by acids or juices of the plants and are cheaper. Redwood is meeting a growing demand for staves according to silo makers in other states but none was used in Pennsylvania. It is claimed that redwood, next to cypress, is the most durable wood, can be gotten in long lengths, is free from sap and knots, is not given to check and warp, and will answer both for silos in exposed situations as well as for those built into barns.

Table 63.—Wood for Tanks and Silos, year ending June, 1912.

Kind of Wood.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Longleaf pine,	2,565,000	32.66	\$26 57	\$68,150	.....	2,565,000
Southern white cedar,	2,554,000	32.52	36 31	92,740	.....	2,554,000
Cypress (bald),	1,138,000	14.49	56 32	64,090	.....	1,138,000
White pine,	820,000	10.44	34 84	28,570	60,000	760,000
Douglas fir,	450,000	5.73	43 33	19,500	.....	450,000
Spruce,	100,000	1.27	30 00	3,000	.....	100,000
Shortleaf pine,	86,200	1.10	29 47	2,540	.....	86,200
White oak,	50,000	.64	43 00	2,150	50,000	.....
Norway pine,	50,000	.64	35 00	1,750	.....	50,000
Hemlock,	25,000	.32	18 00	450	25,000	.....
Chestnut,	15,000	.19	20 00	300	15,000	.....
Total	7,853,200	100.00	\$36 07	\$283,240	150,000	7,703,200

MACHINE CONSTRUCTION.

Most parts of the machinery equipment of paper mills, flour mills, ice factories, sawmills, cotton gins, etc., are made of iron and steel, but for others wood is required and it is the different kinds of lumber for making these parts that are listed in Table 64. Electrical machinery parts and other electrical apparatus are not included in this class. This information will be presented subsequently as a separate industry. It is natural to infer that wooden parts of machinery must, in a great number of cases, call for lumber of great strength. It is not surprising, therefore, to find that white oak is the preponderant wood, comprising over one-third of the total and that longleaf pine and hickory follow it in quantity. The largest amount of hickory in the form of plank is shown in this industry. The vehicle and handle makers report using more but their raw material is in billet form, in squares, and in bolts. Douglas fir is the only Pacific coast wood listed. Like longleaf pine it possesses considerable strength and because the trees grow large and of great height, timber of large dimensions and length can readily be obtained. This probably accounts for its appearance in this industry, far from where it is cut. The average price is nearly twice that of longleaf pine.

Machine parts must necessarily be made from high grade lumber and in this connection it is interesting to note that nearly 55 per cent. of all that was reported was grown in the State. The factories included in this industry are numerous, though compared with other industries they use small amounts of wood. The fact that the requirements of these manufacturers are met so largely by the forests of the State should elicit their interest in the movement to protect forests and thereby perpetuate the State's timber supply. Some parts of 14 of the 19 woods listed in the table were cut in Pennsylvania, and their principal uses have been arranged in the order of their importance as follows:

Bins (Road Equipment).

Shortleaf pine.

Breaker.

Yellow poplar.

Cider Mills.

Yellow poplar.

Clay Working Machinery.

Hemlock.

Cranes.

Yellow poplar.

Coal Mining Machinery.

White oak.

Hickory.

White ash.

Shortleaf pine.

Maple.

Birch.

Basswood.

Yellow poplar.

Chestnut.

Hemlock.

Elevators.

Red oak.

Chestnut.

Longleaf pine.

Yellow poplar, (feed mills).

Basswood.

White oak.

Engine and Machinery Skids.

Beech.

Sugar maple.

Hemlock.

Hickory.

Flour and Feed Mill Machinery.

Red oak.

Yellow poplar.

Longleaf pine.

Sugar maple.

Hickory.

Chestnut.

White ash.

White pine.

General Mill Machinery.

White pine.

Longleaf pine.

Sugar maple.

White oak.

Cypress.

Derricks.

White oak.

Cork elm.

Sugar maple.

Douglas fir.

Hoists.

Yellow poplar.
Sugar maple.
Hickory.

Horse Power Machinery.

Sugar maple.
Yellow poplar.

Ice Machines.

White oak.
Red oak.
Longleaf pine.
White ash.

Oil Well Machinery.

White oak.
Red oak.
White pine.
Shortleaf pine.
Hemlock.
Sugar maple.
Beech.
Douglas fir.
Longleaf pine.

Ore Machinery.

Red oak.
Chestnut.

Paper Mill Machinery.

White oak.
Yellow poplar.
Longleaf pine.
Sugar maple.

Push Poles.

Hickory.
Ash.

Road Scrapers.

Longleaf pine.
White pine.

Road Engine Parts.

Yellow poplar.
Red oak.
White oak.
White pine.

Rock and Stone Crushers.

Red oak.
Chestnut.
White oak.
White pine.

Sawmill Parts.

Longleaf pine.
Hickory.
Red oak.
White oak.
Shortleaf pine.

Mining Screens.

Red oak.
Chestnut.

Water Wheels.

White oak.
White pine.
Shortleaf pine.
Poplar.

Table 64.—Wood for Machine Construction Parts, year ending June, 1912.

Kind of Wood.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
White oak,	2,366,100	33.61	\$26 31	\$62,258	2,311,100	55,000
Longleaf pine,	1,431,000	20.33	27 66	39,585	.....	1,431,000
Hickory,	699,000	9.93	27 27	19,063	643,000	56,000
Yellow poplar,	640,800	9.10	42 86	27,463	29,800	611,000
Red oak,	557,500	7.92	27 79	15,491	247,500	310,000
Hemlock,	296,000	4.20	18 22	5,392	296,000	.....
Sugar maple,	288,700	4.10	29 69	8,572	145,700	143,000
Douglas fir,	200,000	2.84	51 25	10,250	.....	200,000
Shortleaf pine,	163,000	2.31	23 99	3,910	10,000	153,000
White pine,	143,500	2.04	41 34	5,932	83,500	60,000
Ash,	83,000	1.18	44 88	3,725	5,000	78,000
Chestnut,	73,000	1.04	35 67	2,604	23,000	50,000
Pitch pine,	49,100	.70	16 44	807	49,100	.....
Loblolly pine,	25,000	.35	32 00	800	.....	25,000
Beech,	11,000	.16	14 55	160	11,000	.....

Table 64—Concluded.

Kind of Wood.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Basswood,	8,500	.12	36 47	310	500	8,000
Birch,	3,000	.01	50 00	75	3,000	.....
Cork elm,	2,000	.03	50 00	100	.....	2,000
Cypress (bald),	150	*	75 00	11	.....	150
Total,	7,040,350	100.00	\$29 33	\$206,508	3,858,200	3,182,150

*Less than 1-100 of 1 per cent.

AGRICULTURAL IMPLEMENTS.

All commodities used by farmers in the preparation of the soil and in gathering and garnering crops are grouped under this industry. The principal uses of the eighteen woods called for are as follows:

Ciæer Mill Presses.

Sugar maple.
White pine.

Cultivator Parts.

Ash (handles, pole).
Shortleaf pine.
White oak (handles).

Corn Planter Parts.

Basswood.
Yellow poplar.

Corn Sheller Parts.

Beech (frames).
Birch (frames).
Chestnut.
Shortleaf pine (sides).
Sugar maple (boxes, posts).

Eveners.

Hickory.
Red oak.
White oak.

Feed and Ensilage Cutter Parts.

Beech (frame work).
Cypress (boxes).
Shortleaf pine (box sides).
Yellow poplar (sides).

Fertilizer and Lime Distributors.

Cotton gum (boxes).
Longleaf pine (poles).
Red gum.

Hand Rakes.

Hickory (teeth).

Harrows, Spike Tooth.

Red oak.
White oak.

Hay Ladders.

Ash.
White oak.

Hay Presses.

Sugar maple.
White oak.

Horse Pokes.

White elm.

Horse Rake Parts.

White ash.

I and Roller Parts.

Longleaf pine (poles, tops).
Shortleaf pine (tops).
Sugar maple (blocks, tongues, tops).
White oak (frames).

Lawn Mower Handles.

Black ash.
White ash.

Levers, Various Implements.

White ash.

Fertilizer Distributor Parts.

Red gum.

Litter and Straw Carrier Parts.

Sugar maple.
White oak.
Yellow poplar.

Neck Yokes.

Hickory.
White oak.
Beech.

Threshing machines, including grain threshers and clover hullers, are the most important commodities of this industry, and in this particular line of manufacture Pennsylvania leads all other states. There are many interior parts of these machines that require woods of different qualities. The general tendency to substitute metal for wood has not proved practical and consequently a majority of these parts like grain registers, dust conveyors, and screen frames are still made largely of wood. Likely for the same reason, frames and siding or exterior panels of threshers call for wood and white pine and yellow poplar are the principal panel woods because these woods are light, easily worked, take paint readily, and are not given to twist and check.

Straw-carriers, closely allied to threshers, are another product important in this industry in Pennsylvania. Woods similar to those for threshers are demanded; white oak, yellow poplar, and sugar maple in the order named being most frequently called for.

Corn shellers and land rollers demand a considerable amount of lumber each year. Beech for framing, shortleaf pine, and yellow poplar for panels play an important part in making the former, and sugar maple and oak for the latter. The rollers of land rollers were formerly made of wood. A cross-section from a sycamore or yellow poplar log was usually selected and the rollers were usually made on the farm or at nearby blacksmith shops. Today these implements are in universal use and have been found indispensable, as a labor saver. The factories sometime ago began making them and now use metal almost entirely, but a small amount of wood is still in use and hard maple meets the demand in the State. The bottoms of the roller platforms are of shortleaf pine but any strong wood will answer for this purpose. The roller blocks or bearing frames are of hard maple. The hay baler manufacturers also use sugar maple ahead of other woods; but oak, both white and red, is indispensable for certain parts.

Table 65.—Wood for Agricultural Implements, year ending June, 1912.

Kind of Wood.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.		Grown Out of Pennsylvania.	
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.		
White oak,	1,678,700	23.97	\$35 60	\$59,768	887,700		791,000	
Red oak,	1,617,000	23.08	32 58	52,680	447,000		1,170,000	
Sugar maple,	1,032,600	14.74	28 04	28,952	365,500		667,100	
Yellow poplar,	757,500	10.81	34 59	26,205	33,000		724,500	
Ash,	599,100	8.55	38 73	23,202	103,100		496,000	
Longleaf pine,	563,200	8.04	31 77	17,893	.....		563,200	
Chestnut,	140,000	2.00	19 07	2,670	40,000		100,000	
Hickory,	124,400	1.73	33 41	4,156	99,400		25,000	
White pine,	116,000	1.66	31 71	3,878	26,000		90,000	
Shortleaf pine,	95,000	1.36	29 74	2,825	.....		95,000	

Table 65—Concluded.

Kind of Wood.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Basswood,	80,000	1.14	31 06	2,485	30,000	50,000
Cork elm,	50,000	.71	25 00	1,250	50,000	.....
Beech,	42,000	.60	22 86	960	32,000	10,000
Cotton gum,	35,000	.50	36 00	1,260	.....	35,000
Cypress (bald),	30,000	.43	35 00	1,050	.....	30,000
Red gum,	24,000	.34	35 00	864	.....	24,000
Birch,	20,000	*.29	24 00	480	20,000	.....
Cucumber,	300	*	30 00	9	300	.....
Total,	7,004,800	100.00	\$32 89	\$230,387	2,134,000	4,870,800

*Less than 1-100 of 1 per cent.

TOYS.

The commodities included in this industry and the woods that supplied the material for making them are as follows:

Animals.

Basswood.

Chestnut.

Birch.

Sugar maple.

Blocks (Toy Wagon).

White pine.

Soft maple.

White oak.

Red oak.

Boats.

Basswood.

White pine.

Games.

White ash.

White oak.

Yellow poplar.

Basswood.

Cannon and Fort Sets.

Basswood.

Sweet birch.

Beech.

HOLDERS (Christmas Tree).

Yellow poplar.

Chairs (Children's).

Hard maple.

Beech.

Jumpers (Swing).

Red gum.

Chairs.

Birch.

Pianos (Children's).

Basswood.

Circus Sets.

Basswood.

White pine.

Yellow poplar.

Sweet birch.

Beech.

Pastry Sets.

White elm.

Red oak.

White oak.

Dolls.

Basswood.

Play Yards (Baby).

White oak.

Red oak.

Furniture.

White pine.

Beech.

Yellow poplar.

Shooting Galleries.

White pine.

Beech.

Sweet birch.

Basswood.

Rockers.

White oak.
Red oak.

Tricycle Seats.

Yellow poplar.
Basswood.

*Stick Horses.**Heads.*

White pine.
Yellow poplar.

Sticks.

Basswood.
White pine.

Wheels.

Beech.
Sweet birch.

Stocks, Pop Gun.

Basswood.
Beech,
Sugar maple.

Swings.

Red oak.
Sugar maple.

Walkers.

Hard maple.
Yellow poplar.
Red gum.
Beech.

Rocking Horses.

White ash.

Toy Parts.

Basswood.
Beech.
Cotton gum.
Spruce.
Yellow poplar.
Hard maple.
Red oak.
White oak.

Wagons and Autos.

White pine.
Basswood.
Yellow poplar.

Tops.

Birch.
Beech.
Yellow poplar.
Chestnut.
Soft maple.
Sugar maple.
White oak.
Red oak.

Wheelbarrows.

White pine.
Basswood.
Yellow poplar.

Xylophones.

Sugar maple.
Rosewood.

Basswood is the principal material for wooden toys and for the wooden parts of metal toys. It is not only demanded in the greatest amount but it enters into the manufacture of more kinds than any other species. It alone supplied the material for the all-wood doll which is made in no other state. This doll is unique, ingenious, and wonderfully useful, in that nearly all parts,—body, arms, legs, hands, feet,—even the head—are made of solid wood. The face is artistically carved and when enameled in lifelike colors and the doll dressed, it is difficult to tell that it is made of wood. The parts of the body are jointed with steel bands having swivel connection, which gives flexibility and freedom of movement. The all-wood doll is made with facial characteristics representative of different nations and of comical characters.

The making of toy pianos is another important division of this industry. Basswood is the prevailing wood again and it goes into all the various parts except the base of large size pianos where a stronger wood is needed, and ash and oak meet this demand. Because it is easily bored and turned to shape, this wood answers first for toy cannons. It is also principally used for wooden animals in menageries and for horse heads and bodies for stick horses.

Though Pennsylvania was sixth in the list of states in the production of basswood lumber, the toy manufacturers reported purchasing 60 per cent. of their requirements from other states. Sugar maple, white pine, and yellow poplar were used not only in almost equal amounts but the average price paid for these woods was also nearly equal. That so much yellow pop-

lar was State-grown is somewhat surprising. In no other industry of this report does wood, State-grown, equal so large a per cent. of the total. Nearly six and a half million feet was required and of this over 85 per cent. is cut in Pennsylvania.

Table 66.—Wood for Toys, year ending June, 1912.

Kind of Wood.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Basswood,	1,404,000	21.86	\$40 80	\$57,286	560,000	844,000
Sugar maple,	762,500	11.87	25 31	19,300	712,500	50,000
White pine,	725,000	11.29	24 90	18,050	487,500	237,500
Yellow poplar,	702,000	10.93	25 48	17,888	659,500	42,500
Beech,	627,400	9.77	18 41	11,553	585,000	42,400
Birch,	617,000	9.61	23 84	14,708	617,000	.....
Chestnut,	500,000	7.79	21 00	10,500	500,000	.....
Red and silver maple,	450,000	7.01	24 00	10,800	450,000	.....
Ash,	320,000	4.98	42 03	13,450	182,500	137,500
White oak,	152,000	2.37	29 26	4,448	132,000	20,000
Red oak,	125,300	1.95	27 17	3,404	100,800	24,500
White elm,	25,000	.39	21 00	525	12,500	12,500
Cotton gum,	5,000	.08	20 00	100	.....	5,000
Red gum,	5,000	.08	25 00	125	5,000	.....
Spruce,	1,300	.02	43 00	56	.....	1,300
Total,	6,421,500	100.00	\$28 37	\$182,193	5,064,300	1,417,200

TRUNKS AND VALISES.

Nine woods make up the four million feet of lumber required yearly in Pennsylvania for making trunks. A number of manufacturers do all the work from the arrival of the rough lumber to the covering, lining, and varnishing of the finished commodity, but others make only the rough boxes in the white, others slats, and others purchase the different parts already manufactured and merely put them together and finish them. The last named class of manufacturers did not make reports for this study because they do not operate wood-working machinery and are merely assemblers. The fact that white elm leads in quantity all other woods listed in the table indicates that in Pennsylvania the slat makers form the most important division of this industry. The quantity demanded, though fairly large, does not equal the amount of ash, which, next to elm, is generally the principal slat wood. Hickory is a frequently used slat wood on sample cases because of its strength but none of the trunk makers reported its use in Pennsylvania; its weight and its high price being against it.

Basswood is the favorite wood for trunk boxes and in Pennsylvania furnished about three-quarters of the material which the manufacturers used. It works easily and holds its shape. The fact that it is fairly strong for its weight qualifies it more than any other factor for this use. Cottonwood is its principal competitor and in the country at large is used in larger quantities. Like basswood it enters largely into veneer and then into built-up lumber from which the better grades of trunk boxes are largely made. Three and four-ply are the thicknesses principally used. Besides being of

lighter weight than ordinary solid trunk box material it is also more substantial and, therefore, in most cases, does not require slat reinforcement. The trunk maker does not buy veneer and make panels. He buys panels already glued together in various thicknesses according to his varied needs. Red gum appears in the table in only small quantities. In other states the demand for it for trunks seems to be increasing and, like cottonwood, is purchased mostly in the form of built-up lumber.

White pine is a favorite wood for trunks made of solid lumber. It is purchased surfaced two sides and edged in thicknesses ranging from $\frac{3}{8}$ inches to $\frac{7}{8}$ inches according to the size and purpose for which the trunk is designed. In quantity the Pennsylvania trunk makers demanded white pine next to basswood. In the country at large loblolly pine is probably called on for solid trunk boxes ahead of any other wood. Lumber from second growth trees is preferred because of the large proportion of sapwood, its freedom from pitch, its light color and light weight. It goes for making the cheaper grades. As little of the wood is visible in the finished product, being covered with leather, cloth, and metal, the figure or color of the wood is not essential.

To save weight, a light wood, cut as thin as the maximum stress will allow, is demanded for trays and inside compartments. Basswood met the largest part of the demand in Pennsylvania while in other states yellow poplar, cotton gum, buckeye, and cottonwood were the species principally employed.

Table 67.—Wood for Trunks and Valises, year ending June, 1912.

Kind of Wood.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
White elm,	1,837,500	44.57	\$30 82	\$56,625	250,000	1,587,500
Basswood,	1,374,500	33.34	27 86	38,209	754,500	620,000
White pine,	428,500	10.39	28 60	12,255	128,500	300,000
Cottonwood,	177,350	4.30	37 95	6,731	.....	177,350
Loblolly pine,	160,000	3.88	24 22	3,875	.....	160,000
Ash,	87,500	2.12	36 42	3,187	87,500	.....
Chestnut,	37,500	.91	25 00	938	17,500	20,000
Red gum,	20,000	.49	35 00	700	.....	20,000
Total,	4,122,850	100.00	\$29 72	\$122,520	1,238,000	2,884,850

BRUSHES.

Pennsylvania surpasses all other states in the production of brush blocks and for their manufacture the factories consume over four million feet of wood annually. Of this material the forests of the state furnished over 93 per cent. of the total, a fact which should appeal to this class of manufacturers when giving consideration to the source of future supply of raw material and what measures are to be taken when the present timber stand is gone. Each kind of the almost multitudinous variety of brushes that are manufactured requires a block of special size and shape, and a wood pos-

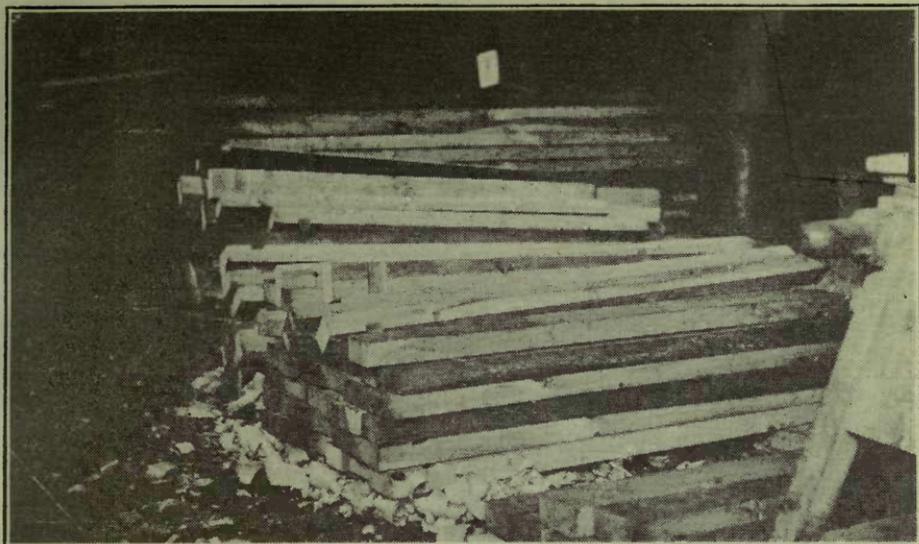


Fig. 21.—Oil tank staves preparatory to assembling.

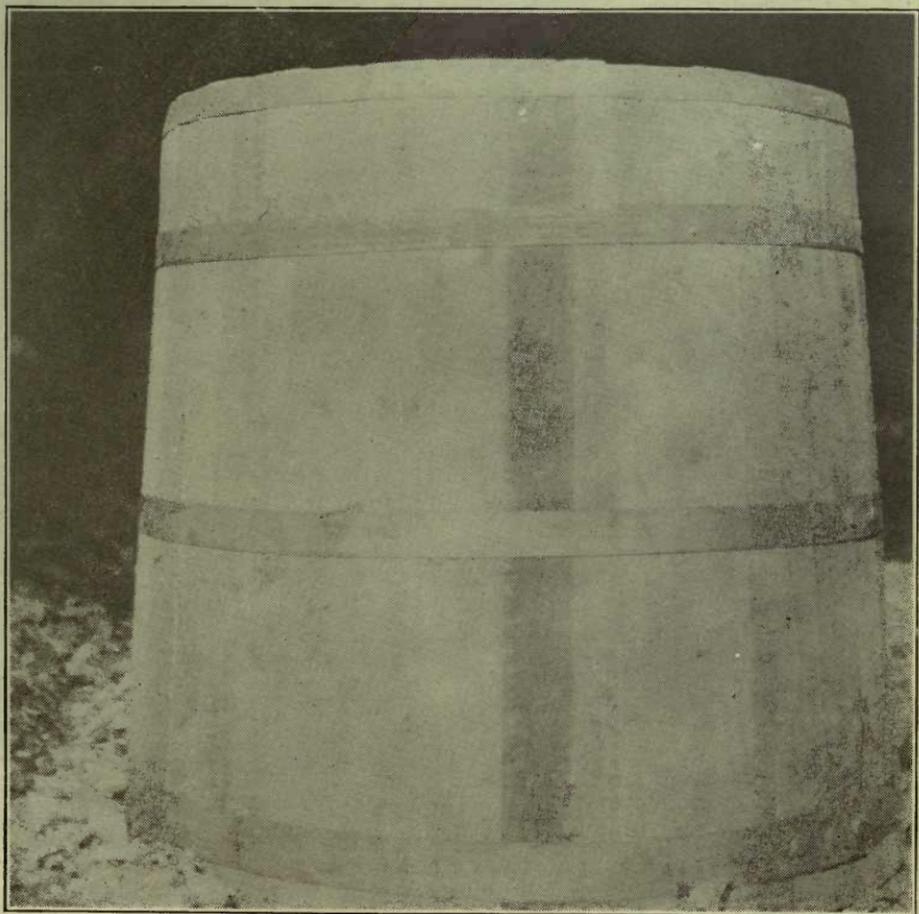


Fig. 22.—Finished oil tank.

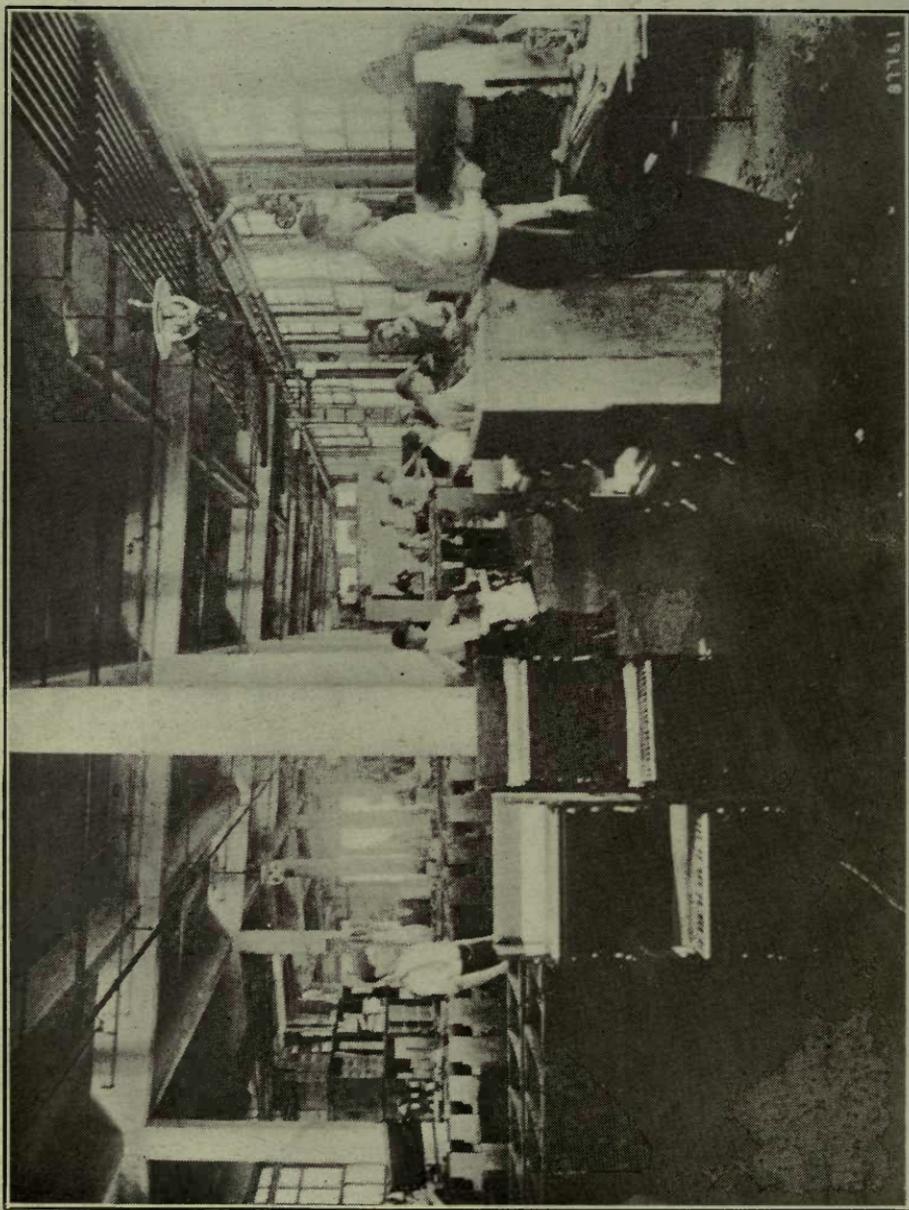


Fig. 23.—Manufacture of toy pianos.

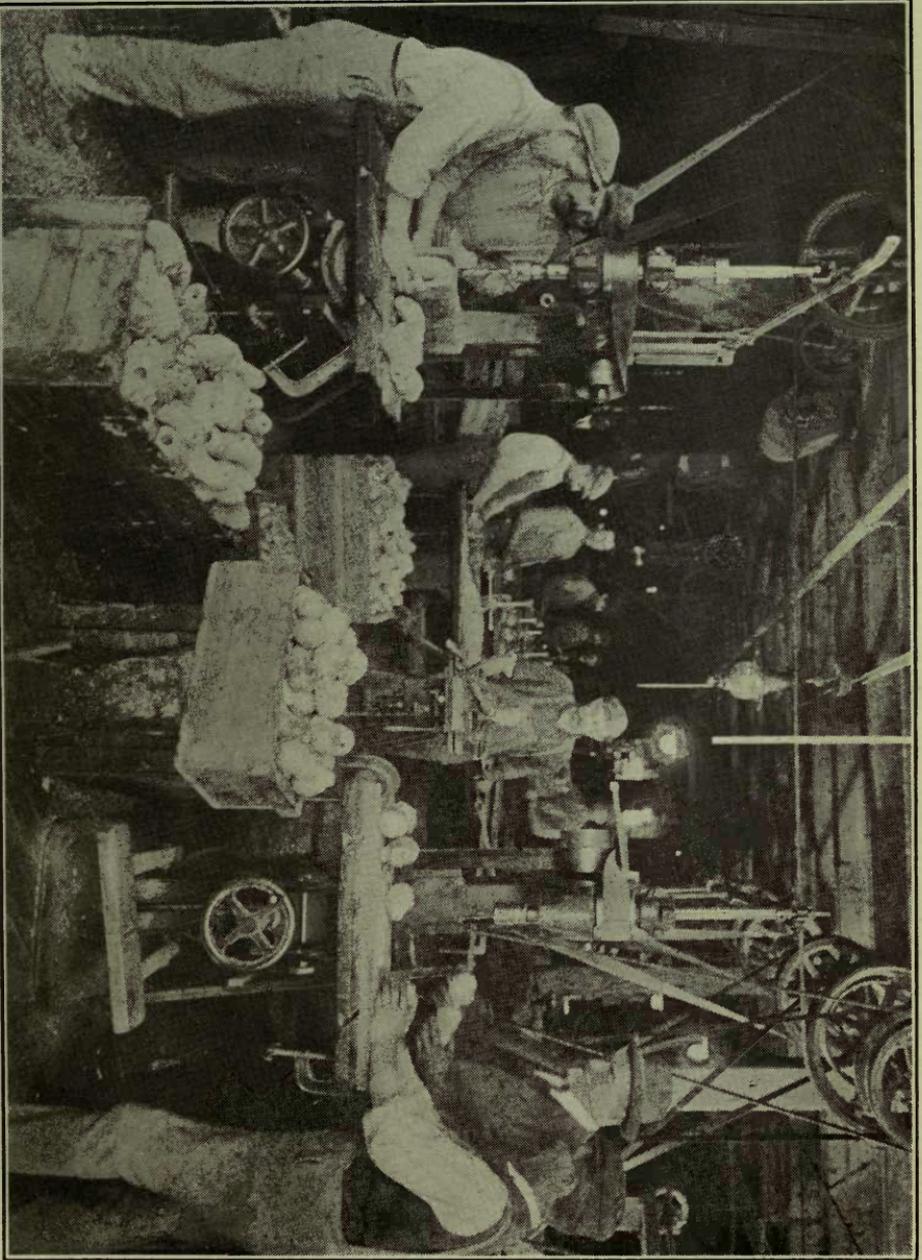


Fig. 24.—Woodworking department of a toy manufacturer. Making wooden dolls.

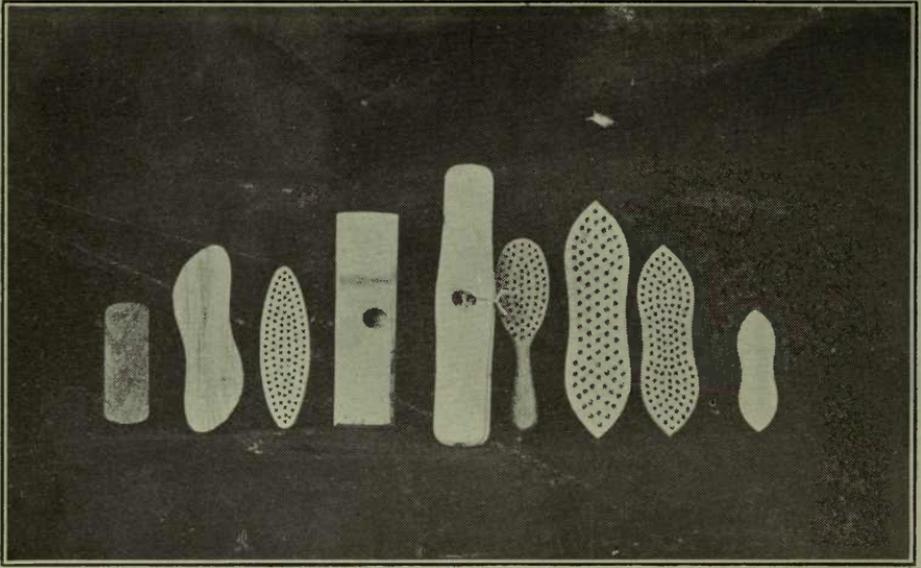


Fig. 25.—Brush Blocks.

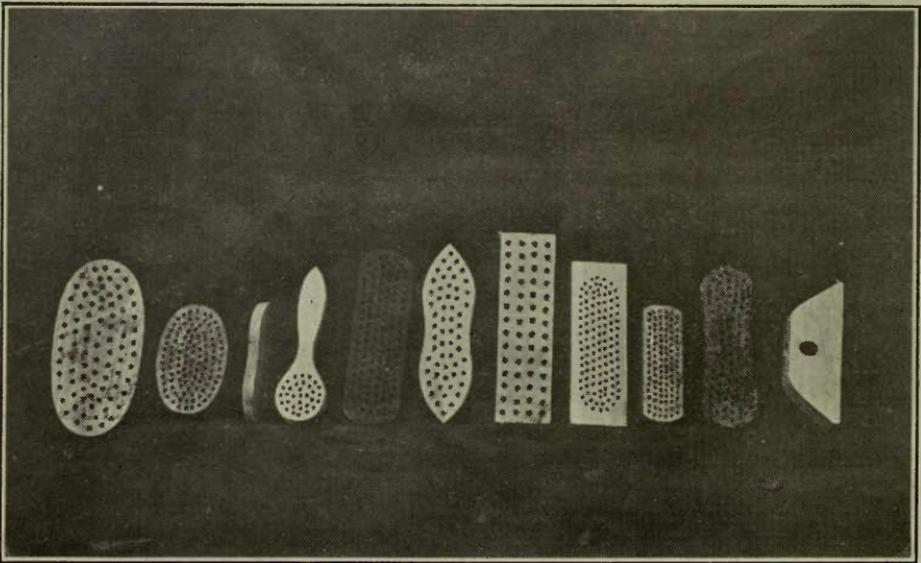


Fig. 26.—Brush Blocks.

sessing qualities adaptable to the special use of the brush. This accounts for the long list shown in the table. There are sixteen woods, and beech constitutes much the largest amount, being equal to almost half of the total. This wood is one of the most plentiful hardwoods growing in Pennsylvania, having properties admirably suited for cheap brushes, and is one of the factors making the industry important in the state. Maple furnishes material for brush blocks considerably more desirable than beech, and, therefore, is in demand for a better grade of brushes. It follows beech in importance as to quantity but of course is higher priced. In no other industry is cherry reported in so large amounts as for brushes. Its low average price—as compared to that paid for the same wood by other classes of factories in the State is quite surprising. This industry does not include altogether the production of cheap brush blocks such as are used for making scrubbing, creamery, and brewery, sinks, dust pan, horse, feather dusters, window, stove, carpet, paint, whitewash, and frescoing brushes, and stable and street brooms, but it includes blocks for better grades requiring higher priced woods,—such as red cedar, ash, sycamore, holly, red oak, black walnut, rosewood, boxwood, and other foreign woods. The latter kinds are used for hair brushes, hat, jewelry, clothes, hand, nail, and flesh brushes. The absence of mahogany and ebony from the list of high grade brush woods is hard to explain but none of the manufacturers reported them in this State.

Table 68.—Wood for Brushes, year ending June, 1912.

Kind of Wood.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Beech,	1,931,000	47.83	\$18 87	\$36,430	1,931,000	.....
Sugar maple,	1,066,800	26.43	23 22	24,772	1,066,800	.....
Cherry (black),	482,900	11.96	25 43	12,282	482,900	.....
Yellow poplar,	157,500	3.90	40 68	6,407	32,500	125,000
Red and silver maple,	156,000	3.86	18 96	2,957	135,000	20,000
Sycamore,	71,000	1.76	26 00	1,846	.....	71,000
Birch,	51,000	1.26	14 02	715	51,000	.....
Basswood,	42,300	1.05	34 96	1,479	42,300	.....
Red gum,	37,000	.92	27 00	999	.....	37,000
Red cedar,	23,000	.57	64 57	1,485	5,000	18,000
Ash,	12,600	.31	34 29	432	12,600	.....
Boxwood (West Indian),	3,140	.08	51 91	163	.....	3,140
Holly (American),	1,000	.02	45 60	45	.....	1,000
Black walnut,	1,000	.02	80 00	80	1,000	.....
Red oak,	600	.02	37 00	22	600	.....
Rosewood,	250	.01	300 00	75	.....	250
Total,	4,037,000	100.00	\$22 34	\$90,189	3,761,700	275,390

SHUTTLES, SPOOLS, AND BOBBINS.

The industry making bobbins, spools, shuttles and other loom appliances is in quantity not so large and important in Pennsylvania as in Maine, New York, and New Hampshire; but the fact that these commodities manufactured in Pennsylvania go almost entirely for use in silk mills, and only

a few for woolen and cotton mills, is quite significant. Sugar and soft maple furnished the bobbin and speeder material, and for quills sugar maple and dogwood met the demand, the latter to only a limited extent on account of its higher price. Bobbin material must be hard, tough, close grained, with a texture that smooths easily, and must not rough up in turning.

Paper birch is the species from which small thread spools are manufactured and Maine is the state where most of them are produced. Small spools are turned from a single piece of wood but no factories in Pennsylvania were found making them. The manufacture of large spools, the three-pieced product, used in loom weaving, called for a considerable quantity of lumber. The barrels, sometimes called middles, are made by a process similar to that used in making bobbins and speeders and when in the rough-turned form resemble them except the barrels are uniformly cylindrical. Sugar and soft maple supplied the material for their making in Pennsylvania, but in New England beech and the birches were also used. The heads of these spools, which are cut circular, were entirely of yellow poplar and are screwed on and glued to the barrel, which is threaded at each end.

The most exacting demand for both dogwood and persimmon is for shuttle manufacture. These woods possess a hard dense fiber, wear smooth by use, do not rough up, and besides are heavy and strong. They are the favorite domestic woods for this purpose. Shuttles for silk weaving are made to only a limited extent of these woods. Foreign woods are also called on. Boxwood, both the kind that comes from the Caspian Sea countries and that shipped from the West Indies, was reported, and also small amounts of sarbo and doncella. They are the highest priced woods that are shown in the table. Formerly boxwood furnished nearly all the shuttle material but when its price became prohibitive dogwood took its place and proved a practical and satisfactory substitute. Persimmon has in comparatively recent years become prominent for shuttles, chiefly owing to the insufficient supply of dogwood to meet the entire demand. Shuttles are made from squares cut to the desired size called shuttle blocks and it is in this form that the manufacturers in Pennsylvania purchase their raw material. From the rough block to the finished shuttle there are twenty-two distinct operations.

White oak appears in this industry for making picker sticks and in no other state in which this article was reported was this wood used to any considerable extent. Hickory is the principal picker stick material and in Pennsylvania it supplied almost two-thirds of all wood demanded for this use. Quill boards are made entirely of yellow poplar and loom frames of sugar maple.

Table 69.—Shuttles, Spools, and Bobbins, year ending June, 1912.

Kind of Wood.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Sugar maple,	2,528,000	75.51	\$24 85	\$62,816	1,870,000	658,000
Red and silver maple,	375,000	11.20	26 43	9,910	40,000	385,000
Yellow poplar,	321,000	9.59	36 50	11,715	25,000	296,000
Hickory,	63,000	1.88	46 98	2,960	30,000	33,000
White oak,	35,000	1.05	50 00	1,750	5,000	30,000

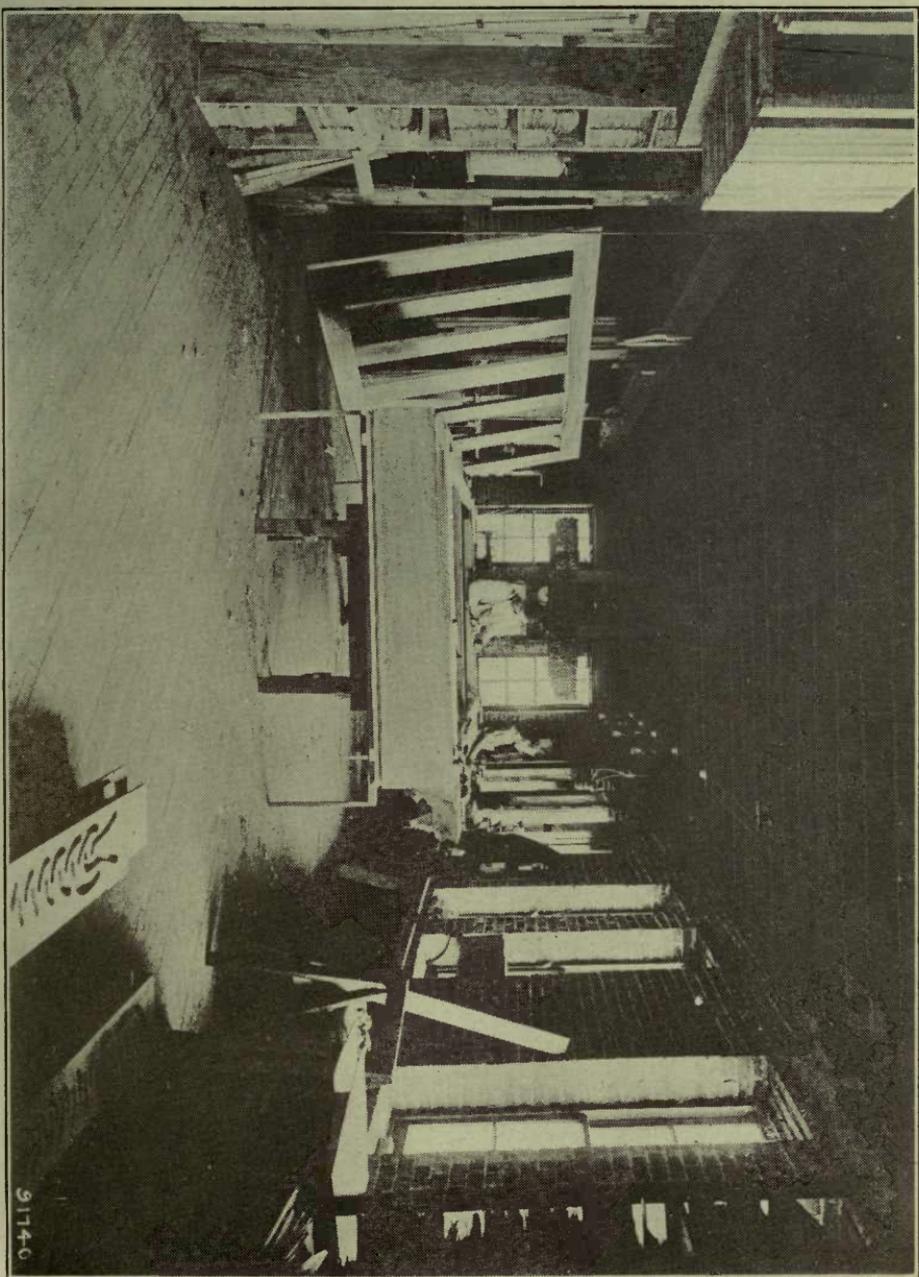


Fig. 27.—The manufacture of pipe organs.

91740

Fig I

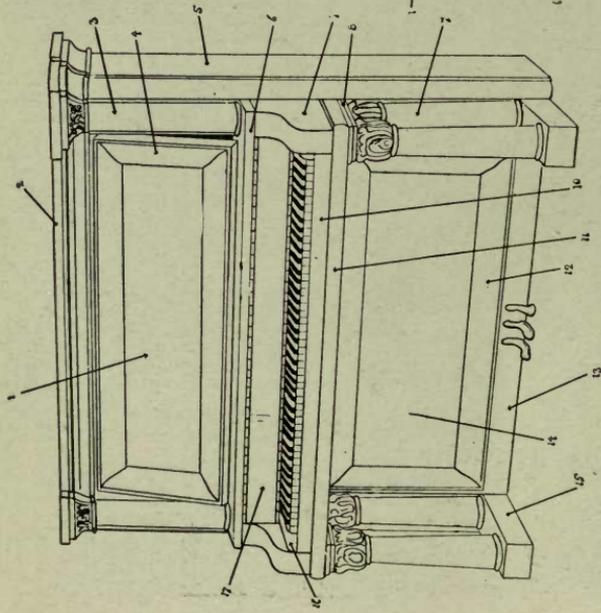


Fig III

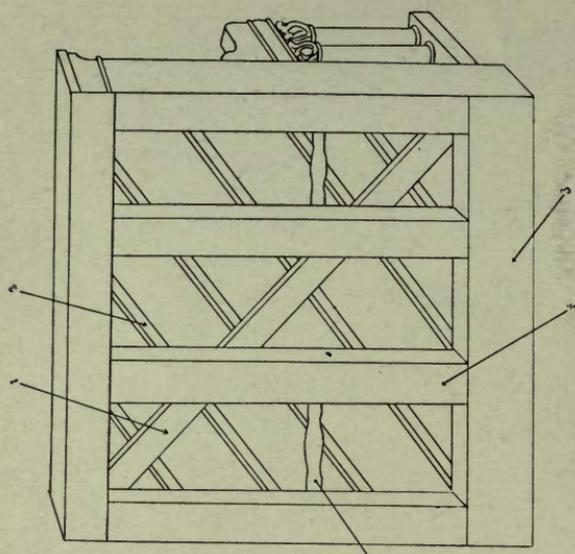


Fig II

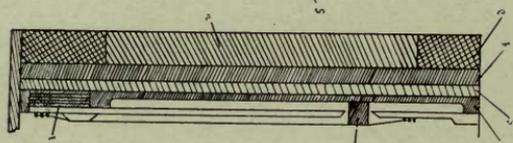


Fig III

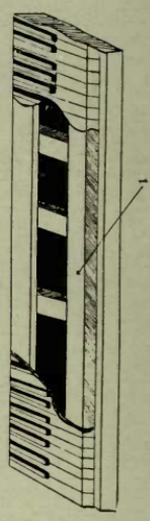


Fig. 28. Piano cases and kinds of wood used in their manufacture.

DESCRIPTION OF FIGURE 28.

UPRIGHT PIANO.

Figure I.

1. Top panel,
2. Top,
3. Pilaster,
4. Moulding,
5. Side,
6. Shelf,
7. Cheek,
8. Moulding,
9. Pilaster,
10. Key slip,
11. Key bottom,
12. Moulding,
13. Pedal board,
14. Bottom panel,
15. Feet,
16. Key block,
17. Fall board,

The cases of the cheaper pianos, as a rule, are made of solid wood, generally sweet birch, beech, or basswood, which is stained to imitate some higher priced wood. The cases of the more expensive instruments, with the exception of the smaller parts, as the moulding, fall boards, pilasters, and key blocks, are always veneered, the veneer being of a fine-finish wood such as mahogany, birds-eye maple, black and Circassian walnut, and rosewood, and from one to three-ply in thickness on a core of some good body wood such as sound wormy chestnut, red oak, yellow poplar, and white pine.

Figure II.

1. Pin blocks: Sugar Maple.
2. Posts: Sugar Maple, White Ash.
3. Back boards: White Ash, Sugar Maple.
4. Diagonal sweep: Spruce.
5. Sounding board ribs: Spruce.
6. Sounding board: Spruce.
7. Bridge: Spruce.

Figure III.

1. Diagonal sweep: Spruce.
2. Sounding board ribs: Spruce.
3. Back board: White Ash, Sugar Maple.
4. Posts: Sugar Maple, White Ash.
5. Handles: Sugar Maple, White Ash.

Figure IV.

1. Key bottom: White Ash, Sugar Maple, Yellow Poplar, White Pine, Mahogany.

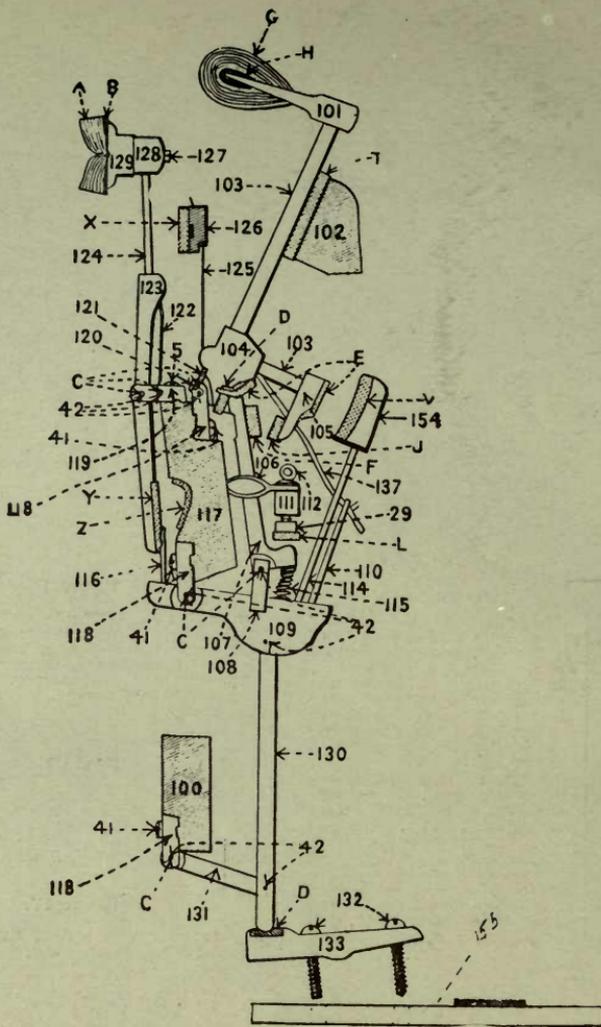


Fig. 29. Action parts of upright piano.

A—Damper felt.
 B—Damper head lining felt.
 C—Brushing cloth.
 D—Action cloth.
 E—Action leather.
 F—Catcher felt.
 G—Hammer top felt.
 H—Hammer under felt.
 J—Butt felt.
 L—Regulating punchings.
 T—Hammer rail cloth.
 Y—Back check felt.
 X—Spring rail felt.
 Y—Damper lever felt.
 Z—Action cloth.

No.

5—Action screw.
 29—Regulating button (Sugar Maple).
 41—Action screw.
 42—Center plus.
 100—Lower flange rail (Sugar Maple).
 101—Hammer moulding (Sugar Maple, Red Cedar, Mahogany).
 102—Hammer rail (Sugar Maple, Mahogany, Birch).
 103—Hammer shanks (Sugar Maple, Red Cedar).
 104—Hammer butt (Sugar Maple).
 105—Back stop (Sugar Maple).
 106—Regulating rail bracket.

No.

107—Jack (Sugar Maple).
 108—Fly flange (Sugar Maple).
 109—Wippen (Sugar Maple).
 110—Bridle wire.
 111—Regulating rail (Sugar Maple, Birch).
 112—Regulating rail screw.
 114—Back check wire.
 115—Jack Spring.
 116—Damper spoon.
 117—Center rail (Sugar Maple).
 118—Flange (Sugar Maple).
 119—Damper lever flange (Sugar Maple).
 120—Action screw.
 121—Butt plate.
 122—Damper Spring.
 123—Damper lever (Sugar Maple).
 124—Damper wire.
 125—Hammer butt spring.
 126—Spring rail (Sugar Maple).
 127—Action screw.
 128—Damper block (Sugar Maple).
 129—Damper head (Sugar Maple).
 130—Abstract (Sugar Maple).
 131—Tongue (Sugar Maple).
 132—Jack screw, piano head.
 133—Key rocker (Sugar Maple).
 137—Bridle strap.
 154—Back check (Sugar Maple).
 155—Key (Sugar Maple).

Table 69—Concluded.

Kind of Wood.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Dogwood,	17,585	.52	69 60	1,224	.....	17,585
Persimmon,	7,010	.21	60 06	421	.....	7,010
Boxwood (West Indian),	1,350	.64	62 96	85	.....	1,350
Sarbo,	36	*	200 00	6	.....	36
Doncella,	10	*	100 00	1	.....	10
Total,	3,347,955	100.00	\$27 14	\$90,888	1,970,000	1,377,955

*Less than 1-100 of 1 per cent.

DAIRYMEN'S AND POULTERERS' SUPPLIES.

The new methods in vogue for carrying on the dairy and creamery as well as the poultry business along scientific lines has brought about the use and manufacture of special equipment among which are included important articles made of wood. The factories manufacturing these articles are the ones that have supplied the data which has been compiled in the table following. They are in no way related and have been combined only for convenience in presenting the statistics since it is considered in this way the uses of the various woods may be more readily discussed. No one factory was found making the entire equipment for all of these above lines of business. They usually specialize either in one particular line or in the manufacture of a single commodity as incubators, butter tubs, egg crates, etc.

Under dairymen's supplies for Pennsylvania are grouped the making of churns, butter tubs, cheese boxes, churn vats, milk bottle washers, and curd grinders. Ash is the principal wood for churns, both for the staves and for the paddles because it retains its shape and is less liable than any other wood to impart taste. This wood is used for making all kinds from the small domestic churns propelled by hand to the large cylindrical churn used in creameries. For the same reason that ash is used for churns it is called for ahead of any other wood for making butter tubs and butter pails. Maple is used with it for bottoms and covers of butter tubs but the quantity is relatively small. In some states experiments have been made with cypress for butter tubs but it was not in use in Pennsylvania although it was reported with ash for churn vats. Over a million and a half feet of wood is required for making cheese boxes. Because white elm has the property of bending it is used for these commodities ahead of any other wood, not only in Pennsylvania, but elsewhere. Other woods are used in fairly large amounts probably more for the reason that they could be purchased cheaper than for any special adaptability. These woods include beech, yellow birch, oak, hemlock, and ash. Wooden parts of the curd grinding machines in cheese factories account for the appearance in the table of cottonwood, ironwood, and a large part of the sugar maple.

The manufacturers of poulterers' supplies required almost as much lumber as the factories making dairymen's equipment. Incubators and brooders were the commodities manufactured. Cypress in the largest amounts answered

with yellow poplar and white pine for incubator cases and also for trays and other inside work. Its stability, affinity for paint and durability are the qualities desired for these uses. The bases and legs of incubators are of red oak and sugar maple, probably selected for strength. Brooder case woods are the same as for incubators except red oak instead of cypress went for frames.

Table 70.—Wood for Dairymen's, Poulterers', and Apiarists' Supplies, year ending June, 1912.

Kind of Wood.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
White elm,	600,000	18.51	\$25 00	\$15,000	250,000	350,000
Cypress (bald),	545,000	16.82	37 02	20,175	.....	545,000
Ash,	400,000	12.34	15 00	6,000	395,000	5,000
Basswood,	370,000	11.42	18 00	6,560	.....	370,000
Yellow poplar,	220,000	6.79	29 82	6,560	.....	220,000
Hemlock,	215,000	6.63	15 49	3,330	215,000	.....
White oak,	205,000	6.33	18 90	3,875	200,000	5,000
Sugar maple,	152,950	4.72	27 96	4,276	23,500	129,450
Shortleaf pine,	145,000	4.48	15 69	2,275	.....	145,000
Beech,	100,000	3.09	16 00	1,600	100,000	.....
Birch,	100,000	3.08	18 00	1,800	100,000	.....
White pine,	79,000	2.44	22 58	1,784	15,000	64,000
Red cedar,	45,000	1.39	55 00	2,475	.....	45,000
Red oak,	36,000	1.11	23 00	1,008	.....	36,000
Red and silver maple,	15,000	.46	10 00	150	15,000	.....
Horbeam,	10,000	.31	12 00	120	10,000	.....
Cottonwood,	2,500	.08	40 00	100	2,500	.....
Total,	3,240,450	100.00	\$23 82	\$77,188	1,326,000	1,914,450

MUSICAL INSTRUMENTS.

A few manufacturers of this class specialize in building finished piano cases, and in the rough, which are called shells. Others make only the actions and keys. Others not included in this study buy their cases of one manufacturer, their actions of another, their sounding boards of a third, and their hardware from those specializing in that line, and operate merely in assembling the instrument and varnishing and finishing the exterior.

Chestnut which combines sufficient strength with light weight and has a special adaptability for holding glue is favored above all woods for backing veneered cases, and in the quantity consumed leads all other woods reported by the Pennsylvania piano makers and organ builders. It is entirely a case wood for piano cases. That so much of the chestnut reported should have been shipped from other states to the Pennsylvania piano makers is surprising because the chestnut tree is common throughout Pennsylvania, and in the production of chestnut lumber in 1912 Pennsylvania is among the three leading states. Other woods used for veneer backing were red oak, white pine, yellow poplar, and soft maple, because they possess qualities of sufficient strength, are stable in holding their shape, are easily worked, and have a special affinity for glue. The woods used for exterior finish include red oak, white oak, and red gum, Circassian walnut, sweet birch,

mahogany, black walnut, and sugar maple. They are bought to a large extent as veneer because in that form the selection of the most attractive figures is possible. For the backs, posts, and diagonal sweeps, several species—sugar maple, beech, soft maple, yellow birch, and white ash contribute the material because hardness and strength are the properties demanded. The bridges are of spruce, maple, and white ash, because they hold their shape well and are strong. The bottom boards are made of maple, oak, and hemlock, and the pedal boards of sugar and soft maple.

Spruce is the most vibrant wood and therefore foremost for piano sounding boards and sounding board ribs. The red spruce native of the Appalachian and New England regions, and white spruce of the Lake states, have probably been preferred; but since sounding boards are made from wide stock of uniform structure, trees suitable for this purpose are sought over great distances. At present, therefore, sounding board material is shipped from the Northern Pacific Coast states and British Columbia, where Sitka spruce supplies the demand. Sounding board material which shows a number of small annual rings indicating a slow rate of growth is preferred and purchased for high priced pianos. It is usually cut from trees on high altitudes where the development is fairly restricted.

Sugar maple, because it is a hardwood and easy to shape, is most used for actions, although some manufacturers use mahogany and sweet birch for action rails and red cedar and mahogany for hammer moulding and hammer shanks. Sugar maple, owing mostly to its hardness, is used to the exclusion of other woods for pin blocks. Red gum comes in for action parts, and the fact that it has been reported for this use in several other states besides Pennsylvania shows that its qualities have proved it practical for this kind of work.

Piano and organ keys are usually from the upper grades of white pine and sugar maple, but in Pennsylvania basswood also served except for sharps or flats which, like the organ stops, are made of ebony. Ebony was not reported in Pennsylvania nor was any mention made of the manufacture of keys and stops indicating that these commodities are brought into the State ready manufactured. White ash, white pine, sugar maple, yellow poplar, and mahogany furnished the material for the key bottoms because they have little tendency to warp.

Black walnut which is used in larger quantities in this industry than in any other is demanded almost entirely for the outside finish or cases of both pipe and reed organs. White oak, red oak, red gum, cherry, cotton gum, and mahogany also served with it for this use and for consoles and pilasters added only ornamentation. The frames and sills of organ cases were of shortleaf pine, chestnut, hemlock, and red oak, the wind chests and bellows of yellow poplar, basswood, white pine, sugar pine from California, and redwood, while white pine, shortleaf pine and yellow poplar answered for swell boxes. White pine is the principal wood for organ pipes but cherry, sugar pine, and redwood were also reported. Action chests are of a strong wood and red oak supplied most of the material. It is interesting to note that redwood has begun to be used by the eastern manufacturers for interior organ parts. Being fairly strong compared to its light weight, easily worked, free from pitch, and possessing the property of holding its shape well are the reasons why it is held in high favor with the manufacturers and will probably be used more extensively in the future.

Table 71.—Wood for Musical Instruments, year ending June, 1912.

Kind of Wood.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Chestnut,	671,900	22.81	\$24 81	\$16,669	327,000	344,900
Sugar maple,	647,800	22.00	32 20	20,857	225,300	422,500
Spruce,	325,500	11.05	43 24	14,075	.....	325,500
Basswood,	271,500	9.22	42 36	11,500	11,000	250,500
Mahogany,	201,100	6.83	83 11	16,713	.....	201,100
Yellow poplar,	135,100	4.59	70 54	9,530	24,000	111,100
Black walnut,	131,200	4.46	44 05	5,779	67,700	63,500
Red oak,	102,000	3.46	32 25	3,290	.....	102,000
Birch,	90,000	3.06	23 89	2,150	50,000	40,000
White oak,	88,000	2.99	53 90	4,743	33,000	55,000
White pine,	88,000	2.99	34 56	3,041	.....	88,000
Red gum,	50,000	1.70	51 20	2,560	.....	50,000
Red and silver maple,	44,000	1.49	26 82	1,180	.....	44,000
Beech,	20,000	.68	22 00	440	.....	20,000
Cotton gum,	20,000	.68	25 00	500	.....	20,000
Shortleaf pine,	19,900	.67	34 52	687	.....	19,900
Sugar pine,	11,200	.38	87 50	980	.....	11,200
Redwood,	10,000	.34	40 00	400	.....	10,000
Ash,	5,300	.18	44 34	235	5,000	300
Cherry (black),	4,400	.15	75 68	233	3,600	800
Loblolly pine,	3,000	.10	40 00	120	.....	3,000
Hemlock,	2,600	.09	35 00	91	1,600	1,000
Cypress (bald),	2,500	.08	43 60	109	.....	2,500
Total,	2,945,000	100.00	\$39 38	\$115,982	748,200	2,196,800

MACHINERY AND ELECTRICAL APPARATUS.

The wood used in Pennsylvania for making parts of electrical equipment is represented by Table 72. There are fourteen species required, their principal uses being:

Cable Reels.

White pine.
Shortleaf pine.
Hemlock.
Red oak.
Spruce.

Wire Spools.

Sugar maple.
Yellow poplar.
Basswood.
Red oak.

Insulating Pieces.

Sugar maple.

Relay Boxes.

White pine.
Red oak.

Switch Boards.

Mahogany.

Wire Reels.

Hemlock.
White pine.
Red oak.
Yellow poplar.
Spruce.

Electrical Cabinets and Cases.

White ash.
Walnut.
Red oak.
Sugar maple.
Mahogany.
Longleaf pine.

Trunking.

Shortleaf pine.
White pine.

Switch Signal Blades.

White pine.
White ash.
Sugar maple.

The largest amount and greatest number of woods of this industry go into cable and wire reels and spools for small size insulated wire. It will be noted that the softwood or conifers not plentiful in Pennsylvania are preferred in their manufacture which probably accounts for so great a percentage of the material being shipped in from other states. Hemlock and black walnut were the only woods listed as wholly home-grown. Pennsylvania wire manufacturers use a much larger number of wood reels than is indicated in this table but because they are manufactured elsewhere and brought to the State ready for use after being assembled merely, information concerning this material was not asked for. It had previously been accredited to the state where the reels were actually manufactured.

Table 72.—Wood for Machinery and Electrical Apparatus, year ending June, 1912.

Kind of Wood.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Shortleaf pine,	968,200	35.66	\$21 89	\$21,191	.....	968,200
White pine,	787,200	28.99	46 02	31,504	150,000	637,200
Sugar maple,	558,600	20.57	34 85	19,465	150,000	408,600
Hemlock,	143,600	5.29	26 85	3,856	143,600	.....
Spruce,	87,700	3.23	26 00	2,280	.....	87,700
White oak,	80,000	2.95	28 38	2,270	10,000	70,000
Red oak,	43,500	1.60	41 72	1,815	.....	43,500
Ash,	25,000	.92	60 00	1,500	.....	25,000
Yellow poplar,	10,000	.37	55 60	556	.....	10,000
Mahogany,	6,000	.22	160 00	960	.....	6,000
Black walnut,	2,500	.09	40 00	100	2,500	.....
Basswood,	2,000	.07	55 60	111	.....	2,000
Longleaf pine,	1,000	.04	25 00	25	.....	1,000
Total,	2,775,200	100.00	\$31 54	\$85,633	456,100	2,259,100

WATER PIPES AND PUMPS.

Over two and one-half million feet of lumber is demanded annually in Pennsylvania for making wooden water pipes and wood linings for iron water pipes. In coal mining operations the chemical action of the water that collects there holds in solution various minerals, chiefly sulphur, that have a deleterious effect upon iron. Pipes employed for conducting this water away, when of iron, are usually lined with wood to prevent corrosion or, as in many cases, are made entirely of wood. White pine is demanded in the largest quantities for both of these purposes. The average price indicates that the lower grades were employed, as were the sugar maple, beech, and sweet birch and other species were used. Most of the white pine reported was State-grown, which is another instance of an industry at present depending on the forest resources of the State. Yellow poplar, the most expensive wood, came from a distance and went entirely into liquor logs, both for well and boat pumps, the latter used principally on boats for transporting ore coal and other heavy freight. In other states, according

to quantity, cucumber is preferred for liquor logs but unless it was mixed with yellow poplar, as is frequently done in marketing this wood, none was used in Pennsylvania.

Table 73.—Wood for Pumps, year ending June, 1912.

Kind of Wood.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
White pine,	2,092,000	77.71	\$24 59	\$51,435	1,575,000	517,000
Sugar maple,	400,000	14.86	17 00	6,800	400,000	.....
Yellow poplar,	100,000	3.71	45 00	4,500	.....	100,000
Birch,	50,000	1.86	17 00	850	50,000	.....
Beech,	50,000	1.86	15 00	750	50,000	.....
Total,	2,692,600	100.00	\$23 90	\$64,335	2,075,000	617,000

BASKETS AND VENEER PACKAGES.

The products of this industry are made exclusively of veneer cut from close grained non-resinous woods with the tops and bottoms of thicker material—thin lumber,—which is often sawed from the cores (that part of the log after the veneer has been removed), or from low grades of lumber. Formerly splint baskets were the kinds used. There is a wide difference between split wood and woods suitable for veneers. The former require straight grained woods, easily rived. The sapwood of white oak, basket oak, cow oak, ash, and hickory were among those frequently used. After the introduction of rotary veneer machines they began to make them, as they are doing in Pennsylvania, from veneer cut into wide strips and woven; and cheaper woods, usually with close compact cross grain without much resin, have taken the place of the splint woods. For stave baskets a great deal of the veneer is cut into staves varying in length from 12 inches to 18 inches. The bottom is of solid edged lumber, to which the narrow ends of the staves are tacked. The staves are held in place at the top and added strength is given at the bottom by the use of thin cut rims of white elm, beech, and soft maple. These baskets are made in many sizes and have a bent handle which is often of beech, hard maple, and white elm. Various woods answer for the veneer part of the stave baskets; the principal ones reported by Pennsylvania manufacturers are beech, soft maple, elm, ash, birch, and black gum.

Other commodities made by this industry include packages used in marketing fruits and vegetables such as tills, hoppers, vendors' trays, and the like. This industry in Pennsylvania used a comparatively small amount of wood compared with the amounts used in Delaware, Maryland, Virginia, and North Carolina. The number of firms specializing in this line as well as in basket making justifies the grouping of the information concerning this line of manufacture into a separate industry instead of including it with the material going into boxes and crates, as has been the case in a number of other state reports where the veneer package industry is relatively unimportant.

Table 74.—Wood for Baskets and Veneer Packages, year ending June, 1912.

Kind of Wood.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Beech,	1,079,000	40.22	\$18 62	\$20,093	949,000	130,000
Sugar maple,	549,000	20.46	18 15	9,963	549,000	.....
White pine,	230,000	8.57	21 00	4,830	230,000	.....
Basswood,	220,000	8.20	20 18	4,440	220,000	.....
Red and silver maple,	145,000	5.40	20 00	2,900	.....	145,000
Red oak,	125,000	4.66	23 00	2,875	125,000	.....
White elm,	115,000	4.29	21 87	2,515	115,000	.....
Chestnut,	100,000	3.73	19 00	1,900	100,000	.....
Birch,	70,000	2.61	22 43	1,570	70,000	.....
Ash,	30,000	1.12	21 00	630	30,000	.....
Black gum,	20,000	.74	22 00	440	20,000	.....
Total,	2,683,000	100.00	\$19 44	\$52,156	2,408,000	275,000

FRAMES AND MOULDINGS.

Woods used in Pennsylvania for picture frame mouldings—plain, enameled, embossed, and carved,—electric wire moulding, and frames for school slates and blackboards, are listed in Table 75. This industry excludes all mouldings employed in the interior finish of houses except those which are put in place by the paper hangers for drop ceiling work and for picture hanging. Furniture, casket, and fixture moulding are grouped with the material respectively for the industries making these commodities.

Twenty-one woods are called on for the manufacture of the commodities mentioned above and scarcely one-fourth of the total quantity was cut from trees that grow within the State. Basswood is the principal material used, exceeding three times the total of all others. It went principally for fancy finish such as gilt, enamel, and embossed mouldings. Basswood not only holds paint well but keeps its shape and is easy to work and to cut, nail, and fit to place. Yellow poplar met part of the demand but was consumed in relatively small quantities. Frames displaying the figure of the wood are usually the highest priced moulding. Mahogany, white oak, black walnut, ash, and chestnut are called on by the Pennsylvania manufacturers for these lines of work if they are finished in oil or wax to bring out the natural beauty of the wood or else are darkened by stains or ammonia fumes for mission effects. Red gum is an important wood in this industry. It stood third in a similar table in Illinois, second in Michigan, and fourth in New York. It answers with sweet birch for the imitation of expensive woods.

Considerably over half a million feet of lumber each year is demanded in Pennsylvania for mouldings to conceal and protect electric wiring on walls and ceilings. Shortleaf pine and red oak were used in small quantities, but basswood met practically all the demand. Slate frames, except those covered with cloth, were entirely of beech. Basswood answered for the felt-bound ones and together with spruce supplied the material for blackboard frames.

Table 75.—Wood for Frames and Mouldings, year ending June, 1912.

Kind of Wood.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Beech,	1,200,000	45.82	\$20 08	\$24,100	600,000	660,000
Basswood,	902,000	34.44	23 09	20,825	352,000	550,000
White oak,	107,000	4.09	55 46	5,934	27,000	80,000
Spruce,	100,000	3.82	30 00	3,000	.....	100,000
Chestnut,	93,000	3.55	22 41	2,084	25,000	68,000
Yellow poplar,	87,000	3.32	38 51	3,350	.....	87,000
Red gum,	50,000	1.91	30 00	1,500	.....	50,000
Sugar maple,	20,000	.76	22 50	450	20,000	.....
Mahogany,	15,000	.57	120 00	1,800	.....	15,000
Red oak,	12,000	.46	44 00	528	2,000	10,000
Black walnut,	10,500	.40	80 67	847	4,500	6,000
Ash,	10,000	.38	35 00	350	10,000	.....
Birch,	7,500	.29	75 00	562	.....	7,500
Shortleaf pine,	5,000	.19	30 00	150	.....	5,000
Total,	2,619,000	100.00	\$25 00	\$65,480	1,040,500	1,578,500

REFRIGERATORS AND KITCHEN CABINETS.

Table 76 lists the woods used in Pennsylvania in the manufacture of refrigerators, kitchen cabinets, and cupboards. The combination cabinets and cupboards have become almost indispensable to housekeepers in that they provide a convenient place for all the accessories to cooking that are necessary to be kept at hand. In late years they have become popular and factories making them specialize in this line. Because they are sold at low prices they are not usually made of the upper grades of lumber that are employed in the manufacture of furniture. Yellow poplar and oak, both red and white, and to a limited extent birch, are the woods mainly used in Pennsylvania for the case or outside work. The interior parts, such as shelving, compartment partitions, drawer sides and bottoms, etc., are made of yellow poplar, spruce, cottonwood, maple and beech. The backs of these cases are also made of low grade material and none of special quality or kind was demanded. Almost any cheap species, easily worked, will answer. In consequence, a proportion of nearly all listed in the table served for this use. Shortleaf pine, spruce, and white oak were reported for framing.

Refrigerators run from what are practically small ice boxes to large sectional cases the size of a room used by butchers and others doing business requiring cold storage equipment. Refrigerators and chests for domestic purposes call for soft woods of conifers for linings. The reason for this is that many hardwoods have an odor and therefore are unfit for a storage compartment of perishable foodstuffs. Spruce is the principal lining material in Pennsylvania, and was also employed for ice pan supports. Cypress in some states is used for this purpose and in others white and yellow pine is used. The siding or outer case is usually hardwood,—white oak, white ash, red oak, birch, cherry, and red gum. They are selected as being not only best for the work intended, but the exterior properly finished gives the chest the appearance of an article of furniture. The case is not attached

to the lining, since between the lining and the case there is provided an insulation space, which in some refrigerators is filled with materials like sawdust, cork, and charcoal, and in other refrigerators the space is left unfilled, the dead air being regarded the most effective insulation. Lumber for refrigerators must be well dried as otherwise the extreme variations of temperature are apt to cause it to buckle and check. The large refrigerators or cooling rooms are built to order in the place in which they are used. Though hardwoods are called on for the exterior or case work of the higher priced work, softwoods answer to a considerable extent both for the linings and cases. The materials for both of these parts are usually rather thick and are preferred to guard more effectively against the penetration of heat. It is possible, so the Pennsylvania manufacturers claim, to secure a temperature of 38 degrees from ice alone in these large refrigerators.

Table 76.—Wood for Refrigerators and Kitchen Cabinets, year ending June, 1912.

Kind of Wood.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Yellow poplar,	566,200	22.93	\$28 27	\$16,009	363,000	203,200
Shortleaf pine,	453,750	18.42	27 07	12,284	.....	453,750
White oak,	448,450	18.20	30 44	13,649	250,000	198,450
Spruce,	413,800	16.79	37 39	15,474	190,000	223,800
Cottonwood,	150,000	6.09	32 00	4,800	.....	150,000
Red oak,	117,450	4.77	41 91	4,922	.....	117,450
Sugar maple,	80,750	3.28	28 71	2,318	80,750	.....
Birch,	65,000	2.64	25 15	1,635	30,000	35,000
Beech,	55,900	2.23	17 36	955	30,000	25,000
Hemlock,	37,100	1.50	22 13	821	33,100	4,000
Ash,	32,000	1.30	38 19	1,222	4,600	28,000
Basswood,	21,600	.83	31 11	672	1,600	20,000
Chestnut,	11,800	.48	28 05	331	11,800	.....
Cherry (black),	7,500	.30	62 50	469	7,500	.....
Red gum,	2,900	.12	50 60	145	.....	2,900
White pine,	500	.02	28 00	14	500	.....
Total,	2,463,800	100.00	\$30 73	\$75,720	1,002,250	1,461,550.

EXCELSIOR.

Formerly excelsior was called wood fiber but later it received its present name given it by an upholstery firm in its advertisement. In 1860 this commodity was first placed on the market by a Maine manufacturer, but it was not called on to meet much of a demand for a decade; then with the improved machinery invented by Europeans the manufacture of excelsior was greatly facilitated. Since that time it has become a staple product. According to a recent report by the Forest Service and the Bureau of the Census, it was ascertained that 85,000,000 feet of forest material is yearly demanded for its manufacture. Pennsylvania is not so important an excelsior state as either Virginia or New York, the former being second and the latter third. Pennsylvania is the tenth, consuming each year over one and a half million feet of wood all cut within the State. In the New England

and Lake states, aspen or popple, basswood and willow are used; in Virginia and North Carolina, scrub and loblolly pine, yellow poplar, and white pine meet the demand. In the Mississippi Valley states excelsior makers report the use of cottonwood, yellow poplar and yellow pine, and in the Pacific coast states black cottonwood alone furnishes all of the demand. For the United States, in quantity, aspen is the favorite excelsior wood, yellow pine next. Pennsylvania manufacturers prefer basswood and yellow poplar next. These woods with aspen make the best grades of excelsior. The consumption of yellow poplar in this line of manufacture is greater in Pennsylvania than in any other state, though it is used in eight others. Butternut appears in only one other state, New Jersey, and, next to Michigan, beech finds its greatest demand in Pennsylvania for excelsior. Chestnut excelsior is solely a product of Pennsylvania and until this investigation, the Forest Service had received no record of the use of this wood for this purpose. Excelsior wood should be straight grained, soft, dense, light in weight and color, moderately non-brittle, stiff when dry, and odorless.

The raw material used for making excelsior comes in the form of bolts and split billets, usually in lengths the multiples of 18 inches. The wood is thoroughly seasoned before manufacturing but if seasoned too long it becomes brittle and often is injured by certain forms of incipient decay. The billets are set in the excelsior machines and without further handling are shaved into the finished product. The output of an eight block machine varies from 6,000 to 10,000 pounds per day according to the fineness of the product. From the cutting machines the excelsior is taken to the baling room where presses, similar in operation to hay balers, put it into marketable form.

The first use of excelsior was for packing wares liable to injury in transportation, but later it proved valuable for filling cheap mattresses and upholstered furniture. In France not only does excelsior answer for this purpose, but highly improved machinery has made it possible to manufacture a product of such fine grade as to be a fit substitute for the absorbent lint used in hospital, or filtration purposes, and for weaving into floor coverings. Various grades of excelsior are frequently dyed without losing their elasticity. They serve as an ornamental packing material, and for color schemes in displaying goods in show cases, but none was reported in Pennsylvania. Table 77 gives the available statistics.

Table 77.—Wood for Excelsior, year ending June, 1912.

Kind of Wood.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Basswood,	749,600	44.53	\$13 77	\$10,315	749,000	.....
Yellow poplar,	688,000	40.90	15 00	10,030	688,000	.....
Beech,	116,500	6.93	15 00	1,748	116,500	.....
White pine,	63,500	3.78	15 00	953	63,500	.....
Butternut,	30,000	1.78	15 00	450	30,000	.....
Aspen (popple),	30,000	1.78	15 00	450	30,000	.....
Chestnut,	5,000	.30	14 00	70	5,000	.....
Total,	1,682,000	100.00	\$14 28	\$24,016	1,682,000	.....

PLAYGROUND EQUIPMENT.

Under this industry are listed the woods used for making apparatus or wooden parts thereof that contribute equipment for public parks and playgrounds. Swings, merry-go-rounds, coasting boards, ferris wheels, croquet sets, see-saws, shoot-the-chutes, etc., are examples of the principal ones. Swings, however, were the only commodities manufactured in Pennsylvania. The total of the following table, 1,507,300 feet, represents the amount of material that is required each year for their manufacture. Not all of this material went into playground swings since swings of every description are included and some required more lumber for making than others. According to quantity consumed, lawn and porch swings are the most important. The latter answer not only for amusement but are also useful as furniture,—a suspended settee for porch appointments. Of late this commodity has grown rapidly in favor.

Nine woods are listed in Table 78, and those species best suited for swing material, i. e., those possessing the necessary inherent qualities of strength, hardness, and durability when exposed are the ones included. The oaks, beech, and ashes in the order named, were the most prominent hardwoods. The chief conifers used were longleaf, shortleaf, and loblolly pine, the last named being used in the largest quantities. The pines answered mostly for lawn swings and principally for the staffs and the frame work or superstructure.

Table 78.—Wood for Playground Equipment, year ending June, 1912.

Kind of Wood.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.				
Red oak,	456,300	30.27	\$32 23	\$14,707	216,300	246,000
Loblolly pine,	400,000	26.54	20 00	8,000	.....	400,000
Shortleaf pine,	240,000	15.92	27 00	6,480	.....	240,000
White oak,	151,000	10.02	37 95	5,730	98,500	52,500
Beech,	130,000	8.62	29 46	3,830	130,000	.....
Ash,	75,000	4.98	33 00	2,475	37,500	37,500
Yellow poplar,	25,000	1.66	36 00	900	12,500	12,500
Sugar maple,	23,000	1.53	26 96	620	3,000	20,000
Longleaf pine,	7,000	.46	52 00	364	.....	7,000
Total,	1,507,300	100.00	\$28 60	\$43,106	497,800	1,009,500

PRINTING MATERIAL.

Electrotype backing, woodcut engravings, and wood type are the only products listed under this head. Four woods were demanded for their making. Cherry heads the list as to quantity and went entirely into electrotype mountings, which is probably the most exacting use it has. Because it is less liable to warp than any other American woods that possess the other requisite qualities for this use is the reason the electrotypers demand cherry exclusively. Its strength and density, its resistance to splitting, and its property to work smoothly are other important qualities which com-

mend it. Electrotpe backing is not made, as formerly, entirely from solid lumber. Glue is to a large extent called on to put together narrow strips or thin layers for built-up mountings that are beginning to be used extensively. The growing scarcity of cherry, together with the rapidly increasing demand for this line of work requires the electrotypers to pay a price over twice as great as that asked five years ago.

For wood engravings, boxwood from Turkey and Russia was the only wood reported and in other states as well it met most of the demand, especially for high grade work. It is the most expensive wood that is listed in any industry. The price, \$1,300 per thousand feet, is little, if any, above the usual cost of this wood for engravings and it is usually sold in terms of cubic inches, four cents being the average reported in Philadelphia. Owing to the high cost of this wood, engravers employ domestic substitutes to a large extent, but they are for the cheaper grades of work. Sugar maple, apple, and pearwood are the kinds most used.

Metal has almost entirely replaced wood for printer's type. Wood is still called for to a limited extent, chiefly for manufacturing large size type such as is used for printing billboard advertisements. Formerly boxwood furnished the material, but its high cost now stands in the way and sugar maple, which was the only wood reported in Pennsylvania, now furnishes most of the supply.

Table 79.—Wood for Printing Material, year ending June, 1912.

Kind of Wood.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Cherry (black),	1,166,800	91.56	\$29 14	\$34,003	634,000	532,800
Birch,	30,000	2.36	50 00	1,500	10,000	20,000
Red and silver maple,	25,000	1.96	31 60	790	20,000	5,000
Mahogany,	23,500	1.84	85 96	2,020	.....	23,500
Redwood,	20,000	1.57	63 00	1,260	.....	20,000
Yellow poplar,	5,000	.39	18 00	90	.....	5,000
Beech,	2,000	.16	30 00	60	2,000	.....
Applewood,	1,000	.08	55 00	50	1,000	.....
Sugar maple,	500	.04	80 00	40	500	.....
Hickory,	500	.04	50 00	25	500	.....
Boxwood (Turkish),	26	*	576 92	15	.....	26
Total,	1,274,326	100.00	\$31 27	\$39,853	668,000	606,326

*Less than 1-100 of 1 per cent.

LADDERS.

Nine manufacturers reported the making of ladders, including step ladders, travelling store ladders, firemen's ladders, and extension ladders used by painters and other mechanics. In other state reports ladders have been classified under woodenware but owing to the number of concerns in Pennsylvania specializing in making them and because of the large quantity of wood which they annually consume, their presentation under a separate heading is justified.

Loblolly pine and basswood supplied the largest part of the demand and were called on mostly for step ladders because being strong and at the same time light in weight they are well adapted for this line of use. Beech was used extensively for steps because of its strength, and in order not to make the ladders too heavy, it was used with a lighter wood for styles. Other step ladder woods were cypress, longleaf pine, and spruce. The staffs, which are the hinged supports, are made of various woods and usually of the same kind as the styles except those of considerable length where extra strength is desired. In order not to add too much weight staffs are made of strips of small dimension and to meet the stress imposed are well braced and made from material free from imperfections. For extension and firemen's ladders high grades are used. Spruce is most in demand for the styles or uprights while for the ladder rungs, hickory, ash, beech, and maple were employed in the order mentioned.

Travelling ladders are so named because they are readily moved by the occupant without descending. They are used in stores. Pulleys, movable on a track, are attached at the top, and in some designs the bottoms rest on castors. Lightness of weight is not a consideration in these as in step ladders and thicker materials and heavier woods are therefore used. Longleaf pine was used mostly but sugar maple, loblolly, and shortleaf pine also met a part of the demand.

Sixty-five per cent. of the ladder woods were kinds that do not grow plentifully and some not at all in Pennsylvania. This accounts for only 20 per cent. of the requirements of this industry being met by the forests of the State. Of the kinds reported common to Pennsylvania, the entire amounts consumed were home-grown except basswood, nearly one-half of which was brought in from forests of other states.

Table 80.—Wood for Ladders, year ending June, 1912.

Kind of Wood.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Loblolly pine,	400,000	36.08	\$20 00	\$8,000	.....	400,000
Basswood,	275,000	24.81	29 18	8,025	150,000	125,000
Spruce,	191,000	17.23	43 40	8,290	.....	191,000
Cypress (bald),	62,500	5.64	54 64	3,415	.....	62,500
Longleaf pine,	50,000	4.51	28 00	1,400	.....	50,000
Sugar maple,	50,000	4.51	27 00	1,350	50,000	.....
Hickory,	25,000	2.26	18 00	450	25,000	.....
Shortleaf pine,	25,000	2.26	25 00	625	.....	25,000
Beech,	22,000	1.98	13 27	402	22,000	.....
Ash,	4,000	.36	70 00	280	4,000	.....
Yellow poplar,	4,000	.36	21 06	84	.....	4,000
Total,	1,108,500	100.00	\$29 16	\$32,321	251,000	857,500

ELEVATORS.

Fifteen manufacturers reported using wood for the manufacture and repair of freight and passenger elevators, both hand power and traction, lifts, dumb waiters, etc., and many of them are important industries maintaining formidable establishments. In the production of the finished commodity they give Pennsylvania a high standing among the states but in consumption of lumber they report the use of only a little over a million feet, annually, making this industry 35th in the list or 17th from the last. Not many years ago lumber was the most essential material the elevator manufacturers used but generally steel construction began to take the place of wood and proved to be such a practical and desirable substitute that now for power elevators, especially passenger, wood is employed only incidentally for a few minor parts. The sight of the old time wooden passenger elevator car today is an exception, but on the other hand many small freight elevators and dumb waiters are made entirely of wood, the initial cost being much lower than steel. Some are made that are part steel and part wood. The rough lumber demanded for elevator construction is shown in Table 81. Eleven kinds were reported and their principal uses are as follows:

PASSENGER ELEVATORS.

Car Platforms.

Sugar maple.

Overhead Machine Platform.

Sugar maple.

FREIGHT ELEVATORS.

*Guide Posts.*White pine.
Longleaf pine.
Norway pine.*Panel Sides.*Longleaf pine.
Loblolly pine.
White oak.
Sugar maple.*Guide Strips.*Sugar maple.
White ash.*Overhead Beams.*Sugar maple.
Longleaf pine.
Loblolly pine.
White ash.*Upper Frames.*Sugar maple.
Longleaf pine.
White ash.*Car Beams.*Sugar maple.
White elm.
White oak.
Norway pine.*Enclosures.*Longleaf pine.
White pine.
Loblolly pine.*Weight jams.*Longleaf pine.
Sugar maple.
White elm.*Gates.*White oak.
Loblolly pine.*Footing Pieces.*Longleaf pine.
Norway pine.
Sugar maple.
Cork elm.*Car Platforms.*Sugar maple.
Cypress.
Longleaf pine.

DUMB WAITERS.

*Car Frames.*Spruce.
Cork elm.
Longleaf pine.
Sugar maple.*Shaft Lining.*White oak.
Hemlock.
Chestnut.
Loblolly pine.

Car Finish.

Yellow poplar.
Loblolly pine.
White pine.

Guide Posts.

Yellow poplar.
White pine.

Guide Strips.

White ash.
Sugar maple.

Weight Jams.

Yellow poplar.
White pine.
Cork elm.

Weight Boxing.

Loblolly pine.
Yellow poplar.
White pine.

This industry does not depend on the forests of the State to any great extent as a source of raw material. Less than one-quarter of the total was grown in Pennsylvania because the lumber chiefly used in elevator construction is of kinds that are rarely, if at all, cut in Pennsylvania. Longleaf, Norway or red, loblolly, and shortleaf pine, and cypress together constitute over 52 per cent. of the total. Sugar maple and ash were the principal home-grown woods demanded and from the average prices recorded the upper grades were principally purchased. The available statistics are:

Table 81.—Wood for Elevators, year ending June, 1912.

Kind of Wood.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.		Grown Out of Pennsylvania.	
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.		
Longleaf pine,	269,900	26.75	\$36 73	\$9,913	.....	269,900	.....	.....
Sugar maple,	141,200	14.00	49 74	7,023	81,200	.....	60,000	.....
Norway pine,	100,000	9.91	28 00	2,800	.....	100,000	.....	.....
Loblolly pine,	96,500	9.56	32 81	3,118	.....	96,500	.....	.....
Ash,	98,000	9.22	71 17	6,619	43,600	.....	49,400	.....
Yellow poplar,	82,600	8.19	41 88	3,459	30,600	.....	52,000	.....
White pine,	62,200	6.16	40 45	2,516	32,200	.....	30,000	.....
White oak,	53,200	5.27	48 03	2,555	23,200	.....	30,000	.....
Shortleaf pine,	50,000	4.96	22 00	1,100	.....	50,000	.....	.....
Cork elm,	20,500	2.03	65 00	1,332	20,500	.....	.....	.....
White elm,	12,000	1.19	65 00	780	.....	12,000	.....	.....
Cypress (bald),	10,000	.99	55 00	550	.....	10,000	.....	.....
Spruce,	10,000	.99	30 00	300	10,000	.....	.....	.....
Chestnut,	4,000	.40	70 00	280	.....	4,000	.....	.....
Hemlock,	3,800	.38	30 00	114	3,800	.....	.....	.....
Total,	1,008,900	100.00	\$42 08	\$42,459	245,100	.....	763,800	.....

CANES AND WHIPS.

The variety of woods used for canes, umbrella and parasol handles exceeds that reported by any other industry in Pennsylvania. Table 82 includes 72 species of wood. Because the raw material for these commodities is most usually purchased in billet, pole or twig form, and very frequently by the piece, it was impractical to reduce the amount of the material reported to board feet except in a few cases when certain woods were used in comparatively large quantities. The total of Table 82 does not, therefore, represent the entire amount of wood that is used for manufacturing these

products in Pennsylvania, but in order that the remarkable number of different kinds of wood,—many of which have not been reported in any other state report,—may be presented, they have been listed in the table without accompanying statistics. Most of them are high priced and a majority are foreign woods. As many as were readily available will be found included in the preceding illustration. A large per cent. of all the sugar maple and soft maple shown in the table went for dowels or shanks of umbrellas and parasols, while the entire amount of beech answered for whip stocks and handles. Reed cut in large quantities from rattan shipped from the Orient was also used for whips but it was reported in pounds and could not be reduced to feet to be included in the table.

Table 82.—Wood for Whips, Canes, and Umbrella Sticks, year ending June, 1912.

Kind of Wood.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Beech,	266,500	30.18	\$21 91	\$5,838	252,000	14,500
Sugar maple,	241,100	27.31	17 57	4,237	241,100	.....
Lbony,	124,150	14.06	187 94	23,333	.....	124,150
Red and silver maple,	107,000	12.12	26 45	2,830	2,000	105,000
Congo,	60,000	6.80	133 00	8,000	.....	60,000
Hickory,	26,000	2.94	55 85	1,452	.....	26,000
Foxwood,	25,600	2.90	362 28	9,300	.....	25,600
Red gum,	20,000	2.27	50 00	1,000	.....	20,000
Basswood,	12,500	1.42	32 48	406	5,000	7,500
Weichsal roots,	30	*	540 00	16	.....	30
Total,	882,880	100.00	\$63 90	\$56,412	500,100	382,780

*Less than 1-100 of 1 per cent.

Woods for canes and parasol and umbrella handles purchased by the piece:

Apple.	Haw (black thorn).
Apricot.	Holly.
Arbor vitae.	Hop tree (hopwood).
Bamboo.	Hornbeam (ironwood).
Birch.	Huckleberry tree.
Black ash.	Lancewood.
Black gum.	Laurel.
Black walnut.	Lilac.
Butternut.	Madagascar.
Cherry.	Mahogany.
Chestnut.	Malacca (rattan).
Chestnut oak.	Morello cherry (sweet cherry).
Circassian walnut.	Orange wood.
Corra.	Osage orange.
Crab apple.	Paper birch (gray birch).
Cucumber.	Partridge.
Dogwood.	Peach tree.
Elm.	Pear tree.
English oak.	Persimmon.
French oak.	Plum.
Furze.	Poison Sumach.
Hazelnut.	Quince.

Red cedar (juniper).	Sweet (cherry) birch.
Red oak (jersey oak).	Sycamore.
Rice root.	Whangee.
Sassafras.	White ash.
Savin (red cedar).	White oak.
Scotch thistle.	White thorn.
Siberian crab.	Willow.
Slippery elm.	Yellow birch.
Striped maple (swamp dogwood).	Yellow poplar (hickory poplar).

PLUMBERS' WOODWORK.

In connection with bathroom and toilet furnishings and other forms of plumbing installation there are certain useful commodities made of wood which have been grouped under this heading and the materials used for making them presented in Table 83. Drainboards, which serve as dish washing tables, connected with the sink, call for a large quantity of wood which, on account of holding its shape, ash alone supplied. Usually these boards are grooved to facilitate drainage. Sweet birch, finished with a high polish, was mainly used for bath stools, some in imitation of mahogany but most of them painted or enameled white, the birch being specially adaptable to both kinds of finish. Water closet seats, lids, and tanks, are the other commodities of this industry in Pennsylvania and like the wood for fixtures and furniture, high grade material with considerable figure and susceptible of taking a polish is largely demanded. Yellow poplar is an exception as it answers in large amounts only for white enameled finish and is desired because it holds its shape, takes paint readily, and is moderately strong. Birch is probably equally suitable except that it is more liable to warp, but this is overcome in the superior advantages it offers in being stronger and affording a higher polish. White and red oak, including considerable quartered stock, cherry, mahogany, ash, and sweet birch used for exterior work are the woods selected for figure and are finished natural with wax or varnish. Chestnut in some states was reported among these woods but in Pennsylvania where it is extensively cut, the manufacturers of plumbing woodwork made no mention of it. This industry does not depend largely upon the forests of the State as the manufacturers report only 15 per cent. of all the wood they used as State-grown.

Table 83.—Wood for Plumbers' Woodwork, year ending June, 1912.

Kind of Wood.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
White oak,	189,500	32.43	\$43 78	\$8,297	40,000	149,500
Yellow poplar,	131,000	22.94	40 00	5,360	.....	131,000
Ash,	110,000	19.83	34 00	3,740	.....	110,000
Birch,	85,000	16.26	30 95	2,940	75,000	20,000
Red oak,	30,000	5.13	30 00	900	30,000	.....

Table 83—Concluded.

Kind of Wood.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.				
Shortleaf pine,	12,250	2.10	28 00	343	.....	12,250
Mahogany,	6,000	1.03	155 00	930	.....	6,000
Cherry (black),	4,400	.75	94 55	416	400	4,000
White pine,	2,500	.43	36 00	90	.....	2,500
Sugar maple,	300	.05	30 00	9	.....	300
Black walnut,	300	.05	35 00	10	300	.....
Total,	584,250	100.00	\$39,43	\$23,035	145,700	433,550

INSULATOR PINS AND BRACKETS.

Durability and strength are the requisite qualities of insulator pin material, and locust is the wood principally used in their manufacture. In the country at large, its use for this purpose exceeds seven times the amount of all other woods combined and in Pennsylvania over 425,000 feet are used each year. White oak, red oak, elm, and osage orange are other woods used for pins in various states, but, unlike locust, where these are employed they are ordinarily dipped in paint or some antiseptic solution, such as creosote, in order to increase their durability. In Pennsylvania locust was the only wood reported for insulator pins and the other woods appearing in the table were used for pole brackets.

Table 84.—Wood for Insulator Pins and Brackets, year ending June, 1912.

Kind of Wood.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.				
Locust (black),	463,500	80.12	\$23 90	\$11,076	463,500	.....
White oak,	60,000	10.37	13 33	800	60,000	.....
Red oak,	55,000	9.51	11 82	650	55,000	.....
Total,	578,500	100.00	\$21 65	\$12,526	578,500	.....

BUTCHERS' BLOCKS AND SKEWERS.

The two important woods for butchers blocks are sycamore and sugar maple. On account of their desired qualities, hardness and uncleavability, together with their strength and tastelessness, they are first among the domestic woods for this use. Formerly butchers' blocks were round, usually

a cross section of a large tree barked and trimmed symmetrically, varying in thickness from 18 to 30 inches. It is exceedingly difficult to season pieces of this size thoroughly and trouble results by blocks checking, rendering it difficult to keep them clean and sanitary. Lately considerable improvement in seasoning processes has partly overcome the only objection to sycamore blocks. The advancement made in the art of gluing woods, which has brought into prominence built-up lumber, has entirely overcome all checking difficulties and enabled the making of blocks lighter in weight but with requisite strength, equally as serviceable and with a more attractive appearance.

The built-up block is the only kind of block being made in Pennsylvania, and sugar maple is the wood used. The size of the pieces that are glued differ slightly according to the dimensions of the finished block but most commonly they are 3 inches thick, 4 inches wide, and 16 to 18 inches long. It is very important that the lumber for the blocks be thoroughly seasoned and to bring it to the desired condition both air and kiln-drying methods are used. Before gluing the pieces together, they are jointed by machinery in order that they fit perfectly, leaving no apertures along edges for glue to collect and thus taint the meat. That they may more readily adhere to the glue the smooth flat surfaces are roughened. This process is important since the rough usage given the meat block brings great strain on the glued joints which must be as strong as it is possible for the best glue to make them. The flat glue joint is used and to weld the pieces together after being heated and covered with glue, they are subjected for 12 or 14 hours to the pressure of a hydraulic machine. They are then bored for several iron rods that are added as a reinforcement for the glued joints. The legs are made usually of the same kind of wood as the meat blocks, namely, maple, but sometimes red oak is used.

Hickory and white pine are the principal woods used for skewers. Those made from the latter wood are employed in kitchens for holding in shape croquettes and other dainties and by confectioners for taffy sticks. Hickory skewers were made to meet the demand of the butchers. Beech and maple are prominent for meat skewers but none were reported by the manufacturers in Pennsylvania where these woods are common lumber trees.

Table 85.—Wood for Butchers' Blocks and Skewers, year ending June, 1912.

Kind of Wood.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Sugar maple,	270,000	51.92	\$20 37	\$5,500	270,000	.....
White pine,	200,000	38.46	22 00	4,400	200,000	.....
Hickory,	50,000	9.62	18 00	900	50,000	.....
Total,	520,000	100.00	\$20 77	\$10,800	520,000	.....

WEIGHING APPARATUS.

This industry as measured by the consumption of wood is one of the small ones of this report. It includes material for scale manufacture such as is used by railroads, called track scales and hay wagon scales, often used in coal yards, besides platform and counter scales for stores, warehouses, and cabinet scales such as are used for compounding medicines, weighing gold, silver, and precious stones.

Longleaf pine is the most common wood for large scales on account of its durability, strength, and elasticity. It goes principally into the framework of track and wagon scales and was shipped to Pennsylvania from the Gulf states. Sugar maple is next in quantity answering more for the counter and platform scales than any other use because, being hard, tough, strong, and close grained with a tendency to wear smooth, it is specially adapted for this purpose. The handsome finish of mahogany and cherry, together with their compact structure, and the property of holding their shape, commend them for use as material for making the basal parts of cabinet scales and for the frame of the glass cases usually enclosing these scales.

Table 86.—Wood for Weighing Apparatus, year ending June, 1912.

Kind of Wood.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Longleaf pine,	200,000	50.84	\$30 00	\$6,000	.....	200,000
Sugar maple,	171,000	43.47	33 13	5,665	21,000	150,000
Yellow poplar,	10,000	2.54	25 00	250	10,000	.....
Cherry (black),	7,500	1.90	27 00	202	7,500	.....
Mahogany,	4,000	1.02	90 60	360	.....	4,000
Ash,	900	.23	93 05	84	900	.....
Total,	393,400	100.00	\$31 91	\$12,561	39,400	354,000

PROFESSIONAL AND SCIENTIFIC INSTRUMENTS.

The amount of lumber used by this industry is relatively very small, but the products grouped under it are numerous and vary according to the uses they serve in the several trades or professions included. In the quantity of wood used the pencil makers are the most important class. Similar to the pencil manufacturers in New Jersey, New York, and other states, they report using only one wood, red cedar, which is brought to Pennsylvania from the southern states. Tennessee and Florida are at present the centers of production of this wood. Other kinds, both domestic and foreign, have been considered as possible substitutes because of the growing scarcity of red cedar, but the experiments indicate that only a few species have been found fairly successful and these answer mostly for a cheap pencil. This brings out how difficult it is to find a wood combining all the qualities requisite for pencil material and how essential it is that pencil woods possess qualities almost identical to red cedar. Pencil makers procure their raw material in the form of slats that are usually 2½ inches wide and 7 inches

long, and $\frac{1}{4}$ inch thick. Not frequently the pencil makers manufacture their own slats, but there are concerns specializing in cedar products who convert their best material into pencil slats and the remainder into lumber for utility boxes, furniture squares, and closet linings. Formerly when cedar was abundant pencil slats were manufactured entirely from logs, but rapidly decreasing supply of cedar timber has brought into the market old stumps, fence rails, gate posts, barn and cabin logs, and material in various shapes and condition, even partly decayed and weather checked. As can be expected, therefore, waste incident to the sawing of pencil slats is large and has been estimated to be about four-fifths of the original amount purchased. A pencil slat makes six half-pencils. The same operation that grooves them to accommodate the lead also gives them their final form and the corresponding halves are identically made from another slat and glued together.

Carpenters' tools belong to this industry. They include commodities made almost entirely of wood such as spirit levels, rules, gauges, mallet heads, level boards, etc. Tools part wood and part metal like screwdrivers, chisels, gimlets, etc., have been grouped under the handle industry. White oak alone met the demand for gauges which require a hard dense light colored wood and from the price given only the best grades were used. In other States boxwood and sugar maple were also used but neither kind was reported in Pennsylvania. White ash and mahogany, because most stable when in place, answered for spirit levels and plumbs. In Connecticut and New Jersey, where a quantity of these commodities are made, cherry is an important wood and large quantities are used. Level boards were entirely of white pine, while for mallets a variety of woods is used. For carpenters' and tinner's mallets sugar maple answered while *lignum-vitae*, shipped from Mexico, and dogwood served for bung starters and coppersmiths' mallets. Heads of mauls used by sheet metal workers are made of black or sour gum and it is interesting to note that recently this wood has begun to replace sugar maple for this use. Its interlaced fiber, which prevents it from splitting, commends it, besides it is cheap and owing to the large dimensions the trees attain the bolts can readily be had in desired sizes.

In Pennsylvania, as in other states, boxwood is the principal rule material, both for mechanics' collapsible rules and office rulers. It is shipped to this country usually from Turkey or other Mediterranean countries, and owing to its hardness, light color, and stability, it is preferred to any other wood for this commodity. The same qualities commend it to the makers of draftsmen's scales, such as straight-edges, triangles, graduated and slide rules.

Camera makers report using three woods,—mahogany, cherry, and yellow poplar. The first two are the important ones, being strong, close-grained, and free from warping tendencies as well as ornamental. Yellow poplar is used in only relatively small amounts in this line of work and when so demanded goes principally into kits. Ebony was the highest priced wood shown in the table and was reported by the makers of drafting instruments.

Table 87.—Wood for Professional and Scientific Instruments, year ending June, 1912.

Kind of Wood.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Red cedar,	240,000	73.52	\$52 00	\$12,450	.....	240,000
Yellow poplar,	16,400	5.02	73 78	1,210	.....	16,400
Ash,	15,000	4.60	58 67	880	5,000	10,000
Black gum,	12,000	3.68	52 83	634	2,000	10,000
Cherry (black),	10,000	3.06	100 00	1,000	.....	10,000
White oak,	10,000	3.06	55 00	550	.....	10,000
Dogwood,	7,200	2.21	38 47	277	1,000	6,200
Mahogany,	5,118	1.57	169 21	866	.....	5,118
Sugar pine,	5,000	1.53	70 00	350	.....	5,000
Boxwood (West Indian),	2,300	.70	56 00	126	.....	2,300
Lignum-vitae,	1,000	.31	120 00	120	.....	1,000
White pine,	1,000	.31	90 00	90	.....	1,000
Sugar maple,	930	.28	40 00	37	500	430
Ebony,	500	.15	260 00	130	.....	500
Total,	326,448	100.00	\$57 44	\$18,750	8,500	317,948

PULLEYS AND CONVEYORS.

The commodities grouped in this industry are tackle blocks, belt pulleys, conveyors, and clutches, and thirteen kinds of wood are used for making them. Metal has to a large extent replaced wood in this line of manufacture, but studies similar to this in various states have shown that a considerable quantity of wood is still demanded for making them. For belt pulley rims the manufacturers in Pennsylvania call for birch, basswood, yellow poplar, cucumber, cottonwood, and butternut, and for the center arms, red oak, white oak, sugar maple, ash, and beech.

Tackle block material must be dense, hard, strong, tough, and most difficult to split. White ash, sugar maple, and a small amount of black gum are the woods reported in use in Pennsylvania though in other states elm is frequently used. Pulley blocks are of many types and sizes in order to meet a variety of uses. For example, those required on vessels, in building construction, in mines, on derricks and hoists by house painters, masons, carpenters, etc., range from a snatch block to the multiple pulley blocks. The latter is usually of the shoulder block type and designed for one or more sheaves. It is sometimes chambered out to receive a wheel in each compartment while at other times two or more wheels are placed side by side in a section. The old time block maker did much of the work by hand, but the improved machinery in recent years does the work with greater accuracy and in much less time. The lumber is ripped into dimensions the width of the block and the reciprocating saw then cuts the dimensions into shape, when they are passed on to be mortised. Often the wheel slats are cut by machinery and then the blocks are ready for the sheaves.

A small part of this industry consists in the manufacture of conveyors such as are used in factory elevators and warehouses to carry merchandise and grain. These require only a limited amount of wood for small parts and white oak and sugar maple are the species reported.

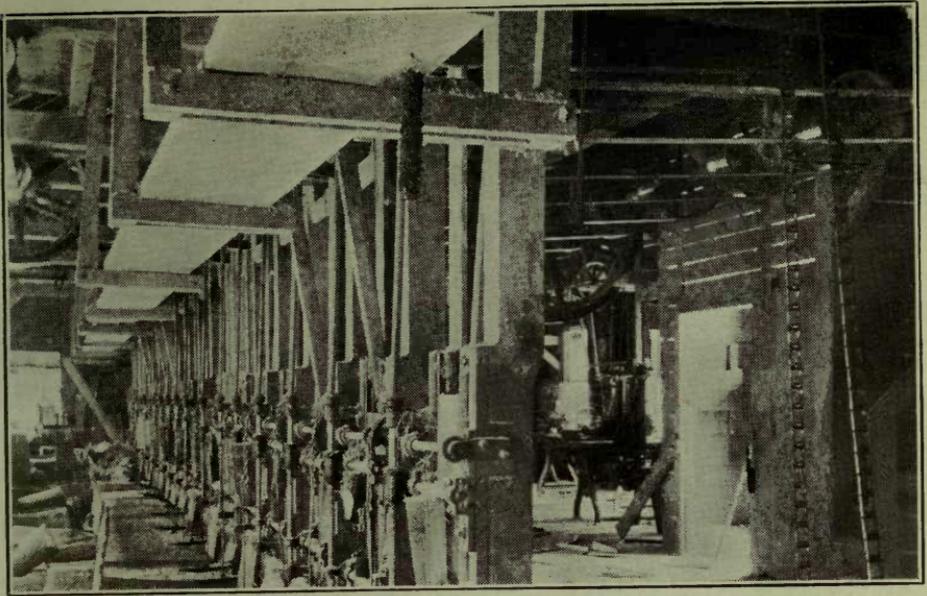


Fig. 30 —Interior of excelsior factory, showing billets in place in excelsior machines.

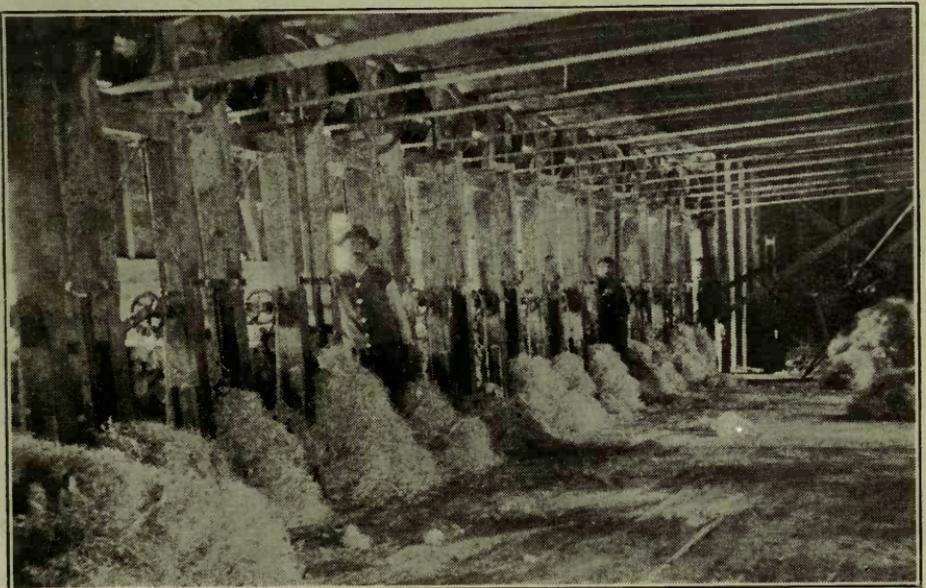


Fig. 31.—Finished excelsior ready for baling.

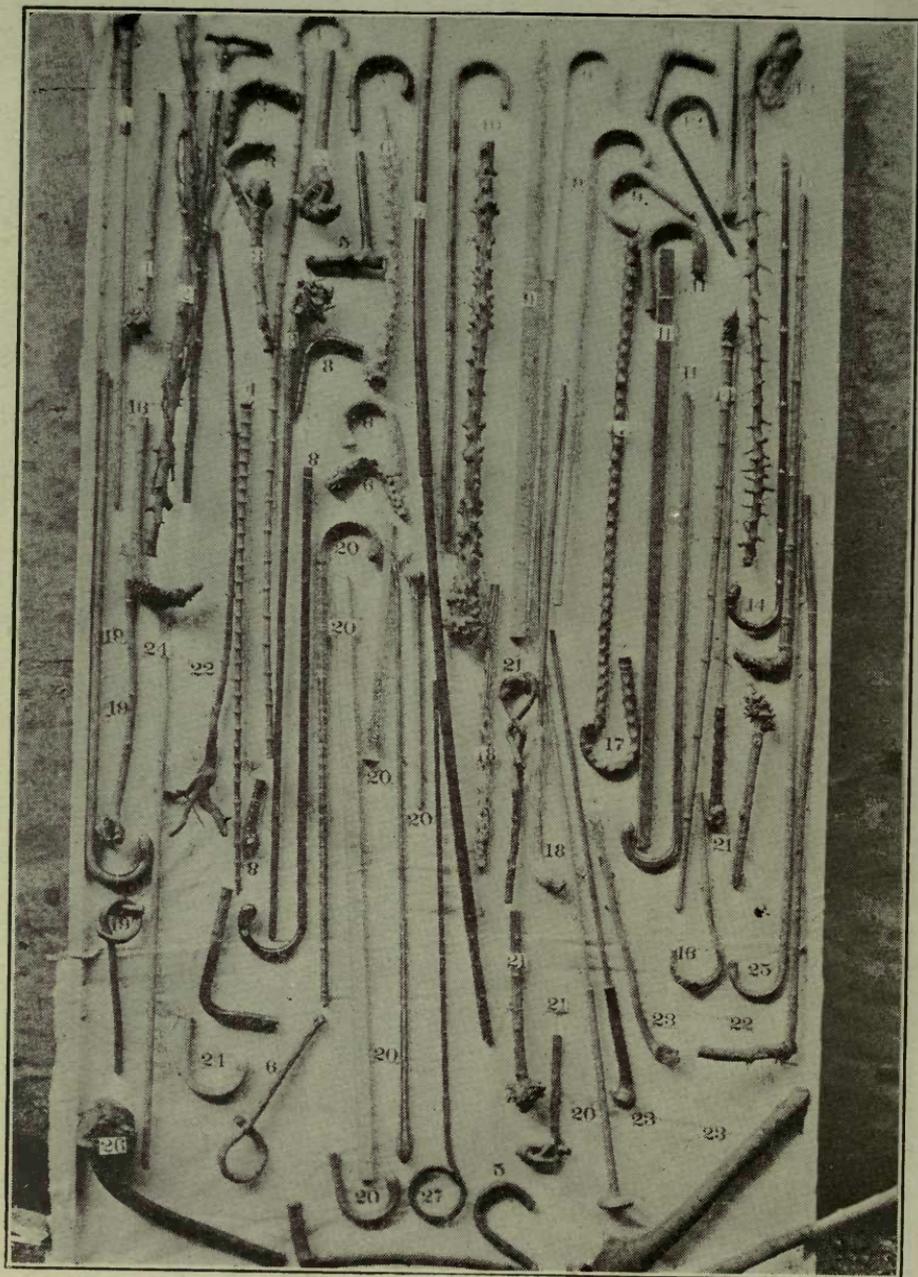


Fig. 32.—Whips, canes, and umbrella handles, and rough stock from which they are manufactured.

DESCRIPTION OF FIGURE 32.

1. Butt cut seedling and umbrella handle—sweet birch.
2. Cut of seedling and cane—osage orange.
3. Butt-cut seedlings, two umbrella handles—boxwood.
4. Whangee cuts, one bent ready to be cut into cane length.
5. Three designs of weichsel umbrella handles.
6. Butt-cut of furze, 1 parasol and 2 umbrella handles.
7. Malacca (rattan) cut and cane.
8. Butt cut seedling, umbrella handle and cane—partridge.
9. Rough sawn billet, parasol handle and cane—holly.
10. Madagascar cut—natural cane ready for ferrule.
11. Rough sawn billet, umbrella handle and cane—applewood.
12. Two parasol and one umbrella handle—ebony.
13. But-cut seedling of haw (black thorn).
14. Cut of bamboo and cane.
15. Corra cane with rice-root handle.
16. Rice-root from which handle of 15 was made.
17. Cut of Congo and umbrella handle.
18. Cut of Scotch thistle and parasol handle.
19. Butt-cut seedling, umbrella handle and cane—dogwood.
20. Rough sawn billet, cane, umbrella and 4 parasol handle—sugar maple.
21. Butt-cut seedling, 4 umbrella handles—French oak.
22. Butt-cut seedling—black ash.
23. Two butt-cut seedlings and umbrella handle—hickory.
24. Cut of lancewood and umbrella handle.
25. Morillo cherry (sweet cherry) parasol handle.
26. Congo root for umbrella handle.
27. Red oak (Jersey)—parasol handle.

Cuts of white thorn and bamboo unnumbered, at bottom of illustration

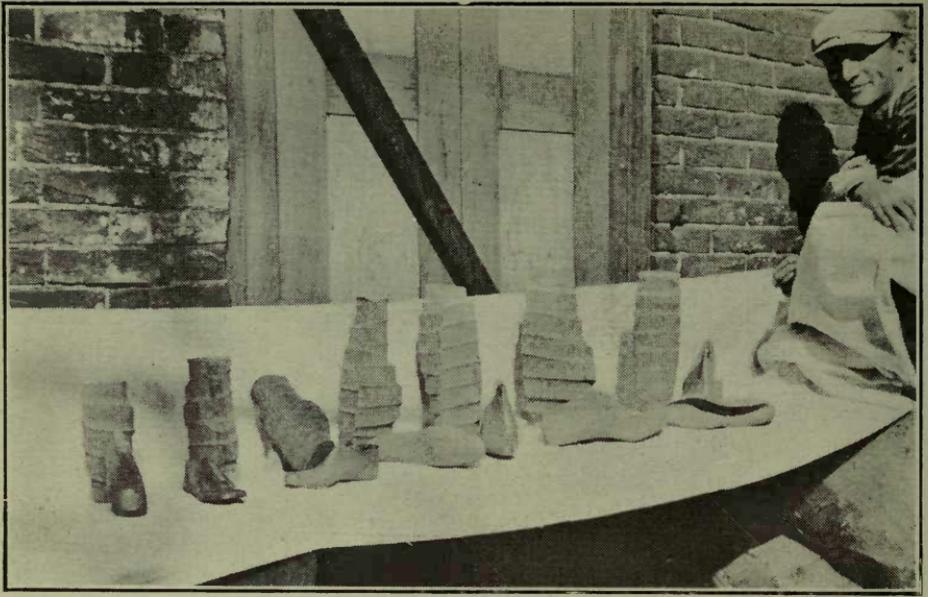


Fig. 33.—Manufacturer of shoe lasts. Roughly cut billets and the finished lasts turned from them.



Fig. 34.—Evolution of a shoe last.

Table 88.—Wood for Pulleys and Conveyors, year ending June, 1912.

Kind of Wood.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Yellow poplar,	80,000	27.16	\$28 75	\$2,300	10,000	70,000
Sugar maple,	68,000	23.09	43 68	2,970	66,000	2,000
Basswood,	40,000	13.58	20 00	800	40,000	.....
Ash,	15,000	5.09	30 00	450	7,000	8,000
Beech,	15,000	5.09	20 00	300	15,000	.....
Black gum,	14,000	4.75	33 71	472	.....	14,000
White oak,	10,500	3.56	30 95	325	10,500	.....
Birch,	10,000	3.40	20 00	200	10,000	.....
Red oak,	10,000	3.40	25 00	250	10,000	.....
Red and silver maple,	10,000	3.40	14 00	140	10,000	.....
Cucumber,	10,000	3.40	18 00	180	10,000	.....
Butternut,	10,000	3.40	20 00	200	10,000	.....
Cottonwood,	2,000	.68	21 00	42	2,000	.....
Total,	294,500	100.00	\$29 30	\$8,629	200,500	94,000

BOOT AND SHOE FINDINGS.

Nearly all shoes in the United States are made over wooden lasts and, therefore, the manufacture of these lasts as well as other shoe findings is an important enterprise. In comparison with the quantity of woods consumed in other states, particularly Massachusetts, Michigan, New Hampshire, and New York, this industry in Pennsylvania is relatively small; but because of the substantial well equipped establishments, of the skilled labor employed, and in the high grade of products manufactured, it is of considerable industrial importance. Lasts, shoe forms, and wood soles are the commodities to which the statistics in Table 89 refer.

Lasts are made from sugar maple and persimmon because they possess the essential qualities of hardness, density, capacity for smooth finish, and permanence in final shape. No other domestic woods have been found equally suitable. The former goes into lasts, all sizes and kinds, both for leather and rubber shoes, and the latter for the better grades of children's and misses' sizes. Considering the great number of shoes made in this country, comparatively few lasts are needed as many pairs are made over the same pattern. The wear on the last is considerable and it can be used steadily for no longer than twelve to fifteen months. For that reason only the high grade select wood is required.

There are two distinct divisions of the last industry,—the manufacture of the last block from bolts, and the manufacture of the finished last from the rough turned blocks. The industry in Pennsylvania covers only the manufacture of the latter and the fact that no last and filler blocks were found being made in the State, though maple and basswood are commonly cut in Pennsylvania, explains the fact that the entire amount of wood used by the last makers was reported as coming from other states.

Last block manufacture entails various difficulties in kiln-drying and many who have started the business have failed. Those who have mastered the obstacles and acquired efficient processes of seasoning manufacture on a

large scale and therefore reduce the number of block factories many times below the number of the last makers. Last blocks are split from bolts winter cut and then rough turned to various sizes on machines usually of special design. The seasoning begins after the blocks are turned. First, they are air-dried about twelve months after they are placed on racks under sheds. The seasoning is completed by means of dry kilns and for this a period, approximately three months, is required when the block is ready to send to the last maker.

Shoe trees, to be inserted into shoes to hold the shape, are an important part of this industry but none are manufactured in Pennsylvania. Formerly they were made solid of wood and were expensive. The best are still so made; but recently, by the introduction of a combination tree of steel bands and wood blocks, it has been made possible to make them to sell at a nominal cost.

Basswood is used as exclusively for forms or fillers as is sugar maple for lasts. Forms are turned similarly from rough turned blocks. They are used to maintain the natural shape of the shoe in samples displayed in show cases and when being handled by traveling salesmen. They fit the shoes perfectly and give an effect similar to the appearance of the shoe on the foot. Fillers should be light in weight to save cost in transportation in salesmen's trunks. To reduce weight to the minimum many are hollowed, and basswood being soft, easily worked, light, and sufficiently tough, holding its shape well, is the most practical wood to use. The growing high cost of basswood has made a demand for a suitable substitute at a lower price but as yet none has been found.

Clog or wooden soled shoes have leather tops and are used by people working in wet and cold places, such as breweries, tanneries, creameries, mines, dye works, fish canneries, slaughter houses, paper mills, also in foundries and metal works, and by others who desire a very durable shoe at a reasonable price. High grades of yellow poplar and basswood are the materials demanded for clog soles in Pennsylvania, but in Illinois, Michigan, and Kentucky, beech, maple, and basswood in the order named contributed the material.

Table 89.—Wood for Boot and Shoe Findings, year ending June, 1912.

Kind of Wood.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Sugar maple,	100,500	37.92	\$55 86	\$5,614	.....	100,500
Persimmon,	99,000	37.36	59 19	5,860	.....	99,000
Basswood,	35,500	13.40	50 73	1,801	18,000	17,500
Yellow poplar,	30,000	11.32	56 67	1,700	.....	30,000
Total,	265,000	100.00	\$56 51	\$14,975	18,000	247,000

SMOKING PIPES.

Pennsylvania leads all other states in the consumption of wood for smoking pipes. Five woods supply the raw material for this line of manufacture; two of them are foreign species. Applewood leads the list as to amount, and is the only wood reported cut in the State. The best grades of pipes are made from French briar, ebony, and rosewood, but the last named was not reported in Pennsylvania. The sapwood of sweet or cherry birch and red gum is used for cheap pipes, the former to imitate calabash and the latter rosewood. Olivewood pipes resemble meerscham when finished.

Table 90.—Wood for Tobacco Pipes, year ending June, 1912.

Kind of Wood.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Applewood,	121,435	53.38	\$52 42	\$6,372	61,435	60,000
French briar,	81,800	35.95	351 34	28,740	.....	81,800
Red gum,	12,000	5.27	50 00	600	.....	12,000
Ebony,	9,800	4.31	183 67	1,800	.....	9,800
Birch,	2,000	.88	50 00	100	.....	2,000
Olive wood,	480	.21	81 25	39	.....	480
Total,	227,515	100.00	\$165 49	\$37,651	61,435	166,080

SPORTING AND ATHLETIC GOODS.

Ash, on account of its strength and convenient weight, is probably the premier wood for baseball bats. The entire amount listed in Table 91 went for this use, and most of it was purchased in the form of squares, usually 3 inches by 3 inches by 38 inches long. In other states bat manufacturers used several woods, the principal ones other than ash being hickory, willow, beech, ironwood, and maple. Though all of these are trees indigenous to Pennsylvania, and the wood easily obtained, the manufacturers in this State did not report the use of any.

Twice as much beech was used for game traps as any other wood and its strength and density especially favor it for this purpose. Hard maple, its chief competitor, with small quantities of ash and birch supplied the rest of the material, purchased in the form of surfaced lumber. All used was cut in the State.

Sugar maple, hard, tough, close grained, easily turned, has proved the best qualified wood for duck and ten pins. The quantity used in Pennsylvania is somewhat disappointing considering the large quantity of pins sold. Information was secured of a large number of duck pin squares being cut in the State, but they were shipped elsewhere to be manufactured and doubtless are sent back to be sold in the finished product. Lignum-vitae answered for bowling balls and, though a composition ball resembling hard rubber is being more generally used, the best bowlers prefer the wooden ball. Lignum-vitae is the highest priced wood shown in the table and is bought in the form of bolts shipped from the West Indies. No domestic wood possesses the com-

bined qualities for balls equal to lignum-vitae. It is very heavy, hard, dense, strong, and keeps its shape. Dogwood is the nearest approach and is used to a limited extent but is not durable. None was reported in Pennsylvania.

Sugar maple and longleaf pine are the most used woods for bowling alleys. The latter wood, edge grain and best grade, is used for the bed of the alley, and the former for the approach and pin spot end and also for the return track. Spruce or longleaf pine are the best for the gutters, and for the buffer frames and sheathing shortleaf pine and hemlock were called for.

Pool and billiard tables and shuffle boards account for the rest of the woods not mentioned above which are listed in the table. Chestnut and yellow poplar answers for frames of pool and billiard tables, red oak, white oak, ash, and sugar maple for the legs and also for sides and bodies. Cherry went into triangles for setting pool balls and maple was the only wood for cues.

Table 91.—Wood for Sporting and Athletic Goods, year ending June, 1912.

Kind of Wood.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Sugar maple,	97,500	45.32	\$36 14	\$3,524	47,500	50,000
White oak,	41,500	19.29	38 27	1,588	31,000	10,500
Ash,	30,000	13.94	66 83	2,005	30,000	.....
Beech,	20,000	9.30	17 25	345	20,000	.....
Cottonwood,	10,000	4.65	32 00	320	.....	10,000
Chestnut,	10,000	4.65	33 00	330	5,000	5,000
Yellow poplar,	5,000	2.32	28 00	140	5,000	.....
Lignum-vitae,	550	.25	118 18	65	.....	550
Red oak,	500	.23	35 00	17	500	.....
Cherry (black),	100	.05	46 00	5	100	.....
Total,	215,150	100.00	\$38 76	\$8,339	139,100	76,050

SADDLES AND HARNESS.

Hames are the principal commodity included in the following table. They require a tough, strong, close wood. Ash and white oak furnished the largest portion of the supply of raw material in Pennsylvania, which was purchased in the form of squares of various sizes, the principal sizes being 2½ inches by 2½ inches, 30 inches long, and 2¾ inches by 2¾ inches, 32 inches long. White ash was the favorite as to quantity. Black ash and hickory, though used, contributed but small amounts. Pennsylvania is the first state in which hickory has been reported by hame manufacturers though it has for a long time been used by farmers for hand-made hames. According to reports from factories in other states, ironwood, sugar maple, beech, white elm, and red oak are suitable hame materials though their use was not reported in large quantities.

White ash was the only wood called for in Pennsylvania for making saddle trees, which is the only product except hames classed under this heading. From other similar state reports, ash, though adaptable, is an unimportant wood for this use. The kinds most used named in the order of quantity and selected because of the quality of toughness with requisite weight are: White

elm, cottonwood, sycamore, soft maple, white oak, ash, hackberry, and basswood.

Table 92.—Wood for Saddles and Harness, year ending June, 1912.

Kind of Wood.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Ash,	100,000	53.19	\$44 80	\$4,480	76,000	24,000
White oak,	70,000	37.23	71 43	5,000	60,000	10,000
Hickory,	10,000	5.32	60 00	600	.....	10,000
Red oak,	8,000	4.26	40 00	320	.....	8,000
Total,	188,000	100.00	\$55 32	\$10,400	136,000	52,000

GATES AND FENCING.

Table 93 lists seven woods used in Pennsylvania for fence pickets and gates, both farm gates and those used for the enclosure of front yards and lawns. White cedar, shipped in from the Carolinas, stands first as to quantity and in no other industry was it the principal wood. Its durability in exposed situations especially commends it for this use. Spruce is listed in the table in large quantities and the fact that it was preferred to several State-grown woods that could probably have been obtained cheaper and known to be more durable, is worthy of note. The durable properties of cypress, together with its strength, favor it also as an excellent wood for gate and fencing material. That cypress is demanded for the best lines of work of this character is seen from the fact that it is the only wood reported by railroads for crossing gates. In the lower grades it is popular for lawn fence pickets, for which use it serves with chestnut and white pine. Stubs, the wooden parts of patent woven wire fencing, called for chestnut and white cedar. Though white cedar was used in larger quantities, yet chestnut, because it is cheaper and at the same time possesses lasting qualities for outdoor uses, is destined to grow in favor for this purpose.

Table 93.—Wood for Gates and Fencing, year ending June, 1912.

Kind of Wood.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Southern white cedar,	100,000	61.98	\$20 00	\$2,000	.....	100,000
Spruce,	36,000	22.31	25 00	900	.....	36,000
Chestnut,	11,500	7.13	25 39	292	6,500	.....
White pine,	5,000	3.10	22 00	110	5,000	.....
Yellow poplar,	5,000	3.10	26 00	130	5,000	.....
Cypress (bald),	3,840	2.38	55 00	211	.....	3,840
Total,	161,340	100.00	\$22 58	\$3,643	16,500	144,840

CLOCK CASES.

In the quantity of wood consumed, the manufacture of clock cases in Pennsylvania is one of the minor industries. However, since wood is only one of a number of materials required, it is not a fair basis for comparison. Clock makers report the use of lumber for mantel and wall clocks, and to a limited extent for large hall and grandfather clocks. Mahogany is the principal wood used and represents over 50 per cent. of the total. This is the only industry in which an imported wood leads the list of species. Next to mahogany, the oaks were in the largest demand for the exterior work of wall clocks finished natural or darkened by fumes or stain to produce the mission effects.

The backs of cases of all kinds and the bottoms of mantel clocks are not visible and are therefore made of cheaper wood. Yellow poplar and basswood met this demand because they hold their shape and are easy to work and nail. Yellow poplar is also called on to a limited extent for the base or backing of enameled work. The art of enameling wood has made rapid progress of late years and imitations are made not only to resemble foreign woods but also marble and other materials.

Veneer takes a prominent place in this industry, both as a finish and as layers in 3-ply built-up stock used in making clock cases. The appearance of chestnut and yellow poplar in the table is accounted for in this form. In regard to the price shown for red gum, it should be noted that it was used for finish or exterior work and as it is frequently found beautifully modeled with figure and color similar to Circassian walnut it furnishes a substitute for that wood for finish.

Table 94.—Wood for Clocks, year ending June, 1912.

Kind of Wood.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
Mahogany,	43,000	30.83	\$103 84	\$4,465	.....	43,000
Yellow poplar,	35,000	25.09	33 57	1,175	.....	35,000
Black walnut,	21,000	15.05	50 95	1,070	21,000	.....
White oak,	13,500	9.68	74 30	1,003	.....	13,500
Red gum,	10,000	7.17	60 00	600	.....	10,000
Chestnut,	5,000	3.58	30 00	150	5,000	.....
Basswood,	5,000	3.58	60 00	300	.....	5,000
Birch,	4,000	2.87	45 00	180	.....	4,000
Red oak,	3,000	2.15	45 00	135	.....	3,000
Total,	139,500	100.00	\$65 08	\$9,078	26,000	113,500

ROLLERS AND POLES.

Window shade rollers belong to this industry but none are manufactured in Pennsylvania, though sawmills cutting white pine were found furnishing large quantities of material in the desired form to the New York shade roller makers. Curtain poles and brackets, rug and drugget poles, and awning rollers are the articles to which the statistics in Table 95 refer. Basswood is the leading wood and it went entirely into curtain poles. It serves well for this use, first, because it is so easily worked, and second, the ease and permanence with which it takes paint and stain allows it to be finished to imitate expensive hardwoods like walnut, mahogany, and oak. Hard maple, sweet birch, white oak, and white ash are other important curtain pole woods and the ones reported mainly for curtain pole fixtures and brackets.

Rug and drugget pole manufacturers called principally for black gum, but beech, basswood, and yellow poplar met part of the demand. Awning rollers require a heavy wood. Sugar maple, hickory, beech, and black gum were the ones reported. The two former, being expensive, were used in small quantities only. Black gum is practically a new wood for this use but the demand is increasing owing to its being one of the cheapest hardwoods with the requisite weight, strength, and adaptability for being turned. Redwood was the only wood reported for shade hangers.

Table 95.—Wood for Rollers and Curtain Poles, year ending June, 1912.

Kind of Wood.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.		Grown Out of Pennsylvania.	
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.		
Basswood,	37,500	29.86	\$20 00	\$750	37,500	.....	.....	.....
Sugar maple,	27,425	21.84	16 59	455	27,000	.....	425	.....
White oak,	19,000	15.13	16 63	316	19,000	.....	.....	.....
Beech,	12,000	9.56	14 00	168	12,000	.....	.....	.....
Birch,	12,000	9.56	14 00	168	12,000	.....	.....	.....
Ash,	6,150	4.90	32 68	201	5,000	.....	1,150	.....
Black gum,	6,000	4.78	20 00	120	.....	.....	6,000	.....
Hickory,	2,500	1.89	60 00	150	2,500	.....	.....	.....
Redwood,	2,000	1.59	45 00	90	.....	.....	2,000	.....
Yellow poplar,	1,000	.79	65 00	65	.....	.....	1,000	.....
Total,	125,575	100.00	\$19 77	\$2,483	115,000	.....	10,575	.....

MANUAL TRAINING PRACTICE.

Improved systems of public school education today endeavor to give not only a thorough grounding in the usual elementary subjects but also offer opportunities to acquire the fundamentals of various artisan trades by methods of practical work in the laboratory, the shop, or the field. These specialized schools or departments are known as "Manual Training" and in connection with the excellent system of public education in Pennsylvania there has been established a large number of them throughout the State. They offer instruction in a diversity of practical courses. Important among these is wood craft. Shops equipped with tools of all kinds and with wood-working machinery afford training in the making of many kinds of commodities and an insight into all lines and processes of wood-working. Woods that are soft and possess properties to work easily are naturally the kinds in greatest demand. That white pine, yellow poplar, and basswood head the list in Table 96, therefore, is not surprising, but that so small amounts of yellow pine and hemlock are employed, these being the cheapest woods, is interesting, especially as these woods are important in many wood manufacturing industries. If both the red and white oaks had been compiled under one heading, oak, this wood would have been first in the table. Of the twenty species used, mahogany is the highest priced and beech the lowest.

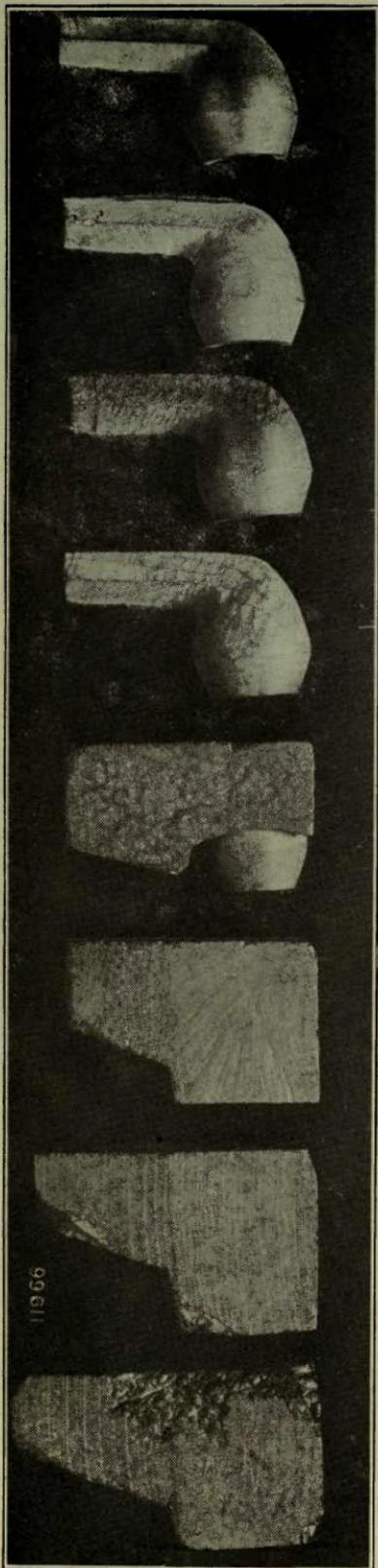


Fig. 35.—Evolution of a briar pipe.



Fig. 36.—Evolution of a gun stock and a number of finished stocks ready for market, made of black and Circassian walnut.

Table 96.—Wood for Manual Training Practice, year ending June, 1912.

Kind of Wood.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
White pine,	21,575	22.49	\$72 35	\$1,561	8,675	12,900
Yellow poplar,	16,250	16.94	66 95	1,088	9,550	6,700
Basswood,	14,400	15.01	43 06	590	7,650	6,750
Red oak,	13,070	13.62	72 61	949	9,070	4,000
White oak,	10,500	10.94	83 81	881	4,950	5,550
Chestnut,	7,000	7.30	64 14	448	5,000	2,000
Sugar maple,	3,350	3.49	50 45	169	3,050	300
Cherry (black),	1,850	1.93	55.68	103	1,850	.....
Cypress (bald),	1,750	1.82	63 43	111	.....	1,750
Ash,	1,100	1.15	70 91	78	300	800
Hickory,	934	.97	70.66	64	234	700
Black walnut,	850	.89	87 06	77	650	200
Mahogany,	750	.78	134 67	101	.....	750
Beech,	600	.62	28 33	17	600	.....
Sugar pine,	500	.52	80 00	40	.....	500
Red gum,	470	.49	72 34	34	.....	470
Red cedar,	400	.42	97.59	39	.....	400
Hemlock,	262	.27	34 35	9	262	.....
Shortleaf pine,	250	.26	40 00	10	.....	250
Redwood,	50	.05	60 00	3	.....	50
Dogwood,	34	.04	90 00	3	34	.....
Total,	95,945	100.00	\$66 44	\$6,375	51,875	44,070

MISCELLANEOUS.

In soliciting information from the various manufacturers concerning the extent of their operations in the consumption of wood, the Forest Service and the Pennsylvania Department of Forestry made assurance that the data would be treated confidentially and not used in the report so as to reveal the identity of the establishments furnishing it. Whenever, therefore, fewer than three factories making similar commodities were entitled to be grouped as an industry, rather than discard the information from the report it was placed under the head "Miscellaneous."

The nearly seven and a half million feet shown as the total of the table includes considerably over five million of State-grown white pine for matches, more than 100 M feet of beech cut in the State for brewer chips, used in breweries to clarify beer, nearly 200 M feet of white ash, Douglas fir, soft maple, and beech for flag poles and shafts, and nearly one-half that amount consisting of spruce, hemlock, and yellow pine for tent poles. Small quantities of red cedar were used for oil barrel faucets, and black walnut and Circassian walnut for stocks and fore-ends of both fire-arms and of air rifles.

Table 97.—Wood for Miscellaneous, year ending June, 1912.

Kind of Wood.	Quantity.		Average cost per 1,000 ft. at factory.	Total cost f. o. b. factory.	Grown in Pennsylvania.	Grown Out of Pennsylvania.
	Feet b. m.	Per cent.			Feet b. m.	Feet b. m.
White pine,	7,002,000	94.41	\$16 00	\$182,070	7,002,000	.....
Beech,	175,003	2.36	14 86	2,600	175,003	.....
Red and silver maple,	50,000	.67	14 00	700	50,000	.....
Ash,	50,000	.67	25 00	1,250	50,000	.....
Black walnut,	34,200	.46	71 81	2,456	10,200	24,000
Birch,	25,000	.34	14 00	350	25,000	.....
Loblolly pine,	17,000	.23	30 00	510	.....	17,000
Douglas fir,	14,400	.20	50 00	720	.....	14,400
Hemlock,	12,250	.17	28 16	345	10,000	2,250
Sugar maple,	11,500	.16	20 00	235	11,500	.....
Spruce,	10,000	.13	20 00	200	.....	10,000
Circassian walnut,	10,000	.13	183 00	1,830	.....	10,000
Red cedar,	5,000	.07	40 00	200	.....	5,000
Total,	7,416,353	100.00	\$26 09	\$193,466	7,333,703	82,650

PART III.

THE USES OF WOOD BY PENNSYLVANIA MANUFACTURERS.

The following list indicates the various uses of wood reported by Pennsylvania manufacturers. The collation comprises over 6,000 separate commodities, and is probably the most complete statement of this kind ever presented.

APPLEWOOD.

Handles, handsaw Pipes, smoking Screws, bookbinders

ASH, BLACK.

Baskets	Crating	Pews, church
Bats, baseball	Finish, boot	Poles, pike
Beams, plow	Frames, automobile bodies	Poles, plow
Bodies, sleigh	Frames, carriage bodies	Refrigerators
Boxes, comb	Frames, wagon bodies	Seats, auto
Boxes, knife	Handles, garden trowel	Seats, carriage
Boxes, salt	Handles, hammer	Sides, cheese box
Boxes, tin plate	Handles, hand drill	Slats, bed
Box shooks	Handles, hoe	Slats, trunk
Cabinets, kitchen	Handles, lawn mower	Sleds, coaster
Cabs, locomotive	Handles, paint brush	Tops, cheese box
Chairs, kitchen	Handles, rake	Tubs, butter
Chests, ice	Handles, wheel hoe	Tubs, lard
Commodore, interior	Hoppers, vegetable	Washboards, laundry
Cooperage stock	Moulding, picture	Wood pulleys
Covers, butter pail	Pails, candy	

ASH, WHITE.

Bottoms, automobile seat	Bushel crates	Dust guards (railway passenger cars)
Automobile bodies	Cabinets, filing, exterior	Elevators, grain
Axle beds, buggy	Cabinets, printer	Evensers
Axle beds, perch spring wagon	Cabinets, special work	Facing, window partition (electric cars)
Axle beds, surrey	Cabinets, typewriter	Felloes, heavy vehicle wheels
Back boards, piano	Cabins, interior, river craft	Felloes, light delivery wagons
Backing, cases	Cabins, interior, ships	Fifth wheel bars, light delivery wagons
Backs, automobile seats	Cabins, interior, yachts	Fifth wheel circles, light delivery wagons
Backs, hair brush	Cabs, locomotive	Fifth wheel spools, light delivery wagons
Backs, nail brush	Carpet strip, house interior trim	Fillers, Scotch hame
Backs, scrubbing brush	Cars, elevator	Fillet, house interior trim
Balusters (stair)	Cases, binnacle	Finish, interior engine cab
Base blocks, house interior trim	Cases, ship chart	Finish, yacht cabins
Base corners, house interior trim	Cases, type	Fixtures, office, exterior
Base board, house interior trim	Casing, controller box, electric cars	Flat battens, house interior trim
Base moulding, house interior trim	Casing, door	Flooring
Baskets, split	Casing, pipe organ	Flooring, freight car platform scales
Batters, baschill	Casing, window	Flooring, freight elevators
Batters, dumb waiter	Chair arms, railway cars	Flooring, (passenger elevator cars)
Beams, dining room ceiling	Chair bottoms	Frames, automobile bodies
Beams (elevator)	Chair rail, house interior trim	Frames, bob sleds
Beds, light delivery wagons	Churn parts	Frames, chair
Belt panel, light delivery wagon bodies	Cleats, dumb waiter	Frames, coal screens
Benches, mess (boat)	Coaming, motor boat	Frames (elevator cars)
Benches, piano	Colonnades, house interior trim	Frames, gravel screens
Blocks, brake	Consoles	Frames, sand shaking screens
Blocks, brush	Corner blocks, house interior trim	Frames, tennis racket
Blocks, pulley	Corner posts, light delivery wagons	Framework, automobile cushion
Blocks, tackle	Costumers	Front panels, light delivery wagons
Boards, drain	Counter tops, bar room	Grilles (ship and boat cabins)
Bodies, automobile	Covers, hatchway (ship)	Guide posts, dumb waiter
Bodies, cart	Covers, switch boxes (electric cars)	Handles, bottom pick
Bodies, wheelbarrow	Cues, billiard	Handles, brush
Book racks	Cupboard doors, railway cars	Handles, clay pick
Bottoms, washing machines	Decking, canoe	Handles, coal pick
Bows, automobile	Doors	Handles, collier shovel
Bows, buggy top	Doors, dumb waiter shaft	Handles, cultivator
Bows, carriage top	Doors, folding	Handles, garden hoe
Bows, hay bed farm wagons	Doors, locker (boat and ship)	Handles, garden rake
Bows, wagon tops	Doors, sliding	Handles, hay knife
Boxes, creamery shipping	Drain boards	Handles, jack screw
Boxes, roller sign, (electric cars)	Drop gate, light delivery wagon bodies	
Brackets, plate rail	Dumb waiters	
Brackets, stair	Dumb waiter parts	
Brushes		

ASH, WHITE—Continued.

Handles, lawn mower	Novelties	Sides, wagon bodies
Handles, lawn rake	Nosing, house interior trim	Side futchels, light delivery wagons
Handles, manure fork	Oars, row boat	Side slats, light delivery wagons
Handles, muning pick	Panels, automobile bodies	Signal blades, railroad
Handles, paint brushes	Panels, ceiling (railway cars)	Sills, automobile
Handles, piano	Panels, door	Sills, buggy
Handles, pick	Panels, wagon bodies	Sills, buggy bodies
Handles, pitch fork	Panels, windows, railway cars	Sills, carriage
Handles, scoop	Panel strips, interior house trim	Sills, carriage bodies
Handles, shovel	Panel wainscoting, railway cars	Sills, delivery wagons
Handles, spade	Paper pulp	Sills, light delivery wagons
Handles, special brushes	Parts, flour mill machinery	Sills, inside window (electric cars)
Handles, varnish brushes	Piano cases, veneer	Sills, window, inside (railway cars)
Hay beds, farm wagon	Pilasters, piano	Slat (automobile tops)
Hay bed blocks, farm wagon	Pillars, light delivery wagon	Slat, bed
Head blocks, house interior trim	Pilot wheels, river craft	Slat, trunk
Head casing, house interior trim	Pilot wheels, ship	Slat, wagon top
Heading, nail keg	Pilot wheels, yacht	Sleds
Heading, slack cooperage	Planks, fish	Sleds, frame work
Heel board, light delivery wagons	Planks, steak	Sleds, toy
Hind spring bars, light delivery wagons	Plate rail, dining room	Splinter bars, light delivery wagons
Horses, rocking	Pole futchels, light delivery wagons	Spokes, automobile wheels
Hounds, light delivery wagon	Posts, chair	Spokes, heavy vehicle wheels
Hubs, wheelbarrow	Posts, piano	Spokes, light delivery wagons
Key bottoms, piano	Posts, wagon	Spokes, push cart wheels
Keels, motor boat	Posts, warehouse trucks	Spring yokes, light delivery wagons
Knees, canal boat	Push carts (bodies)	Staffs, flag
Knees, river craft	Racks, display	Stakes, log cars
Knees, ship	Racks, magazine	Stands, umbrella
Knees, yacht	Rails, doors	Staves, butter pail
Knobs, door	Rails, guide (dumb waiter)	Staves, slack cooperage
Ladders, hay	Rails, river craft	Staves, tight cooperage
Ladders, river craft	Rails, ship	Staves, washing machine
Ladders, ship	Rails, stair	Stay bars, light delivery wagons
Ladders, step	Rails, yacht	Stays, boat
Lagging, refrigerator machine cylinders	Reaches, buggy	Stems, canoe
Lagging	Reaches, farm wagon	Stems, motor boat
Lath	Reaches, lumber wagon	Stems, river craft
Legs, billiard tables	Reaches, perch spring wagon	Stems, ships
Lining, cases	Reaches, surrey	Stems, yachts
Lower head blocks, light delivery wagons	Reaches, wagon	Stern posts, motor boat
Lower panels, light delivery wagon bodies	Rear end posts, light delivery wagons	Stiles, door
Jacks, wagon	Refrigerators	Stops, door, house interior trim
Jams, door	Refrigerators, exterior	Stops, drawer
Interior finish	Ribs, boat	Stretchers, curtain
Interior finish, electric cars	Ribs, canoe	String boards (stair)
Interior finish, house	Ribs, motor boat	Strips (elevator cars)
Interior finish, (railway cars)	Rims, automobile wheels	Strips, guide (elevator)
Interior finish, traction engine cabs	Rims, carriage wheels	Swing cleat, curtain pole
Mantels	Risers, stair	Tables, sewing
Milk counters, dairymans	Rockers, chair	Tables, telephone
Mirror doors, house	Rollers	Tillers, canal boat
Moulding, automobile	Rollers, caster	Tillers, river craft
Moulding, bed, house construction	Rosettes, wall (stairway)	Top rails, light delivery wagon bodies
Moulding, cap, house interior trim	Rounds, ladder	Top slats, light delivery wagon bodies
Moulding, cove, house interior trim	Rounds, plow	Tops, washing machines
Moulding, crown, house construction	Runs, ladder	Treads, stair
Moulding, pleture	Runners, bob sled	TriPods, camera
Moulding, plaster, house interior trim	Running boards, automobile	Upper head blocks, light delivery wagon
Moulding, quarter round, house interior trim	Saddletrees	Veneer
Moulding, spring cove, house construction	Sash, electric cars	Wainscot rail, house interior trim
Neck yokes	Sash, railway cars	Wainscoting, house interior trim
Newel posts, angle	Seat boards, light delivery wagons	Wainscoting cap, house interior trim
Newel posts, starting	Seat frames, canoe	Window apron, house interior trim
	Shackle bars, light delivery wagons	Window stool, house interior trim
	Shafts, light vehicles	
	Shelves, dumb waiter	
	Shoe rails (stair)	
	Showcases, exterior	
	Sides, billiard tables	
	Sides, push cart	
	Sides, truck	
	Side pillars, light delivery wagons	

ASPEN.

Excelsior

BASSWOOD.

Altars, church	Baskets, split	Bellows, organ
Animals, toy	Base blocks, house interior trim	Bellows frames, organ
Astragals, folding door	Base boards, house interior trim	Binding strips, school black-board
Astragals, sliding door	Base corners, house interior trim	Blinds, window
Backing, mirror	Base moulding, house interior trim	Blocks, brake
Backs, buffets	Beams, dining room ceiling	Blocks, brush
Backs, bureaux	Bedsteads, hidden work	Blocks, tassel
Backs, chiffoniers		Mowers, organ
Backs, mirror		

BASSWOOD—Continued.

Blowers, player piano	Feet, piano	Pails, candy
Boards, ironing	Fillet, house interior trim	Panel strips, house interior trim
Boards, pastry	Flag sticks (railway)	Panels, door
Boards, potato chip	Flat battens, house interior trim	Paper pulp
Boards, potato peeler	Flooring	Parting strip, house interior trim
Boards, skirt	Frames, corn graders	Partition moulds, house interior trim
Boards, saw	Frames, front door side light	Pedal boards, piano cases
Boats, toy	Frames, jewelry case	Pews, church
Bodies, baby carriage	Frames, lounge	Pianos, toy
Bottom panels, piano cases	Frames, mirror	Pilasters, piano cases
Bottom rails, sash	Frames, picture	Pipes, organ
Bottoms, buffets	Frames, store fixture	Plate rail, dining room
Bottoms, case	Frames, suit case	Racks, curtain display
Bottoms, chiffonier	Front doors, house	Racks, rug display
Bottoms, dressers	Game boards	Rails, door
Bottoms, grape basket	Grain registers, threshers	Rails, table
Boxes, bottle	Grilles, house interior trim	Reels, electric wire
Boxes, candy	Handles, broom	Reels, solder wire
Boxes, knife	Handles, brush	Refrigerators
Boxes, novelty	Handles, long handled dust brush	Rims, split wood pulleys
Boxes, packing	Handles, mop	Sash, window
Boxes, shirtwaist	Handles, pipe	Seats, automobile
Boxes, trunk	Handles, plastering trowel	Seats, chair
Boxes, type	Handles, street brushes	Seats, tricycle
Brackets, plate rail	Handles, wall brush	Serving tables, hidden work
Brake blocks, mine pit wagon	Handles, window brush	Shelving
Bushel crates	Head blocks, house interior trim	Sideboards, interior work
Capping, sink, house interior trim	Head casing, house interior trim	Side boards, wheelbarrow
Carpet strip, house interior trim	Heading, nail keg	Sides, piano cases
Carts, dump	Heading, slack cooperage	Sides, toy wagons
Carvings, wood	Interior finish, churches	Sides, wagon bodies
Cases, clock	Interior frames, store fixtures	Sides, wheelbarrow
Cases, sample	Ironing boards, folding	Siding, house
Cases, silverware	Jams, door	Sink aprons, house interior trim
Cases, type	Key blocks, piano cases	Slats, automobile tops
Casing, door	Key bottoms, piano cases	Slats, wagon tops
Casing, house	Key slips, piano cases	Spouting, flour mill
Casing, window	Ladders, step	Stands, bible
Ceiling	Lath	Staves, slack cooperage
Chair rail, house interior trim	Lids, grape basket	Staves, tight cooperage
Cheeks, piano case	Mantels	Step ladders
China closet, interior	Mantels, painted work	Sticks, umbrella
Clog soles (shoe)	Meeting rail, sash	Stiles, door
Clothes driers	Mirror doors, house	Stops, door, house interior trim
Coal boxes, traction engine	Molding, bed, house construction	Stops, window, house interior trim
Colonnades, house interior trim	Molding, brick, house construction	Stretchers, curtain
Commun'ion rails, church	Molding, cap, house interior trim	Strips, felt bound school slates
Consoles	Molding, casket	Tables
Corner blocks, house interior trim	Molding, cove	Tables, ironing
Crates	Molding, crown, house interior trim	Templates, shipbuilding
Crating	Molding, drip cap, house construction	Top panels, piano cases
Cups, soap	Molding, electric wire	Top rails, sash
Curtain stretchers	Molding, piano cases	Top slats, light delivery wagon bodies
Display forms, hosiery	Molding, picture	Tops, kitchen table
Display forms, shoe	Molding, plaster, house construction	Tops, piano cases
Doll parts	Molding, quarter round	Tops, table
Doors	Molding, spring cove, house construction	Toy pianos
Doors, folding	Molds, butter	Trays, incubator
Doors, sliding	Mud shields, traction engine	Trays, trunk
Dowels	Mullions, sash	Trunks
Dust cap, house interior trim	Music shelf, piano cases	Veneer
Dust conveyors, threshing machine	Nosing, house interior trim	Wainscot rail, house interior trim
Dust guards, freight car axles	Novelties	Wainscoting cap, house interior trim
Dust guards, railway cars	Novelties, burnt wood	Wheelbarrows, toy
Elevators, flour mill		Window apron, house interior trim
Excelsior		Window stool, house interior trim
Excelsior, packing		
Excelsior, ribbon (mattress stuffing)		
Fall boards, piano cases		

BEECH.

Acetate of lime	Baskets, split	Bottoms, fruit baskets
Alcohol, wood	Bay brackets, house construction	Bottoms, jack plane
Astragals, folding door	Beams, dining room ceiling	Bottoms, wagon bodies
Astragals, sliding door	Blocks, brake	Boxes, comb
Back posts, piano	Blocks, brush	Boxes, foundry moulding
Backing, desk	Boards, bosom	Boxes, knife
Backs, chair	Boards, bread	Boxes, packing
Backs, drawer	Boards, lap	Boxes, plate glass packing
Balusters, porch	Boards, pastry	Boxes, salt
Base blocks, house interior trim	Book shelves	Boxes, tin plate
Base board, house interior trim	Bottom panels, piano cases	Brackets, mine
Base corners, house interior trim	Bottom rail, porch	Brackets, plate rail
Base moulding, house interior trim	Bottom rails, sash	Brackets, porch
Baskets	Bottoms, basket	Brooms, street
	Bottoms, carriage bodies	Capping, sink, house interior trim

BEECH—Continued.

Carpet strip, house interior trim	Handles, fruit baskets	Posts, chair
Cases, blacking	Handles, lawn rake	Posts, dresser
Cases, shipping	Handles, long handled dirt pans	Rails, bed
Casing, door	Handles, plane	Rails, door
Casing, window	Handles, skinning knives	Rails, kitchen table
Celery crates	Handles, steak knife	Reels, hose
Center arms, split wood pulleys	Handles, sticking knife	Refrigerators, exterior
Chair rail, house interior trim	Handles, wheelbarrow	Rims, fruit baskets
Chairs, childrens'	Handles, whip	Rounds, chair
Chairs, folding camp	Hangers, clothes	Ruling machines, bookbinders
Chairs, ladder	Hangers, garment	Rungs, ladder
Charcoal	Head blocks, house interior trim	Screens, door
Cheeks, piano case	Head casing, house interior trim	Screens, window
Chips, brewers	Heading, cooperage	Scroll sawed balusters, porch
Chopping bowls	Heading, nail keg	Seats, buggy
Clamps, trouser hanger	Heading, slack cooperage	Seats, lawn swings
Clothes driers	Hubs, wheelbarrow	Sides, cheese box
Colonnades, house interior trim	Interior finish, freight cars	Sides, drawer
Commodos	Jambs, door	Sides, mine dump cars
Consoles	Key blocks, piano case	Sides, piano case
Corner blocks, house interior trim	Key bottoms, piano cases	Sides, step ladder
Costumers	Key slips, piano cases	Sink aprons, house interior trim
Cots, camp	Lath	Slats, ash can
Crating	Legs, table	Slats, lawn swings
Cresting, porch roof	Legs, ironing board	Slides, table
Cross-ties, railroad	Mantels	Spindles, porch
Door boards, coal car	Medicine cabinets	Sprags, mine
Door boards, railway grain car	Mine props	Staffs, flag
Doors, folding	Meeting rails, sash	Staves, cement barrel
Doors, sliding	Mirror doors, house	Staves, cooperage
Dowels	Moulding, bed, house construction	Staves, slack cooperage
Dust cap, house interior trim	Moulding, cap, house interior trim	Step ladder chairs
End sills, log cars	Moulding, cove	Steps, step ladder
Face brackets, house construction	Moulding, crown, house construction	Sticks, flower
Fall boards, piano cases	Moulding, drip cap, house construction	Sticks, umbrella
Feet, piano	Moulding, picture	Stiles, door
Felloes, wheelbarrow wheel	Moulding, piano case	Stools, camp
Fillet, house interior trim	Moulding, plaster, house construction	Stops, door, house interior trim
Fixtures, curtain	Moulding, quarter round	Stops, window, house interior trim
Flat battens, house interior trim	Moulding, spring cove, house construction	Tabourettes
Flooring, house	Mullions, sash	Tongues, toy wagon
Flooring, mine dump cars	Music shelf, piano case	Top panels, piano case
Frame work, farm machinery	Nosing, house interior trim	Top rail, porch
Frames, buck saw	Novelties	Top rails, sash
Frames, corn sheller	Panel strips, house interior trim	Tops, kitchen table
Frames, door	Panels, door	Tops, piano cases
Frames, front door side light	Paper pulp	Tops, sleds
Frames, light vehicles	Parasol sticks	Toy express wagons
Frames, school slate	Partition moulds, house interior trim	Toy furniture
Frames, window	Parts, bookbinders machinery	Toy tops
Frieze rail, porch	Pedal boards, piano cases	Traps, game
Front doors, house	Pilasters, piano cases	Traps, mouse
Furniture, camp	Pins, cartridge	Traps, rat
Gable brackets, house construction	Pins, clothes	Veneer
Gable ornaments, house construction	Pipe, wooden water	Wainscot, rail, house interior trim
Grilles, house interior trim	Planes, moulding	Wainscoting cap, house interior trim
Handles, awl	Plate rail, dining room	Walkers, baby
Handles, boning knife	Poles, curtain	Wedges, mine cap
Handles, broom	Porch columns, built up	Wheelbarrows
Handles, butcher knives	Porch newels, built up	Window apron, house interior trim
Handles, carpenter try-square	Porch spandrels	Window stool, house interior trim
Handles, coal sieve		Wire cloth display racks
Handles, crosscut saw		

BIRCH, BLACK.

Benches, piano	End sills, log car	Rims, automobile wheels
Cabinets, medicine	Felloes, heavy vehicle wheels	Studding, log cars
Costumers	Handles, butcher knives	

BIRCH, PAPER.

Backing, cabinet	Handles, engravers tools	Rollers, lawn mower
Bags, brush	Handles, file	Shelving, cabinet
Baskets	Handles, pall	Spindles, chair
Blocks, brush	Hubs, toy wagon	Spools
Bobbins	Hubs, toy wheelbarrow	Spools, ribbon
Boxes, druggists'	Knobs	Spoons, wooden
Chair frames, rattan	Knobs, drawer	Sticks, candy
Chairs, turned parts	Molding, piano	Toothpicks
Clothespins	Novelties	Toys
Excelsior	Organ parts	Turnings
Handles, brush	Plugs, paper	Wheels, toy wagon
Handles, carrying	Poles, rug	Wood wool
Handles, edge tools	Rollers, curtain	

BIRCH, SWEET.

- Acetate of lime
 Alcohol, wood
 Arms, chair
 Astragals, folding door
 Astragals, sliding door
 Axles, farm wagon
 Backs, chair
 Back posts, chair
 Back posts, piano
 Backing, postoffice furniture
 Backing, desk
 Balusters, stair
 Base blocks, house interior trim
 Base board, house interior trim
 Base corners, house interior trim
 Base moulding, house interior trim
 Baskets
 Baskets, fruit and vegetable
 Baskets, split
 Beams, dining room ceiling
 Beds, folding
 Benches, piano
 Blocks, brake
 Blocks, brush
 Boards, meat
 Boards, potato chip
 Boards, saw
 Boat parts, row
 Bodies, light vehicle
 Bookcases, exterior
 Bookcases, interior
 Bookracks
 Bottom panels, piano cases
 Bottoms, automobile seat
 Bottoms, carriage bodies
 Bottoms, heavy vehicle bodies
 Bottoms, wagon
 Bottoms, wagon body
 Box shooks
 Boxes
 Boxes, cheese
 Boxes, comb
 Boxes, glove
 Boxes, knife
 Boxes, packing
 Boxes, plate glass packing
 Boxes, salt
 Boxes, telephone
 Boxes, veneer
 Boxes, veneered
 Bowls, chopping
 Brackets
 Brackets, mine
 Brackets, plate rail
 Brackets, stair
 Brackets, wall (stair)
 Bread boards
 Buffets, bar room
 Bureaus, exterior
 Cabinet work
 Cabinet work, passenger cars
 Cabinets
 Cabinets, medicine
 Cabinets, music
 Cabinets, parlor
 Cabinets, phonograph
 Cabinets, toilet
 Cabins, interior, yachts
 Cabins, interior, ships
 Cabins, interior, river craft
 Capitals
 Carpet strip, house interior trim
 Cars, elevator
 Cases, blacking
 Cases, clock
 Cases, medicine
 Cases, organ
 Cases, piano
 Cases, railroad tickets
 Cases, shipping
 Cases, wall
 Cases, water closet tanks
 Casting
 Casting, door
 Casting, window
 Caskeys
 Chair rail, house interior trim
 Chairs
 Chairs, adjustable
 Chairs, barber
 Chairs, dining room
 Chairs, office
 Charcoal
 Cheeks, piano case
 China closets
 Clamps, trouser hanger
 Coffins
 Colonnades, house interior trim
 Columns, porch
 Commodes
 Consoles
 Cores, veneer
 Corner blocks, house interior trim
 Cornice, house construction
 Costumers
 Couches
 Counter tops, bar room
 Counters, bar
 Counters, office
 Counters, store
 Cradles
 Crating
 Cutting boards, meat
 Davenport
 Decking, canoe
 Division boards, collapsible crates
 Doors
 Doors, folding
 Doors, sliding
 Dowels
 Dowels, parasol
 Drawers, post-office furniture
 Dressers
 Dressing tables, exterior
 Dust cap, house interior trim
 Exterior finish, house
 Fall boards, piano cases
 Feet, piano
 Fillet, house interior trim
 Fixtures, bar room
 Fixtures, barber shop
 Fixtures, curtain
 Fixtures, laboratory
 Fixtures, office
 Fixtures, soda fountain
 Fixtures, store
 Flat battens, house interior trim
 Flooring
 Flooring, house
 Flooring, inlaid
 Flooring, mine dump cars
 Frame work, farm machinery
 Frames, chair
 Frames, cheval mirror
 Frames, davenport
 Frames, door
 Frames, front door side lights
 Frames, light vehicle bodies
 Frames, light vehicle seat
 Frames, lounge
 Frames, parlor furniture
 Frames, roller towel
 Frames, sofa
 Frames, upholstered furniture
 Furniture, case goods
 Game boards
 Gear parts, light vehicles
 Grille work
 Grilles
 Grilles, house interior trim
 Hall racks
 Handles, coal sieve
 Handles, file
 Handles, hoe
 Handles, lawn rake
 Handles, rake
 Handles, saw
 Handles, screw wrenches
 Handrails, porch
 Handrails, stair
 Head blocks, house interior trim
 Head casing, house interior trim
 Heading, cement barrels
 Heading, cooperage
 Heading, slack cooperage
 Interior finish
 Interior finish, freight cars
 Interior finish, house
 Jamb, door
 Key blocks, piano cases
 Key bottoms, piano cases
 Key slips, piano case
 Keys, organ
 Keys, piano
 Ladders, exterior
 Ladders, step
 Lath
 Launch parts
 Leaves, table
 Leg, table
 Lining, motor boats
 Lounges
 Mantels
 Medicine cabinets
 Mirror doors, house
 Moulding, bed, house construction
 Moulding cap, house interior trim
 Moulding, cove
 Moulding, crown, house construction
 Moulding, drip cap, house construction
 Mouldings, piano
 Mouldings, piano case
 Moulding, picture
 Moulding, plaster, house construction
 Moulding, quarter round
 Moulding, spring cove, house construction
 Moulds, butter
 Mullions, sash
 Music cabinets
 Music shelf, piano cases
 Newel posts, angle
 Newel posts, starting
 Nosing, house interior trim
 Novelties
 Organ cases, exterior pipe
 Ornaments, furniture
 Panel strips, house interior trim
 Panel work, show windows
 Panels
 Panels, stair work
 Panels, veneered
 Paper pulp
 Parquetry flooring
 Partitions, office
 Partitions, post office letter racks
 Partitions, store
 Parts, row boat
 Passenger cars, interior finish
 Patterns, machine
 Pedal boards, piano cases
 Pedestals
 Pen racks
 Plasters
 Plasters, piano cases
 Pillars, chair
 Pins, carriage
 Pins, clothes
 Pipe, wooden water
 Pipes, (imitation clabash)
 Plate rail, dining room
 Poles, curtain
 Racks, book
 Racks, display
 Racks, key
 Rails, stair
 Reels, fence wire
 Refrigerators
 Rims, split wood pulleys
 Risers, stair
 Rockers, chair
 Rollers, towel
 Rosettes, wall (stairway)
 Rough horses, stair
 Rounds, chair
 Ruling machines, bookbinders
 Rungs, chair
 Sash
 Seat frames, canoe
 Screens, door
 Screens, window
 Seats, chair
 Seats, water closet
 Sewing machine parts
 Shelves, book
 Shoe rails, stair
 Showcase
 Sideboards, exterior
 Sides, bookcase
 Sides, cheese boxes
 Sides, china closet
 Sides, desks
 Sides, dressers

BIRCH, SWEET—Continued.

Sides, mine dump cars	Stretchers, chair	Toy tops
Sides, piano cases	String boards, stair	Trays, pen
Sills, cart	Swings, lawn	Treads, stair
Sink mats	Switchboards, telephone	Veneer
Slats, bed	Tables	Veneer cores, piano cases
Slides, table	Tables, billiard	Wagon boxes
Somnols	Tables, library	Wagons
Spindles, chair	Tables, pool	Wainscoting
Spools, electric wire	Tables, sewing	Wainscoting cap, house interior trim
Sprags, mine	Tabourettes	Wainscot rail, house interior trim
Stafs, flag	Tool chests	Wardrobes
Staves, cement barrels	Top panels, piano cases	Wardrobes, exterior
Staves, cooperage	Top slats, light delivery wagon bodies	Wedges, mine cap
Staves, slack cooperage	Tops, case goods	Window apron, house interior trim
Sticks, flower	Tops, piano cases	Window stool, house interior trim
Stools, foot	Tops, post office furniture	
Stools, office	Tops, table	
Stools, piano	Toy chairs	
Stops, door, house interior trim	Toy furniture	
Store fronts		

BIRCH, YELLOW

Balls, croquet	Dishes, butter	Pins, clothes
Blinds	Facing, window partition	Plates, pie
Blocks, brush	Handles, broom	Prints, butter
Boards, chopping	Handles, dust brush	Sash, electric cars
Bobbins	Handles, wrench	Sash, railway cars
Boxes, butter	Heads, spool	Screens, door
Boxes, packing	Horses, clothes	Screens, window
Boxes, tinware	Implements, agricultural	Seats, chair
Cabinets, kitchen	Interior finish, electric cars	Sills, inside window (electric cars)
Chair arms, railway cars	Interior finish, railway cars	Sills, window, inside (railway cars)
Chairs, folding	Interior finish, railway coaches	Sleds
Chairs, kitchen	Mallets, croquet	Spools
Controller box casing, electric cars	Middles, spool	Tables, kitchen
Costumers	Mills, coffee	Tempins, toy
Covers, switch boxes, electric cars	Mirrors, hand	Toy furniture
Crates, tinware	Moulds, butter	Toy tops
Crating	Novelties	Toys
Cupboard doors, railway cars	Panel wainscoting, railway cars	Turnings
Dairy accessories	Panels, ceiling, railway cars	
	Panels, window, railway cars	

BOXWOOD

Boxes, comb	Handles, shaving brush	Scales, draftmen's
Engravings, wood	Quoins, printers'	Shuttles
Handles, umbrella	Rules, carpenters'	Type measures, printers'

BRIAR ROOT

Pipes, smoking

BUCKEYE, OHIO

Balusters, porch	Flat battens, house interior trim	Moulding, screw
Base blocks, house interior trim	Frames, door	Moulding, sprung cove, house construction
Base board, house interior trim	Frames, front door side lights	Nosing, house interior trim
Base corners, house interior trim	Frames, window	Panel strips, house interior trim
Base moulding, house interior trim	Frieze rail, porch	Parting stop, house interior trim
Bay brackets, house construction	Front doors, house	Partition moulds, house interior trim
Beams, dining room ceiling	Gable brackets, house construction	Plate rail, dining room
Blind stop, house construction	Gable ornaments, house construction	Porch columns, built up
Boards, ironing	Grilles, house interior trim	Porch columns, solid
Boards, pastry	Head blocks, house interior trim	Porch newels, built up
Boards, sleeve	Head casing, house interior trim	Porch newels, solid
Bottom rail, porch	Jamb, door	Porch spandrels
Boxes, packing	Mantels	Racks, clothes
Brackets, plate rail	Mirror doors, house	Racks, towel
Brackets, porch	Moulding, bed, house construction	Scroll sawed balusters, porch
Capping, sink, house interior trim	Moulding, brick, house construction	Siding, house
Carpet strip, house interior trim	Moulding, cap, house interior trim	Sink aprons, house interior trim
Casing, door	Moulding, cove	Slide, fly screen
Casing, window	Moulding, crown, house construction	Spindles, porch
Chair rail, house interior trim	Moulding, drip cap, house construction	Stops, door, house interior trim
Colonnades, house interior trim	Moulding, picture	Stops, window, house interior trim
Corner blocks, house interior trim	Moulding, plaster, house construction	Top rail, porch
Cresting, porch roof	Moulding, quarter round	Wainscot rail, house interior trim
Doors, folding		Wainscoting cap, house interior trim
Doors, sliding		Window apron, house interior trim
Dust cap, house interior trim		Window stool, house interior trim
Face brackets, house construction		
Fillet, house interior trim		

BUTTERNUT

Base blocks, house interior trim	Excelsior ribbon (mattress stuffing)	Mirror doors, house
Baseboard, house interior trim	Fillet, house interior trim	Moulding, drip cap, house construction
Base corners, house interior trim	Finish, boats	Moulding, picture
Base moulding, house interior trim	Flat battens, house interior trim	Moulding, quarter round
Beams, dining room ceiling	Frames, door	Moulding, spring cove, house construction
Brackets, plate rail	Front doors, house	Nosing, house interior trim
Capping sink, house interior trim	Grilles, house interior trim	Panel strips, house interior trim
Carpet strip, house interior trim	Head blocks, house interior trim	Paper pulp
Casing, door	Head casing, house interior trim	Patterns, foundry
Chair rail, house interior trim	Interior finish	Plate rail, dining room
Chests, clothes	Jamb, door	Rims, split wood pulleys
Chests, flour	Mantels	Ship furniture
Colonnades, house interior trim	Moulding	Sink aprons, house interior trim
Corner blocks, house interior trim	Moulding, bed, house interior trim	Wainscoting cap, house interior trim
Doors, folding	Moulding, cap, house interior trim	Wainscot rail, house interior trim
Doors, sliding	Moulding, cove	Window apron, house interior trim
Drain boards, sink	Moulding, crown, house construction	Window stool, house interior trim
Dust cap, house interior trim		
Excelsior, packing		

CEDAR, RED

Benches, porch	Churns, butter	Lining, closets
Benches, rustic lawn	Coffins	Lining, clothes closets
Box shooks	Cross arms, telegraph pole	Pencils
Boxes, fuel	Cross ties, railroad	Pergolas
Butter workers, dairymen's	Faucets, oil barrel	Posts, fence
Cabinets, parlor	Frames, couch	Shingles
Cases, casket	Frames, davenport	Siding, house
Cases, coffins	Frames, lounges	Silos
Caskets	Frames, upholstered furniture	Summer houses
Ceiling	Handles, paint brushes	Tanks
Chests, clothes	Handles, varnish brushes	Vats

CEDAR, SPANISH

Cigar boxes	Hulls, boats	Planking, rowboats (flat bottom)
Decking, motor boat	Hulls, canoes	Ribs, canoe
Floor boards, rowboat (round bottom)	Hulls, racing shells	Vencer
Handles, tennis racket	Planking, canoe	

CEDAR, WESTERN RED

Cabinet work	Fixtures, office	Shingles
Caskets	Flooring, porch	Siding
Ceiling	Frames, screen door	Silos
Cornice work	Frames, window screen	Tanks, windmill

CEDAR, WHITE

Boat boards	Hulls, boat	Ribs, canoe
Boat siding	Hulls, canoes	Siding, canoe
Boats, motor	Hulls, racing shells	Siding, launch
Boats, superstructure	Pickets, wire fence	Silos
Box shooks	Planking, canoe	Tanks
Canoes	Planking, boat	Tanks, paper mill
Decking, motor boat	Planking, motor boat	Tubs, washing machine
Finish, interior	Planking, yacht	Vats
Furniture		

CEIBA

Shuttles

CHERRY

Acetate of lime	Beams, dining room ceiling	Carpet strip, house interior trim
Actions (organs)	Blinds, venetian	Carvings, wood
Alcohol, wood	Blocks, brush	Cases, dental
Backing, electrotape	Booths, telephone	Cases, optical
Backs, clothes brush	Boxes, plate glass packing	Cases, wall
Backs, drawer	Boxes, roller sign (electric cars)	Casing, door
Backs, hairbrush	Boxes, sewing	Casing, window
Backs, nail brush	Boxes, veneer	Casings
Balusters (stair)	Brackets, plate rail	Caskets
Balusters, stairway	Brackets, stair	Chair arms, Pullman coaches
Base blocks, house interior trim	Brackets, stairway	Chair rail, house interior trim
Baseboards	Brushes	Charcoal
Baseboard, house interior trim	Bureaus, exterior	Chiffoniers
Base corners, house interior trim	Cabinet work	Coffins
Base moulding, house interior trim	Cabinet work, boat	Colonnades, house interior trim
	Cabinet work (electric cars)	Colonnades, Pullman coaches
	Cabinet work (Pullman cars)	

CHERRY—Continued

Commodes	Head blocks, house interior trim	Panels, window (Pullman coaches)
Consoles	Head casing, house interior trim	Paper pulp
Corner blocks, house interior trim	Heading, nail keg	Partitions, office
Counters, bar	Interior finish	Partitions, store
Counters, store	Interior finish (camera)	Parts, automobile bodies
Covers, switch boxes (electric cars)	Interior finish, electric cars	Patterns
Covers, switch box (Pullman coaches)	Interior finish, Pullman coaches	Patterns, foundry
Cupboard doors, Pullman coaches	Interior trim, house	Peel blades, bakers'
Dashboards, automobile	Jaubs, door	Pipes, organ
Deck trimmings, motor boat	Levels, carpenters'	Plate holders (camera)
Doors	Lids, water closet	Plate rails, dining room
Doors, folding	Linings, boat	Platforms, counter scales
Doors, sliding	Lunch tables, portable (Pullman coaches)	Poison cases (drug store)
Doors, upper berth, sleeping cars	Mantels	Press boards, bookbinders'
Drawer parts, office fixtures	Mantels, soda fountain	Push button frames (Pullman coaches)
Drawer parts, store fixtures	Mirror doors, house	Rails, door
Dust cap, house interior trim	Mirror frames, passenger elevator cars	Rails, stair
Facing, window partition (electric cars)	Mirror frames, Pullman coaches	Rails, table
Files, newspaper	Models	Range finders, camera
Fillet, house interior trim	Models, machine	Refrigerators, soda fountain
Finish, interior (automobile bodies)	Moulding, bed, house construction	Risers, stairway
Fixtures, bank	Moulding, cap, house interior trim	Ruling machines, bookbinders'
Fixtures, bar	Moulding, cove	Sash
Fixtures, barber shop	Moulding crown, house construction	Sash, automobile
Fixtures, office	Moulding, drip cap, house construction	Sash, electric cars
Fixtures, store	Moulding, plaster, house construction	Sash, Pullman coaches
Fixtures (store display)	Moulding, quarter round	Seats, water closet
Fixtures, window display	Moulding, spring cove, house construction	Seats, wire frame chairs
Flat battens, house interior trim	Moulds, fire brick	Show cases
Flooring	Mountings, electrotype	Sides, drawer
Flooring, parquetry	Newel posts, angle	Sills, inside window (electric cars)
Foot rails (stair)	Newel Posts, starting	Slides, drawer
Foot rail, stairway	Nosing, house interior trim	Squares, draftsman
Frames, door	Organs, cabinet	Stands, city directory
Frames, mirror	Organs, pipe	Stiles, door
Frames, picture	Panel strips, house interior trim	Stops, door, house interior trim
Furniture, bank	Panel wainscoting, Pullman coaches	Tops, counter
Furniture (barroom)	Panel work, office partitions	Tops, table
Furniture, barber shop	Panel work, store fixtures	Tops, wire frame tables
Furniture, drug store	Panels, ceilings (Pullman coaches)	Track sections, camera
Furniture (office)	Panels, door	Treads, stair
Furniture, store	Panels, passenger elevator cars	Triangles (billiard)
Grilles		Triangles, draftsman
Grilles, house interior trim		Veneer
Grilles, Pullman coaches		Wainscot rail, house interior trim
Hand rail, stairway		Wainscoting cap, house interior trim
Handles, reciprocating drills		Window apron, house interior trim
Handles, varnish brushes		Window stool, house interior trim

CHERRY, WILD

Paper pulp

CHESTNUT

Astragals, folding door	Boxes, clothiers'	Chairs, arm
Astragals, sliding door	Boxes, coal sieve	Chairs, desk
Backs, brush	Boxes, packing	Chairs, mission
Backing, bureau	Boxes, plant	Chairs, rocking
Backing, desk	Boxes, tin plate	Chests, hall
Backing, dresser	Boxing	Chiffoniers
Backing, furniture	Brackets, plate rail	China cases, shelving
Backing, sideboards	Brackets, stair	Coffins
Backing, washstand	Buffets, exterior	Colonnades, house interior trim
Backs, piano	Bureaus, hidden work	Columns, china closet
Balusters (stair)	Bureaus, exterior	Columns, sideboard
Base blocks, house interior trim	Bushel crates	Commodes
Baseboards	Cabinets, magazine	Consoles
Baseboard, house interior trim	Cabinets, scale	Cores, door
Base corners, house interior trim	Cabinets, smokers,	Cores, veneering
Base moulding, house interior trim	Carpet strip, house interior trim	Corner blocks, house interior trim
Beams, dining room ceiling	Cars, passenger elevator	Couch frames
Beds, folding	Cases (casket)	Counters, store
Bedsteads, exterior	Cases, medicine	Crates
Bedsteads, hidden work	Cases, piano	Crating
Blinds, window	Cases, veneer	Cross arms, telegraph pole
Bodies, toy wheelbarrows	Casing	Cross ties, railroad
Bookcases, sectional	Casing, door	Desks
Book racks, revolving	Casing, window	Doors
Booths, voting (exterior)	Caskets	Doors, folding
Bottoms, grape basket	Celling	Doors, sliding
Box ends, fertilizer sowers	Cellarettes	Drain boards, sink
Box shoes	Chair rail, house interior trim	Drawer fronts
	Chairs	Drawer sides
		Dressers

CHESTNUT—Continued

Dust cap, house interior trim	Moulding, cove	Shelves, book
Fillet, house interior trim	Moulding, crown, house construction	Shelves, piano
Fixtures, bank	Moulding, picture	Shingles
Fixtures, bar	Moulding, plaster, house interior trim	Showcase
Fixtures, barber shop	Moulding, quarter round	Sideboards
Flasks, foundry	Moulding, spring cove, house construction	Sideboards, built in
Flat battens, house interior trim	Moulding, stair	Sideboards, exterior
Flooring	Newel posts, angle	Sides, billiard tables
Flooring, porch	Newel posts, starting	Siding, house
Foot rests	Nosing, house interior trim	Sides, piano cases
Footstools	Outer cases	Siding, plate glass shipping cases
Frames, coal sieves	Panel cases, veneer doors	Slats, trunk
Frames, furniture	Panel strips, house interior trim	Sofas, exterior
Frames, lounge	Panels, organ case	Stands, plant
Frames, mirror	Panels (piano cases)	Staves, cement barrels
Frames, office fixtures	Panels, veneer	Staves, slack coopeage
Frames, picture	Partitions	Staves, tight coopeage
Frames, upholstered chairs	Partition moulds, house interior trim	Stops, door, house interior trim
Frames, upholstered furniture	Parts, flour mill machinery	String boards (stair)
Front doors, house	Pickets, fence	Swell boxes, pipe organ
Furniture	Plate rail, dining room	Tables, dropleaf
Furniture, bed room	Posts, porch	Tables, extension
Furniture, mission	Rails, billiard tables	Tables, library
Furniture, office	Rails, china closet	Tables, tea
Grilles, house interior trim	Rails, shoe (stair)	Tool chests, toy
Hall mirror brackets	Rails, stair	Top frames, piano
Head blocks, house interior trim	Refrigerators	Tops, piano
Head casing, house interior trim	Refrigerators, exterior	Tops, table
Heading, slack coopeage	Risers, stair	Toy furniture
Interior frames, office fixtures	Roller feeders, flour mill machinery	Toy tops
Interior finish, house	Rosettes, wall (stairway)	Treads, stair
Jams, door	Screens, fire	Veneer
Keyboards, organ	Seats, chair	Veneer cores, piano cases
Keyboards, piano	Settees	Wainscot rail, house interior trim
Kitchen furniture	Settles	Wainscoting
Lath	Sewing machine parts	Wainscoting cap, house interior trim
Lids, grape basket	Sheathing	Washstands
Mantels	Sheathing, house	Washstands, exterior
Mirror doors, house		Window apron, house interior trim
Moulding, bed, house construction		Window stool, house interior trim
Moulding, cap, house interior trim		

COCOBOLO

Handles, butcher steel	Handles, hand wood drill	Handles, putty knife
Handles, carpenters' brace	Handles, palette knife	Handles, scraping knife
Handles, combination tool sets	Handles, paring knives	Heads, carpenter brace

CONGO

Handles, umbrella

COTTONWOOD

Balusters, porch	Brooders, poultry	Face brackets, house construction
Base blocks, house interior trim	Cabinets, inside work	Fillet, house interior trim
Baseboard, house interior trim	Cabinets, kitchen	Fixtures, barroom
Base corners, house interior trim	Capping, sink, house interior trim	Fixtures, office
Base moulding, house interior trim	Carpet strip, house interior trim	Fixtures, store
Baskets, berry	Cases, beer	Flat battens, house interior trim
Battens, O. G. barn	Cases, egg	Footstools
Bay brackets, house construction	Casing, door	Frames, box couches
Beams, dining room ceiling	Casing, window	Frames, door
Beds, manure spreaders	Caskets	Frames, front door sightlight
Bevel siding, house	Chair rail, house interior trim	Frames, upholstered furniture
Bins, curd grinding machines	Cigar boxes	Frames, wood
Blind stop, house construction	Cloth boards	Frieze rail, porch
Boards, ironing	Coffins	Front doors, house
Boards, skirt	Colonnades, house interior trim	Gable brackets, house construction
Boards, mortar	Commodes, interior	Gable ornaments, house construction
Boards, pastry	Consoles	Grilles, house interior trim
Bottom rail, porch	Coopeage, slack	Head blocks, house interior trim
Bottom rails, sash	Coops, poultry	Head casing, house interior trim
Bottoms, drawer	Corner blocks, house interior trim	Hoppers, curd grinding machines
Bottoms, trunk	Crates, berry	Incubators
Bottoms, trunk trays	Crates, milk bottle	Interior work, electric shoe shining machines
Boxes, bottle	Crating	Jams, door
Boxes, bottlers	Cresting, porch roof	Lath
Boxes, packing	Cupboards, kitchen	Lining, freight cars
Boxes, trunk	Doors, folding	
Boxes, wheat drills	Doors, sliding	
Brackets, plate rail	Dowels, chair	
Brackets, porch	Drawers, incubator	
	Excelsior	

COTTONWOOD—Continued

Lining, wagon bodies	Panels, door	Slide, fly screen
Mantels	Panels, light vehicle bodies	Soil rollers
Meeting rails, sash	Panels, light vehicle seats	Spindles, porch
Mirror doors, house	Panels, spring wagon bodies	Stiles, door
Moulding, bed, house construction	Panel strips, house interior trim	Stops, door, house interior trim
Moulding, brick, house construction	Panels, threshing machine	Stops, window, house interior trim
Moulding, cap, house interior trim	Parting stop, house interior trim	Tables, kitchen
Moulding, cove	Partition molds, house interior trim	Top rail, porch
Moulding, crown, house construction	Parts, door	Top rails, sash
Moulding, drip cap, house construction	Parts, flour mill machinery	Tops, kitchen cabinets
Moulding, picture	Plate rail, dining room	Tops, kitchen table
Moulding, plaster, house construction	Porch columns, built up	Tops, trunk
Moulding, quarter round	Porch columns, solid	Tops, veneered, trunks
Moulding, screen	Porch newels, built up	Tray bottoms (trunk)
Moulding, spring cove, house construction	Porch newels, solid	Wainscoting cap, house interior trim
Mullions, sash	Porch spandrels	Wainscot rail, house interior trim
Nosing, house interior trim	Roof slats, wagon bodies	Washboards, laundry
Packages, fruit	Scroll sawed balusters, porch	Window apron, house interior trim
Packing cases, plate glass	Shredders, fodder	Window stool, house interior trim
Panels, agricultural machinery	Shipping cases, butter	Wood pulleys
	Sides, farm wagon bodies	
	Sink aprons, house interior trim	

CUCUMBER

Base blocks, house interior trim	Dust cap, house interior trim	Moulding, picture
Baseboard, house interior trim	Fillet, house interior trim	Moulding, quarter round
Base corners, house interior trim	Frames, door	Moulding, spring cove, house construction
Base moulding, house interior trim	Frames, window	Nosing, house interior trim
Beds, spring wagon	Grilles, house interior trim	Paper pulp
Blind stop, house construction	Head blocks, house interior trim	Partition moulds, house interior trim
Brackets, plate rail	Jamb, door	Plate rail, dining room
Carpet strip, house interior trim	Mantels	Rims, split wood pulleys
Casing, door	Mantels, painted work	Sliding, house
Casing, house	Mirror doors, house	Slide, fly screen
Casing, window	Moulding, bed, house construction	Wainscoting cap, house interior trim
Chair rail, house interior trim	Moulding, cap, house interior trim	Wainscot rail, house interior trim
Colonnades, house interior trim	Moulding, cove	Window apron, house interior trim
Corner blocks, house interior trim	Moulding, crown, house construction	Window stool, house interior trim
Doors, folding	Moulding, drip cap, house construction	
Doors, sliding		

CYPRESS

Astragals, folding door	Cases, packing	Frames, front door sidelights
Astragals, sliding door	Casing	Frames, window
Balusters, porch	Casing, door	Frieze rail, porch
Bars, greenhouse	Casing, window	Front door, house
Base blocks, house interior trim	Caskets	Gable brackets, house construction
Baseboard, house interior trim	Chair rail, house interior trim	Gable ornaments, house construction
Baseboards	Churns, butter	Gates, railroad crossing
Base corners, house interior trim	Coffins	Grilles, house interior trim
Base moulding, house interior trim	Colonnades, house interior trim	Hatch covers, river craft
Battens, O. G. barn	Columns, pergola	Hatch covers, ship
Bay brackets, house construction	Consoles	Hatch covers, yacht
Beams, dining room ceiling	Corner beads, house interior trim	Head blocks, house interior trim
Beams, pergola	Corner blocks, house interior trim	Head casing, house interior trim
Beehives	Cornice, house construction	Interior, cupboard
Belt poles, machinists'	Cornice work, house	Interior finish, house
Revel siding, house	Crates, shipping	Jamb, door
Blind stop, house construction	Cresting, porch roof	Keels, canal boats
Blinds (house)	Cross arms, telegraph pole	Keels, river craft
Bottom boards, rowboat	Cross ties, railroad	Keels, ship
Bottom rail, porch	Decking, motor boat	Keels, yacht
Bottom rails (sash)	Doors	Keels on rowboat (flat bottom)
Boxes, bottle	Doors, folding	Ladders
Boxes, packing	Door, railroad passenger coaches	Lattice
Brackets, plate rail	Doors, sliding	Leaboards, canoe
Brackets, porch	Dust cap, house interior trim	Lids, washing machine
Brooders, interior	Exterior finish, house	Mantels
Cabins, exterior, river craft	Face brackets, house construction	Meeting rails (sash)
Cabins, exterior, ships	Fillet, house interior trim	Mirror doors, house
Cabins, exterior, yachts	Finish, locomotive cabs	Moulding, bed, house interior trim
Cabins, interior, river craft	Finish, yacht cabin	Moulding, brick, house construction
Cabins, interior, ships	Flat battens, house interior trim	Moulding, cap, house interior trim
Cabins, interior, yachts	Floor boards, rowboat, round bottom	Moulding, cove
Carpet strip, house interior trim	Flooring, porch	
Cases, casket	Frames, door	
Cases, coffin		
Cases, incubator		

CYPRESS—Continued.

Moulding, crown, house construction	Planking, ship	Stops, door, house interior trim
Moulding, drip cap, house construction	Planking, yacht	Stops, window, house interior trim
Moulding, exterior house	Plate rail, dining room	Sub-frames, hotbed
Moulding, picture	Porch columns, built up	Tanks,
Moulding, plaster, house construction	Porch columns, solid	Tanks, dairyman's
Moulding, porch	Porch newels, built up	Tanks, paper mill
Moulding, quarter round	Porch newels, solid	Tanks, pickling
Moulding, screen	Porch, spandrel	Tanks, wooden
Moulding, spring cove, house construction	Rafters, pergola	Thresholds, porch door
Moulding, stair	Rails, door	Top rail, porch
Mullions (sash)	Rudders, river craft	Top rails (sash)
Nosing, house construction	Rudders, ship	Tubs, washing machine
Panels, door	Rudders, yacht	Vats
Panel strips, house interior trim	Sash	Vats, dairyman's
Parting strip, house interior trim	Sash, hotbed	Vats, paper mill
Partition moulds, house interior trim	Sash, railroad passenger coach	Wainscot rail, house interior trim
Parts, automobile bodies	Screens, door	Wainscoting cap, house interior trim
Planking, motor boat	Screens, window	Washboards, dairyman's
Planking, river craft	Scroll sawed balusters, porch	Water tubs, wooden bridge
	Shingles	Window apron, house interior trim
	Sides, rowboat (flat bottom)	Window stool, house interior trim
	Silos	
	Slide, fly screen	
	Spindles, porch	
	Staves, tight cooperage	
	Stiles, door	

DOGWOOD

Bobbins	Handles, kitchen fork	Mallets, tinner's
Handles, brick trowel	Handles, small tools	Shuttles
Handles, kitchen knife	Mallets, coppersmith	

DONCELLA

Shuttles

EBONY

Backs, clothesbrush	Chessmen	Handles, tea strainer
Racks, hairbrush	Handles, chafing dish	Handles, umbrella
Canes	Handles, drawing instruments	Pipes, smoking
Checkers	Handles, pocket knife	Walking sticks

ELM, CORK

Baskets, vegetable	Gear parts, flour mill machinery	Platforms, machine
Battens, dumb-waiters	Grain boxes, corn planters	Reaches, light vehicle
Beams, elevator cars	Guide posts, dumb-waiters	Rims (automobile wheels)
Beds, coal wagon	Guide rails, dumb-waiters	Rims, basket
Bent seats, automobile	Handles, machine	Rims, butter tub
Books, hub	Handles, plow	Rollers, cable
Boxes, packing	Hay rake parts	Runners, sleigh
Boxes, weight (dumb-waiter)	Heading, slack cooperage	Shelves, dumb-waiters
Boxes, wheat drills	Hoops, slack cooperage	Singletrees
Cabinets, kitchen	Hoppers, grain	Skids, engine
Chair rockers	Hounds, light vehicle	Staves, cement barrels
Chairs, stepladder	Hubs	Staves, slack cooperage
Churns, butter	Hubs, carriage wheels	Swings, lawn
Cleats, dumb-waiters	Hubs, light delivery wagons	Traps, mouse
Crating	Hubs, light vehicles	Traps, rat
Doubletrees	Ladders	Trees, saddle
Dumb-waiters	Over-head beams, dumb-waiters	Trucks, gasoline engine
Eveners	Parts, automobile bodies	Tubs, lard
Egg cases	Parts, hay baler	Whiffletrees
Frames, sieve	Pews, church	Yokes, neck
Friction blocks, derrick	Platforms, elevator	

ELM, WHITE

Backs, chair	Bushel measures	Frames, couch
Backs, kitchen cabinets	Cabinets, medicine	Frames, cultivators
Baskets	Cabinets, printers'	Frames, davenport
Baskets, split	Cabinets, seed	Frames, lounge
Baskets, vegetable	Cases, type	Frames, sofa
Blocks, brush	Chairs	Frames, upholstered furniture
Boards, ironing	Chairs, kitchen	Furniture, toy
Boards, pastry	Chairs, rocking	Game boards
Bookcases, inside work	Chests, ice	Handles, basket
Bodies, automobile	China closets, inside work	Handles, canthook
Boxes, wheelbarrow	Commodies, inside work	Handles, cross-cut saw
Boxes, trunk	Crating	Handles, peavy
Boxes, knife	Doors, automobile	Heading, slack cooperage
Boxes, comb	Eveners	Hoops, slack cooperage
Boxes, cheese	Fixtures, bar	Hubs, wheelbarrow
Boxes, candy	Fixtures, office	Ladders, step
Box shooks	Fixtures, store	Lath
Brooders, poultry	Flasks, foundry	Locomotive cabs, interior
Bureaus, interior work	Flooring	Paper pulp
Bushel crates	Frames, chair	Parts, washing machine

ELM, WHITE

Pastry sets
Pews, church
Pins, insulator
Pokes, horse
Refrigerators
Rims, cheese box
Rims, sieve
Rungs, ladder
Seat frames, chair

Showcases
Sieves, ash
Signboards
Slats, trunk
Sleds, bob
Slides, extensible
Splint baskets, porch hammocks
Stands, bible
Staves, slack cooperage

Stops, drawer
Tables, communion
Telephone apparatus
Tops, sleds
Traps, mouse
Traps, rat
Tubs
Washboards, laundry
Veneer

EUCALYPTUS

Furniture, special work

FIR, BALSAM

Freezers, ice cream
Lath

Oars, boat
Pulp, paper

Silos

FIR, DOUGLAS

Astragals, folding door
Astragals, sliding door
Balusters, porch
Base blocks, house interior trim
Base board, house interior trim
Base corners, house interior trim
Base moulding, house interior trim
Battens, O. G. barn
Bay brackets, house construction
Beams, dining room ceiling
Bevel siding, house
Blind stop, house construction
Blinds, window
Booms, river craft
Booms, ship
Bottom boards, barge
Bottom boards, row boat
Bottom boards, scow
Bottom rail, porch
Bottoms, piano cases
Brackets, plate rail
Brackets, porch
Brackets, telegraph pole
Bumping posts, railroad
Cabins, exterior, river craft
Cabins, exterior, ships
Cabins, exterior, yacht
Capping, sink, house interior trim
Carpet strip, house interior trim
Casing, door
Casing, window
Ceiling
Chair rail, house interior trim
Colonnades, house interior trim
Corner blocks, house interior trim
Cornice, house construction
Covers, vats
Covers, water tank
Cresting, porch roof
Cross-arms, telegraph pole
Cross-ties, railroad
Decking, boats
Decking (ship and boat)
Derricks, hoisting
Derricks, oil well
Doors, folding
Doors, sliding
Drop siding, house
Dust cap, house interior trim
Face brackets, house construction
Feed mill machinery parts
Fillet, house interior trim
Fireless cookers, exterior

Flat battens, house interior trim
Flooring, electric passenger cars
Flooring, freight cars
Flooring, house
Flooring, porch
Flooring, railway passenger coaches
Flooring, scale platforms
Frames, door
Frames, freight car
Frames, front door side light
Frames, target
Frames, window
Frieze rail, porch
Front doors, house
Gable brackets, house construction
Gable ornaments, house construction
Gates, railway crossing
Hay balers, parts
Hayloaders, parts
Hayrakes, parts
Head blocks, house interior trim
Head casing, house interior trim
Hods, mortar
Jambs, door
Joiners, deck (ship)
Keels, canal boats
Keelsons, river craft
Keelsons, ship
Keelsons, yacht
Ladders, extension
Ladders, step
Lath
Lattice
Masts, river craft
Masts (ship)
Mirror doors, house
Moulding, bed, house construction
Moulding, brick, house construction
Moulding, cap, house interior trim
Moulding, cove
Moulding, crown, house construction
Moulding, drip cap, interior trim
Moulding, plaster, house construction
Moulding, quarter round
Moulding, screen
Moulding, spring cove, house construction
Nosing, house interior trim

Panel strips, house interior trim
Parting strip, house interior trim
Partition, house
Partition moulds, house interior trim
Planking, barge
Planking, canal boat
Planking, river craft
Planking, scow
Planking, ship
Planking, yacht
Plate rail, dining room
Plates, railway car frames
Poles, flag
Poles, pike
Porch ornaments, built up
Porch columns, solid
Porch newels, built up
Porch newels, solid
Porch spandrel
Pump rods, windmill
Push poles, locomotive
Refrigerators, exterior
Ridge poles, railway car frames
Scroll sawed balusters, porch
Sides, row boat
Siding, barge
Siding, canal boats
Siding, railway box cars
Siding, railway passenger coaches
Sills, freight cars
Sills, oil well drilling machinery
Sink aprons, house interior trim
Slides, fly screen
Spars, ship
Spindles, porch
Staves, silo
Staves, tight cooperage
Staves, water tanks
Stops, door, house interior trim
Store fronts
Tongues, farm machinery
Top rail, porch
Towers, oil well
Towers, water
Vats
Wainscot rail, house interior trim
Wainscotting cap, house interior trim
Window apron, house interior trim
Window stool, house interior trim

FIR, OREGON

Push poles, locomotive

GUM, BLACK

Baskets, split
Blocks, hub
Boxes, tin ware
Crates, tin ware

Cross-ties, railroad
Fenders, river craft
Friction blocks (railway cars)
Heading, oil bands

Hubs
Hubs, carriage wheels
Hubs, light delivery wagon
Hubs, wheelbarrow

GUM, BLACK—Concluded

Mauls
Mine rollers

Packing cases, plate glass
Rollers, car

Rollers, mine
Staves, oil barrels

GUM, COTTON

Baskets, splint
Baskets, vegetable
Bottoms, drawer
Boxes, berry
Boxes, cigar
Boxes, cracker
Boxes, milk bottle
Boxes, packing
Boxes, trunk
Cases, sample
Cases, traveling

Coops, poultry
Crates, beer
Crates, fruit
Crates, vegetable
Crating
Cross-ties, railroad
Dishes, lard
Heads, maul
Hoppers, machine
Legs, table
Mallets, ship builders

Mortars
Paper pulp
Parts, agricultural machinery
Pestles
Pins, clothes
Plates, pie
Rammers, street
Rollers, awning
Rollers, shipbuilders
Truck barrels, veneered

GUM, BLACK

Baskets, split
Blocks, hub
Boxes, tin ware
Crates, tin ware
Cross-ties, railroad
Fenders, river craft

Friction blocks (railway cars)
Heading, oil barrels
Hubs
Hubs, carriage wheels
Hubs, light delivery wagon
Hubs, wheelbarrow

Mauls
Mine rollers
Packing cases, plate glass
Rollers, car
Rollers, mine
Staves, oil barrels

GUM, RED

Astragals, sliding door
Backs, chairs
Backing, case goods
Balusters, porch
Base blocks, house interior trim
Base board, house interior trim
Base corners, house interior
Base moulding, house interior
Bay brackets, house construc-
tion
Beams, dining room ceiling
Blinds, house construction
Blocks, brake
Bottoms, case goods
Bottom rails, porch
Bottom rails, sash
Box shoofs
Boxes, creamery shipping
Boxes, macaroni
Boxes, packing
Boxes, trunk
Brackets, porch
Cabinets, music
Capping, sink, house, interior
trim
Carpet strip, house interior trim
Cases, casket
Cases, clock
Cases, coffin
Cases, sample
Cases, shipping
Casing, door
Casing, window
Caskets
Chair rail, house interior trim
Chairs, rocking
Coal boards, engine tender
Coffins
Colonades, house interior trim
Consoles
Commodore
Coolers, water
Corner blocks, house interior
trim
Crating
Cresting, porch roof
Cross-ties, railroad
Doors
Doors, folding
Doors, sliding
Drawer sides
Drawers
Drawers, cabinets
Dust cap, house interior trim

Face brackets, house construc-
tion
Fertilizer distributors, parts
Fillet, house interior trim
Flasks, foundry
Flat battens, house interior
trim
Frames, chair
Frames, davenport
Frames, door
Frames, dresser
Frames, front door side light
Frames, window
Frieze rail, porch
Front doors, house
Front rails, beds
Front rails, dresser
furniture
Gable brackets, house construc-
tion
Gable ornaments, house con-
struction
Handles, saw
Handles, sadiron
Head blocks, pattern
Head blocks, house interior trim
Head cases, house interior trim
Hidden work, walnut furniture
House interior trim
Interior finish, house
Jambs, door
Jumpers, baby
Lath
Legs, chiffonier
Legs, dresser
Mantels
Meeting rails, sash
Mirror doors, house
Moulding, bed, house construc-
tion
Moulding, brick, house con-
struction
Moulding, cap, house interior
trim
Moulding, cove
Moulding, crown, house con-
struction
Moulding, drip cap, house con-
struction
Moulding, picture
Moulding, plaster, house con-
struction
Moulding, quarter round
Moulding, spring cove, house
construction
Mullions, sash
Nosing, house interior trim

Panel strips, house interior trim
Panels, door
Panels, light delivery wagon
bodies
Panels, light vehicle bodies
Panels, stair work
Paper pulp
Parting stop, house interior
trim
Partition moulds, house con-
struction
Pipes (smoking)
Plate rail, dining room
Plate rail, house interior trim
Porch columns, built up
Porch columns, solid
Porch newels, built up
Porch newels, solid
Porch spandrels
Posts, beds
Posts, dresser
Pulleys
Rafts, door
Rafts, dresser
Refrigerators, exterior
Scroll-sawed balusters, porch
Seat frames, chair
Shelving, cabinets
Sink aprons, house interior trim
Slide, fly screen
Spindles, porch
Standards, chiffonier
Standards, dresser
Staves, cement barrels
Sticks, parasol
Stiles, door
Strips, weather
Stops, door, house interior trim
Stops, window, house interior
trim
Tables, library
Top rail, porch
Top rails, sash
Tops, desk
Tops, dressers
Tops, chiffoniers
Tops, sideboards
Traps, mouse
Wainscoting cap, house interior
trim
Wainscot rail, house interior
trim
Walkers, baby
Window apron, house interior
trim
Window stool, house interior
trim

HEMLOCK

Astragals, folding door
Astragals, sliding door
Balusters, porch
Balusters (stair)
Barge construction

Base blocks, house interior trim
Base board, house interior trim
Base corners, house interior
trim

Base moulding, house interior
trim
Battens, O. G. barn
Bay brackets, house construc-
tion

HEMLOCK—Concluded.

Beams, dining room ceiling	Frieze rail, porch	Partition moulds, house interior trim
Blind stop, house construction	Front doors, house	Patch-boards, freight car
Booms, river craft	Fruit jar cases	Planking, canal boat
Booms, ship	Gable brackets, house construction	Planking, river craft
Bottom boards, foundry flasks	Gable ornaments, house construction	Planking, ship
Bottom rail, porch	Grilles, house interior trim	Planking, yacht
Bottoms, river barge	Hatch covers, river craft	Plate rail, dining room
Box shooks	Hatch covers, ship	Poles, flag
Boxes, coal sieve	Hatch covers, yacht	Porch columns, built up
Boxes, packing	Head blocks, house interior trim	Porch newels, solid
Brackets, plate rail	Head casing, house interior trim	Porch newels, built up
Brackets, porch	Heading, nail keg	Porch spandrel
Brackets, stair	Heading, slack cooperage stock	Rails (steel)
Bridge construction	Incubators	Reels, cable
Bull-wheel cants, oil well machinery	Jams, door	Reels, wire rope
Cabins, canal boats	Keels, river craft	Refrigerators
Capping, sink, house interior trim	Keels, ship	Risers, stair
Carpet strip, house interior trim	Keels, yacht	Rosettes, wall (stairway)
Casing, door	Kelsons, canal boat	Rough horses (stairway)
Casing, window	Ladders, river craft	Scroll-sawed balusters, porch
Chair rail, house interior trim	Ladders, ship	Seats, row boat
Cheese boxes, veneer	Lath	Shoe rails (stair)
Colonnades, house interior trim	Lattice	Sides, ore car bodles
Consoles	Lining, canal boats	Sides, row boat
Corner blocks, house interior trim	Mantels	Siding, freight car
Cornice, house construction	Masts, river craft	Siding, house
Cornice work, house	Masts, ship	Siding, plate glass shipping cases
Crating	Mirror doors, house	Sink aprons, house interior trim
Creting, porch roof	Moulding, bed, house construction	Skidding (machine)
Cross-ties, railroad	Moulding, brick, house construction	Skidding (steam-pump)
Decking, barge	Moulding, cap, house interior trim	Slides, fly screen
Decking, canal boats	Moulding, cove	Spars, ship
Doors, folding	Moulding, crown, house construction	Spindles, porch
Doors, sliding	Moulding, drip cap, house construction	Stair horses
Dust cap, house interior trim	Moulding, picture trim	Stair work, hidden
Face brackets, house construction	Moulding, plaster, house construction	Staves, silo
Fencing	Moulding, quarter round	Staves, slack cooperage
Fillet, house interior trim	Moulding, screen	Stems, canal boat
Flasks	Moulding, spring cove, house construction	Stops, door, house interior trim
Flasks, foundry	Newel posts, angle	Stops, window, house interior trim
Flat battens, house interior trim	Newel posts, starting	String boards (stair)
Flooring	Nosing, house interior trim	Thresholds, house interior trim
Flooring, freight elevator cars	Packing, boat launching	Top rail, porch
Flooring, passenger elevator cars	Packing cases, plate glass	Transoms, row boat
Flooring, wharves	Pallets, fire brick	Tread (stair)
Frames, canal boat	Panel strips, house interior trim	Veneer
Frames, coal sieve	Paper pulp	Wainscoat, rail, house interior trim
Frames, door	Parting strip, house interior trim	Wainscot cap, house interior trim
Frames, freight car		Weather boarding, house
Frames, front door side light		Window apron, house interior trim
Frames, river craft		Window stool, house interior trim
Frames, ship		
Frames, window		
Frames, yacht		

HICKORY

Arms, chair	Felloes, light delivery wagons	Handles, broad hatchet
Axle beds, perch spring wagon	Fifth wheel bars, light delivery wagon	Handles, cant hook
Axle beds, surrey	Fifth wheel circles, light delivery wagon	Handles, chisel
Axle beds, buggy	Fifth wheel spools, light delivery wagon	Handles, double bitted axe
Axles, light vehicles	Fillers, hame	Handles, drawing knife
Axles, lumber wagons	Flooring, motor truck	Handles, electric air
Axles, wagon	Forks, shaking	Handles, extension saw
Backs, rustic porch chairs	Frames, bob sled	Handles, gof club
Backs, split chairs	Frames, coal screen	Handles, go-devil
Bottoms, wagon boxes	Frames, gravel screen	Handles, grab maul
Boxes, creamery shipping	Frames, porch chair, rustic	Handles, granite hammer
Bows, automobile top	Frames, sand shaking screen	Handles, grub hoe
Brake beams, freight car	Gear parts, automobile	Handles, hammer
Brake lining, hoisting engines	Gear parts, buggy	Handles, hand drill
Canes, walking	Gear parts, light vehicle	Handles, hatchet
Caps, axle	Gear parts, vehicle	Handles, single bitted axe
Caps, light vehicle	Gear parts, wagon	Handles, lawn rake
Carts, dump	Gear woods, flour mill machinery	Handles, machinists' hammer
Carts, road	Grain cradles	Handles, meat cleaver
Cogs, flour mill machinery	Hacks, vehicle	Handles, masons' hammer
Cross bars, buggy shafts	Hames	Handles, maul
Cross bars, light vehicle	Handles, adze	Handles, paint brush
Door boards, coal cars	Handles, axe	Handles, peeling axe
Door boards, railroad grain cars	Handles, bench hatchet	Handles, post mauls
Doubietrees	Handles, blacksmith's hammer	Handles, rig builders' hatchet
Dowels	Handles, bookbinders' machinery	Handles, riveting hammer
Evensers, buggy		Handles, shingle and lathing hatchet
Evensers, carriage		Handles, sledge hammer
Evensers, wagon		
Felloes		
Felloes, heavy vehicle wheels		

HICKORY—Concluded

Handles, timber carver
 Handles, trolley car
 Heads, grab maul
 Heads, mallet
 Hind spring bars, light delivery wagon
 Hounds, light delivery wagon
 Interior finish, houses
 Interior trim, house
 Ladders, hay
 Lower head blocks, light delivery wagon
 Mallets
 Mallets, printers'
 Mauls
 Neck yokes
 Neck yokes, light vehicle
 Neck yokes, wagon
 Quoins, printers'
 Parts, automobile body
 Picker sticks, loom
 Pole futchels, light delivery wagon
 Poles, buggy
 Poles, hanging strap (electric cars)
 Poles, light vehicle
 Posts, wagon body
 Push poles, railway engine
 Rails, automobile
 Rammers
 Rammers, concrete
 Rammers, street

Reaches, buggy
 Rests, foot, (electric cars)
 Rests, foot, (railway cars)
 Ribs, wagon top
 Rims
 Rims, automobile wheel
 Rims, vehicle rims
 Rims, wheel
 Rollers
 Rounds, chair
 Rounds, split bottom chair
 Rounds, ladder
 Runners, ladder
 Runners, sleigh
 Runner frames, sleigh
 Runners, bob sled
 Screws, bookbinder
 Seats, rustic porch chair
 Seats, split chair
 Shackle bars, light delivery wagon
 Shafts, buggy
 Shafts, vehicle
 Shooting sticks, printers'
 Side futchels, light delivery wagon
 Singletrees
 Singletrees, light and heavy vehicles
 Skewers, butchers'
 Slackers
 Splits, split bottom chair
 Splint baskets, porch hammock

Splinter bars, light delivery wagon
 Spokes, automobile wheel
 Spokes, buggy wheel
 Spokes, heavy vehicle wheel
 Spokes, light delivery wagon
 Spokes, light and heavy vehicle
 Spokes, push cart wheel
 Sprags, mine
 Spring bars
 Spring bars, light and heavy vehicle
 Spring blocks, wagon
 Spring yokes, light delivery wagon
 Stakes, heavy vehicle
 Stakes, log car
 Sweep sticks, loom
 Teeth, lawn rake
 Teeth, spur gears
 Tongues, corn planter
 Tongues, light vehicle
 Tongues, wagon
 Treadle sticks, loom
 Trucks, warehouse
 Upper head blocks, light delivery wagon
 Vehicle stock
 Wheelbarrows,
 Wheels, vehicle
 Wreckskids, railway
 Whiffletrees, vehicle

HOLLY

Backs, bath brush
 Blocks, brush
 Cups, soap
 Forks, wooden, cooking

Forks, wooden, salad
 Handles, rolling pin
 Mashers, potato
 Paddles, butter

Pins, rolling
 Spoons, wooden mixing
 Sticks, toddy

HORNBEAN

Balls, duckpin
 Balls, toupin
 Handles, adze
 Handles, canthook
 Handles, grab maul

Handles, peavy
 Handles, timber carrier
 Heading, nail keg
 Heads, grab maul

Neck yokes
 Neck yokes, jockey
 Sides, cheese box
 Whiffletrees

LAUREL, MOUNTAIN

Inlaid work, furniture

LANCEWOOD

Rods, fishing

LIGNUM-VITAE

Balls, lemon squeezer
 Balls, lime squeezer
 Bung starters

Cups, lemon squeezer
 Cups, lime squeezer
 Heads, mallet

Mallets, coppersmith
 Mallets, printers'

LOCUST

Brackets, telegraph pole
 Cross-arms, telegraphs pole

Hubs, light delivery wagon
 Paper pulp

Pins, insulator
 Pins, telephone

MAHOGANY

Antique furniture, exterior
 Arms, chair
 Balusters, stair
 Back posts, chair
 Base boards, house interior trim
 Base moulding, house interior trim
 Beams, dining room ceiling
 Beds, folding, exterior
 Bedsteads, exterior
 Benches, piano
 Book racks, revolving
 Book cases, sectional
 Brackets, plate rail
 Brackets, stair
 Cabinets, magazine
 Cabinets, music
 Cabinets, phonograph
 Cabinets, scale

Cabinets, smokers
 Cabins, interior ships
 Cabins, interior, yachts
 Carpet strip, house interior trim
 Carvings, wood
 Cases, binnacle
 Cases, chart (ship)
 Cases, dental
 Cases, hall clock
 Cases, optical
 Cases, piano
 Casing, door
 Casing (veneered), pipe organ
 Casing, window
 Caskets
 Cellarettes, exterior
 Chair arms, sleeping coaches
 Chair rail, house interior trim
 Chairs, arm
 Chairs, morris

Chests, hall
 Chests of drawers, exterior
 Chests, silverware
 Cheval mirrors
 Chiffoniers, exterior
 Coffins
 Colonnades, house interior trim
 Colonnades, pullman coaches
 Commodes, exterior
 Consoles
 Counters, bar room, exterior
 Covers, switch boxes, (electric cars)
 Covers, switch box (Pullman coaches)
 Cupboard doors, Pullman coaches
 Deck boards, automobile
 Dash boards, automobile
 Decking, canoe

MAHOGANY—Concluded

Decking, motor boat	Legs, piano	Princess dressers
Desk chairs	Legs, table	Push button frames, Pullman
Door strips, automobile	Lens boards, camera	coaches
Doors, folding	Lids, water closet	Rails, stair
Doors, locker, boat and ship	Lunch tables, portable, pull-	Range finders, camera
Doors, ship cabin	man coaches	Rims, pilot wheel (boat and
Doors, sliding	Mantels	ship)
Doors, upper berth (sleeping	Mirror doors, house	Rockers, chair
coaches)	Mirror frames, passenger ele-	Ruling machines, bookbinders
Facings, window partitions	motor cars	Sash, Pullman coaches
(electric cars)	Mirror frames, pullman coaches	Sash, ship cabins
Filing cases, sectional	Mirror frames, ship cabins	Screens, bank
Fillet, house interior trim	Models	Screens, fire
Fine cabinet work	Models, machine	Seats, piano
Finish, yacht cabins	Moulding, bed, house construc-	Seats, water closet
Flat battens, house interior	tion	Servettes, dining room table
trim	Moulding, cap, house interior	Settee
Flooring, parquetry	trim	Settees
Foot rails, stair	Moulding, cove, house interior	Shelves, book
Foot rests	trim	Showcases
Foot stools	Moulding, crown, house con-	Sides, piano case
Frames, chair	struction	Sills, inside window (electric
Frames, couch	Mouldings, piano	cars)
Frames, davenport	Mouldings, quarter round	Sills, window, inside (pullman
Frames, door, house interior	Moulding, spring cove, house	coaches)
trim	interior trim	Spindles, chair
Frames, mirror	Music shelf, piano	Stands, chafing dish
Frames, picture	Newel posts, angle	Stands, plant
Frames, settee	Newel posts, starting	Steering wheel rims, automobile
Frames, upholstered chair	Panel strips, house interior	Stools, piano
Furniture	trim	Tables, drop leaf
Furniture, office	Panel wainscoting, ship cabin	Tables, tea
Furniture, special period	Panel wainscoting, inside Pull-	Tops, counter
Gauges, carpenters'	man coaches	Tops, table
Glass front boards, automobile	Panels, case	Trays, jewelry display
Gunwales, canoe	Panels, ceiling, Pullman coaches	Trays, sewing
Grilles, house interior trim	Panels, clock case	Treads, stair
Grilles, Pullman coach	Panels, desk	Veneer
Grilles, ship cabin	Panels, passenger elevator cars	Veneer, furniture
Ground glass frames, camera	Panels, piano cases	Veneer, piano cases
Hall mirror hatracks	Panels, window, Pullman	Wainscot rail, house interior
Handles, camera slides	coaches	trim
Handles, hand scraper	Parts, automobile bodies	Wainscoting, house interior
Hand rails, yacht	Patterns	trim
Head casing, house interior	Pilasters, piano	Wainscoting cap, house interior
trim	Pillars, chair	trim
Hubs, pilot wheels, boat and	Pilot wheels, ship	Wardrobes, auto-valet
ship	Pilot wheels, yacht	Wheel trays, dining room
Interior finish, camera	Plate holders, camera	Window apron, house interior
Interior finish, electric cars	Plate rail, dining room	trim
Interior finish, Pullman coaches	Players, piano	Window stool, house interior
Key bottoms, piano		trim

MAPLE, SOFT

Acetate of lime	Charcoal	Interior trim
Alcohol, wood	Checkers	Interior work, sideboard
Backing, cases	Chessmen	Lapboards
Baskets	Cheval mirrors, enameled	Lath
Baskets, split	Clothes racks, laundry	Lining, case
Beds, folding	Chiffoniers, enameled	Meeting rails, sash
Blinds, porch	Clothespins	Middles, spool
Blinds, venetian	Cores, veneer	Moulding, picture
Blocks, brush	Commodes	Mullions, sash
Boards, hosiery	Commodes, enameled	Novelties
Bobbins	Costumes	Quills
Bottom rails, sash	Cradles	Panels, door
Bottoms, butter pails	Crates, fruit and vegetable	Paper pulp
Bottoms, carriage bodies	Crates, milk bottle	Patterns
Bottoms, fruit baskets	Crating	Pedal boards, organ
Bottoms, wagon bodies	Dowels, chair	Porch blinds
Box shooks	Driers, towel	Rails, door
Boxes	Dumb-waiter posts	Reels, cordage mill
Boxes, bottle	Dusters	Reels, wire
Boxes, comb	Flooring	Ruling machines, bookbinders'
Boxes, creamery shipping	Frames, chair	Sash
Boxes, knife	Frames, collapsible crates	Saw horses
Boxes, plate glass packing	Frames, couch	Screens, door
Boxes, salt	Frames, davenport	Screens, window
Boxes, tin plate	Frames, door	Seats, baby carriage
Boxes, veneer	Frames, parlor furniture	Seats, chair
Brooders	Frames, sofa	Shelves, book
Brushes, wall	Frames, upholstered chair	Shelving
Brushes, window	Frames, upholstered furniture	Shuttles
Bureaus, enameled	Frames, window	Signboards
Cabinet work	Furniture, case goods	Signs, advertising
Cabinets, medicine	Furniture, doll	Speeders
Cases, backing	Furniture, interior work	Spool heads
Cases, egg	Guide rails, dumb waiter	Spools
Cases, liquor	Handles, paint brush	Spool Gag
Celery crates	Handles, umbrella	Stanchions
Center arms, split wood pulleys	Handles, whitewash brushes	Staves, slack cooperage
Chairs, children's	Heading, slack cooperage	Sticks, parasol
Chairs, kitchen	Heads, spool	Sticks, umbrella
Chairs, laundry		

MAPLE, SOFT—Concluded.

Stiles, door
Stools, camp
Swings, porch
Tabourettes

Tables
Tables, kitchen
Top rails, sash
Toy furniture

Toy tops
Veneer
Wash benches
Wash stands, enameled

MAPLE, SUGAR

Armor backing, ship
Armor blocking, ship
Arms, chair
Arms, split-bottom chair
Axles, cornplanters
Axles, farm wagon
Axles, wagon
Back boards, piano
Back posts, chair
Backs, brush
Backs, chair
Backs, dust brushes
Backs, lawn swings
Backs, nail brush
Backs, scrubbing brush
Beds, warehouse trucks
Benches, automobile
Benches, carpenter
Benches, piano
Blocks, brake
Blocks, brush
Blocks, butchers'
Blocks, die
Blocks, chopping
Blocks, mangle roll
Blocks, pulley
Blocks, tackle
Blades, T-square (draftman's)
Boards, hosiery
Boards, meat
Boards, pie
Boards, potato chip
Boards, potato peeler
Boards, saw
Bolsters
Bolsters, warehouse truck
Bottom boards, piano
Bottoms, automobile
Bottoms, basket
Bottoms, chair
Bottoms, coal wagon body
Bottoms, drawers
Bottoms, drawer (dental cases)
Bottoms, drawer (optical cases)
Bottoms, land roller top
Bowling alleys
Bowls
Bowls, chopping
Bows, buggy top
Bows, carriage top
Bows, wagon top
Boxes
Boxes, butter
Boxes, candy
Boxes, comb
Boxes, foundry moulding
Boxes, knife
Boxes, packing
Boxes, salt
Boxes, tin plate
Brackets, mine
Brakes, electric crane
Bridges, piano
Brushes, paint
Brushes, whitewash
Budging, table sides
Bung starters
Bureaus, exterior
Bushings, cream separator
Cabinets
Cabinets, type
Canes, walking
Cars, hand
Carts, push
Cases, shipping
Cases, type
Cases, wall
Center arms, split wood pulleys
Chairs, children's
Chairs, folding camp
Chairs, rocking
Chair seats, veneered
Chase frames, printers'
Chase furniture, printers'
Children's carriages
Clamps, trouser hanger
Clocks, wall
Clothes driers

Clothes pins
Cogs, flour mill machinery
Collars, cream separator
Cores, typewriter platens
Costumers
Counters, billiard
Covers, butter tub
Crates
Crutches
Cups, billiard
Cups, soap
Decking, canal boat
Dishes, wooden
Display forms, hosiery
Display forms, shoe
Door boards, coal car
Door boards, railroad grain car
Dowels
Dowels, parasol shanks
Dumb waiters
Evensers
Faucets
Fixtures, bar room
Fixtures, barber shop
Fixtures, curtain
Fixtures, office
Fixtures, store
Flasks
Flooring, electric cars
Flooring, engine cab
Flooring, freight car
Flooring, freight car platform
Flooring, house
Flooring, mine dump cars
Flooring, parquetry
Flooring, passenger elevator
Flooring, railway car
Frames, blueprint
Frames, box mattress
Frames, buck saw
Frames, clothes wringers
Frames, corn sheller
Frames, cot
Frames, glass cutter
Frames, spraying machine
Frames, ten pin setter
Frames, thresher grain register
Framework, farm machinery
Friction blocks, derrick
Friction blocks, hoisting engine
Gear parts, automobile
Gear woods, threshing machine
Gauges, carpenters'
Guide strips, dumb waiter
Hammer boards, foundry
Handle cross pieces, lawn mower
Handles
Handles, awl
Handles, broom
Handles, brush
Handles, butcher knife
Handles, canthook
Handles, clothes wringer
Handles, coal pick
Handles, coal sieve
Handles, corkscrew
Handles, cross-cut saw
Handles, dust brush
Handles, fishing rod
Handles, hoe
Handles, ice cream freezer
Handles, lawn rake
Handles, mining pick
Handles, paint brush
Handles, peavy
Handles, piano
Handles, roller (bit brace)
Handles, screw driver
Handles, shoe knife
Handles, shovel
Handles, soldering
Handles, spud
Handles, timber carrier
Handles, vice
Handles, umbrella

Hangers, coat
Heading, cement barrels
Heading, cooperage
Heading, nail keg
Heading, slack cooperage
Heads, spool
Hearse tables, (burial carriage)
Interior finish
Jaws, lemon squeezer
Jaws, lime squeezer
Key bottoms, piano
Knobs, door
Knobs, furniture
Krautcutters
Lasts, shoe
Leaboards, canoe
Legs, billiard table
Legs, chiffonier
Legs, curd grinding machine
Legs, dresser
Legs, dressing table
Legs, incubator
Legs, kitchen table
Legs, table
Legs, washing machine
Lemon squeezers
Lime spreaders, gear woods
Lining, piano case
Machine rolls
Mallets
Mallets, stone cutters'
Mashers, potato
Mauls, steak
Middles, spool
Mine cars
Miter boxes, wooden
Models
Moulding, automobile
Moulds, brick
Moulds, butter
Mounting blocks, cash register
(electric cars)
Mounting blocks, electrical apparatus
Novelties
Orange racks
Overhead beams, dumb waiter
Packer's, flour mill machinery
Paddles, butter
Paddles, canoe
Paper pulp
Parasol sticks
Parquetry flooring
Partitions, drawer
Parts, hay press
Patterns
Pedals, pipe organ
Pin blocks, piano
Pins, cartridge
Pins, clothes
Pins, pie rolling
Pins, rolling
Pipe, wooden water
Planes, printers'
Plates, bread
Poles, curtain
Poles, tent
Porch gates
Posts, bed
Posts, chair
Posts, corn sheller
Posts, dresser
Posts, guide, freight elevator
Posts, piano
Posts, guide, passenger elevator
Posts, split bottom chairs
Press rolls, paper mill machinery
Racks
Racks, curtain display
Racks, rug display
Racks, towel
Racks, umbrella
Ralls, foot, automobile
Ralls, mine car
Reels, electric wire
Reels, solder wire
Refrigerators

MAPLE, SUGAR—Concluded.

Reglets, printers'
Ribs, threshing grain register
Rims, bicycle
Risers, stair
Rockers, chair
Rockers, rustic porch chairs
Rockers, split bottom chairs
Rods, chair
Roller blocks
Roller, caster
Rollers, dye
Rollers, lawn mower
Rollers, mangle
Rollers, mine
Rollers, paperhangers' seam
Rounds, chair
Runners, drawer
Sash, carriage
Seat frames, canoe
Seats, automobile
Seats, lawn swing
Show cases
Shuttles
Sides, billiard table
Sides, mine dump car
Sills, heavy wagon
Skewers, butchers'
Slats, ash can
Slats, automobile

Slats, bed
Sleds
Slides, extension table
Slides, table
Space bars, typewriter
Spoils
Spoons, wooden cooking
Spoons, wooden mixing
Strags, mine
Sprues, foundry flask
Squeezers, lime
Staffs, flag
Staves, cement barrel
Stave, cooperage
Staves, slack cooperage
Steering wheels, automobile
Sticks, dye
Sticks, flower
Straw carriers
Stretcher blocks, foundry
Stretchers, chair
Strips, guide, elevator
Sweepers, carpet
Sweeping brushes
Swings, child's
Swings, porch
Tables, library
Tenpins

Thresholds
Throats, tennis racket
Tongues, corn planter
Tongues, land roller
Tongues, wagon
Tops, table
Toy furniture
Toy ten pins
Toy tops
Traps, game
Traps, mouse
Treads, stair
Trucks
Trucks, handy
Truck sills, gas engine
Tracks, sliding seat (outriggers and racing shells)
Trunks
Turning blocks
Type, wood
Veneer
Walkers, baby
Walking sticks
Washboards
Washstands, exterior
Wheelbarrows
Wrestplanks, piano
Wringers, clothes

OAK, BLACK.

Flooring, wagon bodies

OAK, RED.

Armor backing, ship
Armor blocking, ship
Antique furniture, hidden work
Astragals, folding door
Astragals, sliding door
Axles, heavy wagon
Backs, chair
Backs, dust brush
Balusters, stair
Base blocks, house interior trim
Base boards, house interior trim
Base corners, house interior trim
Base moulding, house interior trim
Bases, dining table
Beams, dining room ceiling
Beams, plow
Bedsteads, exterior
Blind stop, house construction
Blinds, window
Blocks, brush
Bodies, automobile
Bodies, electric car
Bodies, railway cars
Bodies, wheelbarrow
Body frames, light and heavy vehicles
Bookcases, exterior
Bookcases, sectional exterior
Booths, telephone, exterior
Bottom boards, barge
Bottom boards, scow
Bottom rails, sash
Bottoms, automobile bodies
Bottoms, case goods
Bottoms, feed bag
Bottoms, grape basket
Bottoms, light delivery wagon body
Bottoms, pit cars
Bottoms, wagon seat
Boxes, plate glass packing
Boxes, telephone
Boxes, tin plate
Brackets, insulator
Brackets, plate rail
Brackets, stair
Brackets, telegraph pole
Buffets, exterior
Bureaus, exterior
Cabinets, kitchen, exterior
Cabinets, typewriter
Carpet strip, house interior trim
Carriages, interior house finish
Cases, blacking
Cases, casket
Cases, coffin

Cases, dental
Cases, optical
Cases, organ
Cases, water closet tank
Casing, door
Casing, pipe organ
Casing, window
Caskets
Ceiling
Center arms, split wood pulleys
Chair rail, house interior trim
Chairs, morris, exterior
Chests, silverware
Colonnades, house interior trim
Commodore
Consoles
Corner beads, house interior trim
Corner blocks, house interior trim
Costumers
Coupling poles, light vehicles
Cross arms, telegraph poles
Cross ties, railroad
Deck beams, canal boat
Deck beams, motor boat
Deck beams, river craft
Deck beams, ship
Deck beams, yacht
Desks, school
Doors
Doors, china closets
Doors, folding
Doors, sliding
Doors, storm
Draft timbers, freight cars
Draw beams, railway
Drop gates, light delivery wagon body
Dust cap, house interior trim
Easel blackboards
End sills, freight car
Ends, bookcase
Ends, buffet
Ends, bureau
Ends, chiffonier
Ends, desk
Ends, dresser
Felloes, wagon wheel
Fenders, ship
Fillet, house interior trim
Finish, boat
Fixtures, office (exterior)
Flasks
Flat battens, house interior trim
Flooring
Flooring, house
Foot rests, wagon

Frames, agricultural implements
Frames, barges
Frames, bucksaw
Frames, canal boat
Frames, cellar door
Frames, cellar window
Frames, collapsible crate
Frames, door
Frames, engine cab
Frames, flour mill machinery
Frames, freight car
Frames, harrow
Frames, mirror
Frames, picture
Frames, river craft
Frames, scow
Frames, ship
Frames, sieve
Frames, window
Frames, yacht
Front doors, house
Front panels, light delivery wagons
Fronts, china closets
Furniture, bedroom
Furniture, mission, exterior
Gear woods, milling machinery
Grilles, house interior trim
Grille work
Gunwales, row boat (round bottom)
Head blocks, house interior trim
Head casing, house interior trim
Heading, oil barrels
Heading, slack cooperage
Heading, tight cooperage
Hold beams, river craft
Hold beams, ship
Hold beams, yacht
Hoops, slack cooperage
Hubs, light vehicle
Interior finish
Interior finish, house
Interior trim, bar room
Inwales, row boat (round bottom)
Jambs, door
Keels, row boat, (round bottom)
Keels, canal boat
Keels, river craft
Keels, ship
Keels, yacht
Keelsons, canal boat
Keelsons, river craft

OAK, RED—Concluded.

Keelsons, ship	Plate rail, dining room	Stanchions, canal boat
Keelsons, yacht	Posts, bed	Stanchions, river craft
Knees, canal boat	Posts, bookcase	Stanchions, ship
Leaves, dining room table	Posts, buffet	Stanchions, yacht
Legs, billiard table	Posts, chair	Stands, Bible
Legs, brooder	Posts, chiffonier	Stands, plant
Legs, feed mill elevator	Posts, desk	Stands, umbrella
Legs, table	Posts, dresser	Staves, cement barrel
Lids, grape basket	Posts, sideboard	Staves, oil barrel
Lids, water closet	Pullits, exterior	Staves, slack coopeage
Lining, light delivery wagon	Racks, magazine	Staves, tight coopeage
Mantels	Rails, door	Stay bars, light delivery wagon
Medicine cabinets	Rails, stair	Stems, row boat (flat bottom)
Meeting rails, sash	Rails, table	Stem posts, row boat
Mirror doors, house	Reels, electric wire	Sterns, row boat (round bottom)
Mounting blocks, cash register (electric cars)	Reels, solder wire	Stern posts, row boat (round bottom)
Moulding, bed, house interior trim	Refrigerators	Stiles, door
Moulding, cap, house interior trim	Ribs, motor boat	Stops, door, house interior trim
Moulding, cove, house construction	Ribs, row boat (round bottom)	Store fronts
Moulding, crown, house construction	Rims, split wood pulleys	String boards, stair
Moulding, electric wire	Risers, stair	Strips, weather
Moulding, picture	Rosettes, wall (stairway)	Studding, log car
Moulding, plaster, house construction	Runners, sleigh	Swings, porch
Moulding, quarter round	Running boards, automobile	Tables
Moulding, screen	Running boards, electric cars	Tables, extension
Moulding, spring cove, house construction	Sash	Tables, sewing
Mullions, sash	Screens, door	Tables, extension
Newel posts, angle	Screens, window	Tabourettes
Newel posts, starting	Seats, chair	Thresholds, house interior trim
Nosing, house interior trim	Seats, water closet	Tillers, canal boat
Novelties	Shelves, book	Toprails, sash
Panel strips, house interior trim	Shelves, china closet	Tops, table
Panels, door	Shelves, mantel	Toy furniture
Panometry flooring	Shingles	Toy tops
Partitions, office	Shoe rails, stair	Transoms, row boat (round bottom)
Partitions, store	Showcases	Trays, incubator
Pastry sets	Sideboards, exterior	Treads, stair
Pedestals	Sideboards, interior	Veneer
Pedestals, table	Sides, billiard tables	Veneer cores, piano cases
Pews, church	Sides, case	Ventilators, window
Pilots, locomotive	Sides, push carts	Wainscoting
Pins, insulator	Sides, wagon	Wainscoting, cap, house interior trim
Planking, barge	Sills, door	Wainscoting rail, house interior trim
Planking, scow	Sills, gasoline engine truck	Washstands, exterior
	Sills, heavy wagon	Window apron, house interior trim
	Sills, log car	Window stool, house interior trim
	Sills, stone crusher	
	Sills, wagon	
	Slats, lawn seat	
	Sofas, exterior	
	Spokes, cart wheel	
	Spokes, light vehicle	

OAK, WHITE.

Acetate of lime	Blocks, wagon brake	Buggy bottoms
Alcohol, wood	Boats, row	Bull wheels, derrick
Armor, backing, ship	Bodies, automobile	Bull wheel arms, oil well machinery
Armor, blocking, ship	Bodies, mine pit wagon	Bumpers, locomotive
Arms, chair	Bodies, truck	Bumpers, traction engine
Astragals, folding door	Bodies, wagon	Bumping posts, railroad
Astragals, sliding door	Body bolsters, freight cars	Bureaus
Baby tender, walking chairs	Bolsters, heavy vehicle	Bureau, exterior
Back posts, chair	Bolsters, heavy wagon	Cabinet work
Backs, chair	Bottom boards, mine car	Cabinet work, clock cabins
Backs, church pew	Bottom rails, sash	Cabinets, electrical work
Backs, vacuum cleaner brush	Bottoms, baggage truck	Cabinets, magazine
Balusters, stair	Bottoms, delivery wagon	Cabinets, medicine
Bars, wooden harrow	Bottoms, ore car bodies	Cabinets, music
Base board, house interior trim	Bottoms, wagon	Cabinets, phonograph
Base blocks, house interior trim	Bookcases, built-in	Cabinets, phonograph record
Base corners, house interior trim	Bookcases, sectional	Cabinets, smoker
Base moulding, house interior trim	Book racks, revolving	Cabinets, toilet
Baseboards	Booths, telephone	Cabinets, towel
Basket parts	Bows, buggy top	Cabinets, type
Beans, coal car	Bows, carriage top	Cabins, boat
Beams, dining room ceiling	Bows, lawn rake	Cages, elevator
Beams, plow	Bows, wagon top	Capitals
Beater roll, paper mill machinery	Boxes, bit	Carpet strip, house interior trim
Bedposts	Boxes, blacking	Carts, push
Beds, folding	Boxes, plug tobacco	Carved ornaments, furniture
Beds, light delivery wagon	Boxes, telephone	Carvings, interior house finish
Bedsteads	Boxes, wagon	Cases, blacking
Belt, light delivery wagon	Braces, railway car	Cases, casket
Bodies	Braces, railway car frame	Cases, clock
Bonches, piano	Brackets, insulator	Cases, dental
Bonches, shop	Brackets, plate rail	Cases, clock
Blind stop, house construction	Brackets, telegraph pole	Cases, library
Blocks, brush	Brackets, telephone	Cases, medicine
Blocks, thermometer	Brake beams, heavy vehicle	Cases, optical
	Brake blocks, mine pit wagon	Cases, piano
	Buffets	Cases, railroad ticket
	Buffets, exterior	

OAK, WHITE, Continued.

Cases, wall	Drawer fronts, office fixtures	Frames, upholstered furniture
Cases, water closet tank	Drawer sides	Frames, vessel
Casing, door	Drays	Frames, wagon body
Casing, pipe organ	Dressers	Frames, wood-boring machines
Casing, window	Drop gates, light delivery wagon body	Frames, wood-saw
Casings	Drop lids, desk	Frames, yacht
Caskets	Drum lagging, hoisting engine	Front bolsters, wagon
Ceiling, boat	Dump carts, bodies	Front doors, house
Ceiling, house	Dust cap, house interior trim	Front hounds, wagon
Cellarettes	Electric cars, interior finish	Front panels, light delivery wagon
Center arms, split wood pulley	End panels, dresser	Fronts, china closet
Chair frames	End sills, freight car	Fronts, drawer
Chair rail, house interior trim	End sills, locomotive tender	Fronts, dresser
Chairs	End sills, log car	Furniture, bank
Chairs, adjustable	Ends, church pew	Furniture, bar room
Chairs, arm	Ends, mine car bodies	Furniture, barber shop
Chairs, dining	Ends, pit cars	Furniture, case goods
Chairs, invalid	Engine beams, freight cars	Furniture, craftsman's
Chairs, kitchen	Evensers, barrow	Furniture, drug store
Chairs, Morris	Exterior work, electric shoe shining machine	Furniture, office
Chairs, nursery	Feeding platform, rock crushing machinery	Furniture, store
Chairs, office	Felloes	Gates, freight elevator
Chairs, opera	Felloes, automobile wheel	Gear parts, wagon
Chairs, revolving	Felloes, heavy vehicle wheel	Gear wood, light wagon
Chairs, rocking	Fence pickets	Grilles
Chairs, rolling	Fenders, boat	Grilles, house interior trim
Chairs, stenographers'	Fenders, river craft	Guards, boat
Chandeliers, wooden art	File cases	Gunwales, boat
Charcoal	Filing cases, sectional	Gunwales, canoe
Cheese boxes, veneer	Fillet, house interior trim	Gunwales, row boat, (round bottom)
Chests, ball	Finish, boat	Hall mirror hat racks
Chests of drawers	Finish, interior engine cab	Hall racks
Chests, silverware	Fireless cookers, exterior	Handles
Chests, tool	Fixtures, bank	Handles, axe
Cheval mirrors	Fixtures, bar	Handles, barrow
Chiffoniers, exterior work	Fixtures, barber shop	Handles, coal pick
China closets	Fixtures, curtain	Handles, coal shovel
Churn parts	Fixtures, laboratory	Handles, cultivator
Churns, butter	Fixtures, office	Handles, edge-tool
Chute points, freight cars	Fixtures, store	Handles, hand axe
Cleats, wagon box	Fixtures, store display	Handles, machine
Clothes trees	Flat battens, house interior trim	Handles, mattock
Coaming, motor boat	Flooring, automobile bodies	Handles, mop
Coffins	Flooring, boats	Handles, paint brush
Colonnades, house interior trim	Flooring, freight cars	Handles, pick
Columns, porch	Flooring, hardwood	Handles, planters' eye hoe
Commodore	Flooring, house	Handles, plow
Communions rails	Flooring, light delivery wagon	Handles, push cart
Consoles	Flooring, parquetry	Handles, railroad pick
Cores, veneered door	Foot rests	Handles, saw
Corner beads, house interior trim	Foot stools	Handles, spading fork
Corner blocks, house interior trim	Footstays, flour mill	Hand rails, river craft
Corner posts, light delivery wagon	Frames, agricultural implements	Hatracks
Corner posts, ore car bodies	Frames, automobile bodies	Head blocks, house interior trim
Costumers	Frames, barge	Head casing, house interior trim
Counters, bar	Frames, bobsleds	Heading, oil barrel
Counters, soda water, exterior	Frames, canal boat	Heading, slack cooorage
Counters, store	Frames, chair	Heading, tight cooorage
Couplings, farm wagon	Frames, coal screen	Heading, whiskey barrel
Cradles	Frames, cold storage door	Hoel board, light delivery wagon
Cribs, child's	Frames, couch	High chair, child's
Cross arms, telegraph pole	Frames, davenport	Hind bolsters, wagon
Cross ties, railroad	Frames, dump cars	Hind hounds, wagon
Crossing planks, railroad	Frames, dump carts	Hold beams, river craft
Crystal cabinets	Frames, electric cars	Hold beams, ship
Cue racks, billiard	Frames, electric switchboard	Hold beams, yacht
Cupboards, kitchen	Frames, engine cab	Hoops, slack cooorage
Deck beams, canal boat	Frames, freight car	Horns, phonograph
Deck beams, motor boat	Frames, gravel screens	Hounds
Deck beams, river craft	Frames, hall clock	Hounds, heavy wagon
Deck beams, ship	Frames, hand coffee mill	Hounds, wagon
Deck beams, yacht	Frames, hand mirror	Hubs, heavy vehicle wheel
Decking, motor boat	Frames, harrow	Hubs, push cart wheel
Desk chairs	Frames, light vehicle	Hubs, wagon
Desks, electric switchboard	Frames, light vehicle body	Hulls, boat
Desks, flat top	Frames, lounge	Ice chest, outside finish
Desks, roll top	Frames, mirror	Interior finish
Desks, roll top, exterior	Frames, mission hall clock	Interior finish, house
Desks, school	Frames, motor boat	Interior finish, electric cars
Door boards, coal car	Frames, picture	Inwales, row boat, (round bottom)
Door boards, railroad grain car	Frames, quarry car	Jamb, door
Door frames, china closet	Frames, river craft	Joiners, deck
Door frames, freight car	Frames, sand shaking screen	Keel blocks, boat
Doors	Frames, scow	Keels, canal boat
Doors, china closet	Frames, ship	Keels, motor boat
Doors, folding	Frames, surrey body	Keels, river craft
Doors, sliding	Frames, tobacco truck	Keels, row boat (round bottom)
Doubletrees, vehicle	Frames, truck body	Keels, ship
Draft beams, freight car	Frames, truck sleigh	Keels, yacht
Draft timbers, freight car	Frames, upholstered chair	
Draw beams, railway car		
Draw heads, coal car		

OAK, WHITE—Continued.

- Keelsons, canal boat
 Keelsons, river craft
 Keelsons, ship
 Keelsons, yacht
 Kitchen cabinets, exterior
 Kitchen safes
 Knees, canal boat
 Knees, river craft
 Knees, ship
 Knees, yacht
 Knobs, door
 Knobs, furniture
 Ladders, gymnasium
 Ladders, hay
 Ladders, river craft
 Ladders, ship
 Ladders, tobacco
 Lagging
 Leaves, table
 Legs, billiard table
 Legs, chair
 Legs, desk
 Legs, dresser
 Legs, piano
 Legs, sink
 Legs, table
 Lids, water closet
 Light vehicle bodies
 Lining, elevator car
 Lower panels, light delivery wagon bodies
 Mantels
 Mantels, soda fountain
 Manure spreaders
 Medicine cabinets
 Meeting rails, sash
 Milk counters, dairyman's
 Mine cars
 Mine trucks
 Mirror cases
 Mirror doors, house
 Mirrors, adjustable shaving
 Mission furniture
 Models, machine
 Moulding, automobile
 Moulding, bed, house interior trim
 Moulding cap, house interior trim
 Moulding, cove, house construction
 Moulding, crown, house construction
 Mouldings, piano
 Mouldings, picture
 Moulding, plaster, house construction
 Moulding, quarter round
 Moulding, screen
 Moulding, spring cove, house construction
 Mounting boards, telegraph instruments
 Mug cases, barber shop
 Mullions, sash
 Music shelf, piano
 Nosing, house interior trim
 Novelties
 Organ cases
 Organs, cabinet
 Organs, pipe
 Overhead beams, dumb waiters
 Overhead beams, freight elevators
 Paddle wheels, excursion boats
 Panel strips, house interior trim
 Panel work, display windows
 Panel work, store fixtures
 Panels, bed
 Panels, door
 Panels, stair work
 Parallel bars, gymnasium
 Parlor cabinets, exterior
 Partition moulds, house interior trim
 Partitions, office
 Partitions, store
 Parts, cultivator
 Parts, wood sawing machine
 Passenger cars, frames
 Pastry sets
 Patterns
 Pedestals
 Pew book racks
 Pews, church
 Picker sticks, loom
 Pilasters, furniture
 Pilasters, mantel
 Pilasters, piano
 Pillars, chair
 Pilots, locomotive
 Pilot wheels, river craft
 Pilot wheels, ship
 Pilot wheels, yacht
 Pins, insulator
 Plant stands
 Platforms, ten pin setters
 Platforms, freight cars
 Plate rail, dining room
 Plate racks
 Play yards, baby
 Players, piano
 Plow beams
 Plow handles
 Plow parts
 Plows
 Poison cases, drug store
 Poles, curtain
 Poles, farm machinery
 Poles, light vehicle
 Poles, wagon
 Porch swings
 Posts, buffets
 Posts, carriage body
 Posts, chair
 Posts, heavy wagon body
 Posts, railway car frame
 Posts, traction engine cab
 Posts, wagon body
 Press, tennis racket
 Princess dressers
 Pulpits, church
 Racks, billiard ball
 Racks, coat
 Racks, display
 Racks, key
 Rails, bed
 Rail, billiard table
 Rails, boat
 Rails, chiffoner
 Rails, china closet
 Rails, door
 Rails, dresser
 Rails, stair
 Rails, table
 Rails, truck
 Rails, wagon
 Reaches, buggy
 Reaches, heavy vehicle
 Reaches, heavy wagon
 Reaches, lumber wagon
 Reaches, perch spring wagon
 Reaches, surrey
 Reading desks, church
 Rear end posts, light delivery wagon
 Reed organs, exterior work
 Reels, cable
 Reels, wire rope
 Refrigerators
 Ribs, row boat
 Ribs, row boat (round bottom)
 Ribs, motor boat
 Ribs, wagon top
 Rims
 Rims, automobile wheel
 Rims, buggy wheel
 Rims, heavy vehicle wheel
 Rims, sieve
 Rims, split wood pulleys
 Rings, necktie
 Rocker frames
 Rockers, chair
 Rockers, porch chair (rustic)
 Rockers, toy
 Rollers, field
 Rollers, home trainers
 Road carts, bottom boards
 Rounds, chair
 Rounds, plow
 Row boats, parts
 Rudders, ship
 Rudders, yacht
 Rudders, river craft
 Rungs, chair
 Rungs, ladder
 Runners, sleigh
 Running boards, locomotive
 Sand boards, game
 Sand boards, wagon
 Sash
 Scows, frames
 Screens, fire
 Seat boards, light delivery wagon
 Seats, automobile car
 Seats, ball
 Seats, piano
 Seats, water closet
 Seats, wire frame chair
 Secretaries, exterior
 Serving tables
 Settee
 Settles
 Sewing machine parts
 Shafts, dump cart
 Sheathing
 Shelves, book
 Shelves, china closet
 Shelves, mantel
 Shelves, table
 Shelving, china closet
 Showcase
 Shuffleboards
 Sideboards, exterior
 Sideboards, built-in
 Side pillars, light delivery wagon
 Side sills, light delivery wagon
 Side stakes, freight car
 Sides, billiard table
 Sides, dump wagon body
 Sides, parlor settle
 Sides, pit car
 Sides, table
 Sides, truck
 Sidings, boat
 Sidings, mine car
 Sills, automobile body
 Sills, carriage
 Sills, freight car
 Sills, gasoline engine truck
 Sills, light delivery wagon
 Sills, railway car
 Sills, stone crusher
 Sills, truck
 Sills, vehicle body
 Sills, wagon
 Singletrees (vehicle)
 Slats, automobile
 Slats, bed
 Sleds, toy
 Sofas, exterior
 Sofa frames, (upholstered furniture)
 Spindles, chair
 Splints, surgical
 Spokes, automobile wheel
 Spokes, heavy vehicle wheel
 Spokes, wagon
 Spokes, wagon wheel
 Spring bars
 Spring blocks, railway cars
 Spring blocks, railway tank cars
 Stanchions
 Stanchions, boat
 Stanchions, canal boat
 Stanchions, river craft
 Stanchions, ship
 Stanchions, wagon top
 Stanchions, yacht
 Standards, chiffoner
 Standards, dressing table
 Stands
 Stands, bedroom
 Stands, Bible
 Stands, chafing dish
 Stands, city directory
 Stands, flower
 Stands, ball (exterior)
 Stands, jardiniere
 Stands, lamp
 Stands, typewriter
 Stands, umbrella
 Stands, water cooler
 Staves, land roller drum
 Staves, oil barrel
 Staves, slack coopeage
 Staves, tight coopeage stock
 Staves, water tank
 Staves, whiskey barrel
 Stay bars, light delivery wagon
 Stays, boat
 Stems, canal boat

OAK, WHITE—Concluded

Stems, motor boat	Tables, library	Transoms, row boat (round bot- tom)
Stems, river craft	Tables, lunch room	Treadle sticks, loom
Stems, ship	Tables, parlor	Tree blocks, shoe
Stems, yacht	Tables, sewing	Truck bolsters, freight car
Steps, stairwork	Tables, tea	Trucks
Stern posts, canal boat	Tables, typewriter	Trucks, freight car
Stern posts, motor boat	Tables, writing	Trucks, stevedore
Stern posts, river craft	Tabourets,	Vats, beer
Stern posts, row boats	Tail boards, wagon	Vats, oil
Stern posts, row boats (round bottom)	Tank cases, water closet	Vehicle (gear parts)
Stern posts, ship	Tanks	Veneer
Stern posts, yacht	Tanks, brewery	Veneer, furniture
Stiles, door	Tanks, distilling	Veneered doors, craftsman
Stools, office	Tanks, diving (theatrical)	Ventilators, window
Stools, piano	Thresholds	Vestment cases, church
Stops, door, house interior trim	Thresholds, house interior trim	Wagons, diamond drill
Straw carriers	Tie beams, cars	Wainscoting
Stretchers, chair	Ties, railroad track	Wainscoting caps, house inte- rior trim
Stretchers, table	Tight cooperage stock	Wainscoting (elevator cars)
Stringers, railway car	Tillers, canal boat	Wainscoting rail, house inter- rior trim
Studding, log car	Tillers, river craft	Wall cases
Superstructure, launches	Tongues, cultivator	Wardrobes (exterior)
Sway bars, wagon	Tongues, corn planter	Washers, fire escape construc- tion
Sweep sticks, loom	Tongue bounds, wagon	Washstands, exterior
Swing cleats, curtain pole	Tongues, heavy wagon	Wedges, foundry
Swings, lawn	Top rails, light delivery wagon bodies	Wheels, water mill
Swings, porch	Top rails (sash)	Windlass frames, derrick
Switchboards, telephone	Tops, chair	Window apron, house interior trim
Switch timbers, railroad	Tops, counter	Window screens
Tables	Tops, dresser	Window sills
Table slides	Tops, table	Window stool, house interior trim
Tables, billiard	Tops, wire frame tables	
Tables, dining	Toy furniture	
Tables, dressing	Toy tops	
Tables, drop leaf	Trays, jewelry display	
Tables, extension	Trays, sewing	
Tables, folding		

OLIVEWOOD

Backs, clothes brush	Pipes, smoking
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PEARWOOD

T-squares, drawing

PERSIMMON

Handles, brick trowel	Lasts, shoe	Shuttles
Heads, golf clubs		

PINE, LOBLOLLY

Backing, furniture	Ceiling, traction engine cabs	Gates, freight elevator
Balusters (stair)	Clapboards	Guide rails (dumb waiter)
Barn boards	Coffins	Hand rails, stair
Battens, o. g. barn	Cores, veneer	Heading, slack cooperage
Beams, o. h. (elevator)	Cornice	Insulator pins
Beams, ship	Cornice, house construction	Interior finish
Bevel cribbing	Crates, beer	Interior finish, house
Blowers, organ	Crates, cabbage	Interior trim, house
Blowers, player piano	Crates, milk bottle	Lath
Boat construction	Crating	Lining, dumb waiter shaft
Boards, lopping	Cross arms, telegraph pole	Lining, freight cars
Bottom rails, sash	Cross-ties, railroad	Lockers
Bottoms, bank fixtures	Cupboards, built in	Meeting rails, sash
Bottoms, office fixtures	Decking, freight cars	Mouldings
Bottoms, store fixtures	Doors	Moulding, bed, house construc- tion
Box shooks	Doors, freight car	Moulding, crown, house con- struction
Boxboards, heavy vehicles	Excelsior	Moulding, crown, house con- struction
Boxes	Excelsior, packing	Moulding, picture
Boxes, bottle	Excelsior, ribbon (mattress stuffing)	Mull ons, sash
Boxes, coffee	Facia boards, freight cars	Newel posts, angle
Boxes, dry goods	Fallow boards, foundry	Newel posts, starting
Boxes, feed cutter	Fencing	Nosing, interior house trim
Boxes, packing	Fixtures	Panels, door
Boxes, root cutters	Fixtures, office	Paper pulp
Boxes, trunk	Fixtures, store	Partition, house
Boxes, weight (dumb waiter)	Flooring	Patterns (foundry)
Boxes, weight (elevator)	Flooring, porch	Plankling, ship
Brackets, stair	Flooring, wagon bed	Platforms, carriage holst
Cabinets	Frames, coal screens	Platforms (elevator)
Car decking	Frames, door	Poles, tent
Car siding	Frames, gravel screen	Porch work
Cases, casket	Frames, passenger car	Rails, door
Cases, clock	Frames, sand shaking screens	Rails, stair
Cases, shipping	Frames, window	
Casing	Fruit jar cases	
Celling		

LOBLOLLY PINE—Continued

Risers, stair
 Roof ribs, freight cars
 Roofing, house
 Rosettes, wall (stair)
 Rough horses (stairway)
 Safes, kitchen
 Sash
 Screens, door
 Screens, window

Sheathing
 Shelves, dumb waiter
 Shelves, mantel
 Shelving
 Shiplap
 Shoe rails, stair
 Side boards, wheelbarrow
 Sides, corn sheller
 Slats, bed

Staves, slack cooperage
 Stiles, door
 String boards (stair)
 Superstructure, electric cars
 Top rails, sash
 Treads, stair
 Wainscoting
 Weight boxes (elevator)

PINE, LONGLEAF

Astragals, folding door
 Astragals, sliding door
 Backing, counters
 Balusters, porch
 Balusters, stair
 Barn boards
 Barge construction
 Base blocks, house interior trim
 Baseboards
 Base board, house interior trim
 Base corners, house interior trim
 Base moulding, house interior trim
 Bases, gasoline engine
 Battens, dumb waiter
 Battens, o. g. barn
 Bay brackets, house construction
 Beams, derrick
 Beams, dining room ceiling
 Beams, elevator
 Beds, coal wagon
 Beds, light delivery wagons
 Bevel cribbing
 Bevel siding, house
 Blind stops, house construction
 Blinds, window
 Blocking, railway tank cars
 Bodies, manure spreader
 Bodies, railway cars
 Bodies, sugar corn cars
 Booms, river craft
 Booms, ship
 Bottom rails (sash)
 Bottom rail, porch
 Bottoms, dump cart
 Bottoms, heavy vehicle
 Bottoms, lawn swings
 Bottoms, light vehicles
 Bottoms, push carts
 Boxboards, dump carts
 Boxboards, wagon
 Box shooks
 Boxes, lime and fertilizer
 Boxes, sawyers
 Braces, freight car
 Brackets, plate rail
 Brackets, porch
 Brackets, stair
 Bridge poles (car)
 Cabinet work
 Cabinets (dental)
 Cabinets, jewelry
 Cabinets, (toilet)
 Cabins, canal boats
 Cabins, exterior, river craft
 Cabins, exterior, ships
 Cabins, exterior, yachts
 Capitals
 Capping, sink, house interior trim
 Carpet strips, house interior trim
 Cars, dumb waiter
 Cars, elevator
 Cart beds
 Cases, china
 Cases, medicine
 Cases, tobacco
 Casings, door
 Casings, window
 Ceiling
 Chair rail, house interior trim
 Cleats, dumb waiter
 Climbing poles, gymnasium
 Colonnades, house interior trim
 Consoles
 Corner beads, house interior trim
 Corner blocks, house interior trim
 Corner posts, freight cars

Cornice, house construction
 Cores, veneer doors
 Cores, veneer panels
 Covers, ice freezing can
 Covers, tank
 Cradles, tank cars
 Crates, cabbage
 Cresting, porch roof
 Cross-arms
 Cross-ties, railroad
 Deck beams, boat
 Decking, freight cars
 Decking, canal boats
 Decking (ship and boat)
 Derricks, oil well
 Doors, dumb waiter shaft
 Doors, folding
 Doors, railway box cars
 Doors, sliding
 Dumb waiter
 Dust cap, house interior trim
 Elevators (freight)
 Elevators (passenger)
 Eversers
 Face brackets, house construction
 Fencing
 Fillet, house interior trim
 Finish, boats
 Finish, caboose interior
 Fixtures, bar room
 Fixtures, barber shop
 Fixtures, cafe
 Fixtures, laboratory
 Fixtures, office
 Fixtures, store
 Flat battens, house interior trim
 Flooring, automobile
 Flooring, engine cab
 Flooring, freight cars
 Flooring, freight elevators
 Flooring, house
 Flooring, locomotive tender
 Flooring, passenger elevators
 Flooring, porch
 Flooring, refrigerator cars
 Flooring, scale platforms
 Footing pieces (elevator)
 Forms, sewer
 Frames, awning
 Frames, barge
 Frames, box car
 Frames, couch
 Frames, door
 Frames, front door side light
 Frames, log turners
 Frames, motor boat hulls
 Frames (passenger cars)
 Frames, railroad snow plows
 Frames, road scrapers
 Frames, scow
 Frames, store truck
 Frames, window
 Framing, freight car
 Frieze rail, porch
 Front doors, house
 Gable brackets, house construction
 Gable ornaments, house construction
 Grilles, house interior trim
 Guides, mine shaft
 Guide rails, dumb waiter
 Gunwales, row boat (flat bottom)
 Hand cars
 Hand cars, railway
 Hand rails, stair
 Hay beam, farm wagon
 Hay ladders, farm wagon
 Hay rake posts
 Head blocks, boat

Head blocks, house interior trim
 Head blocks, tank cars
 Head casing, house interior trim
 Header posts
 Heading, slack cooperage
 Ice boxes
 Interior finish
 Jambs, door
 Keel strips, row boat (flat bottom)
 Keelsons, river craft
 Keelsons, ship
 Keelsons, yacht
 Ladders, exterior
 Ladders, step
 Lath
 Lattice
 Lids, water closet
 Lining cars
 Lining, freight cars
 Lining, light delivery wagon
 Lining, box cars
 Long sills, freight cars
 Mantels
 Manure spreaders
 Meeting rails (sash)
 Mirror doors, house construction
 Moulding, bed, house construction
 Moulding, brick, house construction
 Moulding, cap, house interior trim
 Moulding, cove
 Moulding, crown, house construction
 Moulding, drip cap, house construction
 Moulding, picture
 Moulding, plaster, house construction
 Moulding, quarter round
 Moulding, screen
 Moulding, spring cove, house construction
 Mountings, rock crushers
 Mullions, sash
 Needle beams (railway car frames)
 Newel posts, angle
 Newel posts, starting
 Nosing, house interior trim
 Ornaments, furniture
 Overhead beams, dumb waiter
 Panel strips, house interior trim
 Panels, door
 Panels, stair work
 Panels, veneered
 Paper pulp
 Parting strips, house interior trim
 Partition, house
 Partition moulds, house interior trim
 Parts, milling machinery
 Parts, railway motor car
 Planos, interior parts
 Planking, boat
 Planking, canal boat
 Plates, freight cars
 Plate rail, dining room
 Plates, electric car
 Plates, freight cars
 Plates, passenger cars
 Platforms, freight elevator
 Platforms, passenger elevator
 Platforms, tank
 Plugs, cross-tie
 Plumber's woodwork
 Poles, farm implements
 Poles, flag

PINE, LONGLEAF—Concluded

Poles, land rollers	Shelves	Stringers, railway car
Poles, tent	Shelves, mantel	Studding
Poles, wagon	Shiplap	Supports, elevator
Porch columns, built up	Shoe rails, stair	Supports, tank
Porch columns, solid	Show cases	Swings, lawn
Porch newels, built up	Shutters	Swings, porch
Porch newels, solid	Sideboards, built in	Tackle blocks
Porch spandrel	Side planks (gondola cars)	Tanks
Posts, freight cars	Side plates	Tanks, acid
Push cars	Side plates (railway freight cars)	Tanks, paper mill
Racks, rug display	Sides, coal flats	Tanks, pickling
Rails, door	Sides, dumb waiter	Thresholds
Rails, river craft	Siding	Thresholds, house interior trim
Railway car construction	Siding, box cars	Tillers, canal boat
Reels, cable	Siding, caboose	Tillers, river craft
Reels, wire rope	Siding, freight car	Tongues, agricultural machinery
Refrigerators	Signboards	Tongues, farm machinery
Refrigerators, outside	Signs, advertising	Tongues, manure spreaders
Ridge poles, freight cars	Sills, door	Tongues, wagon
Risers, stair	Sills, electric cars	Top rail, porch
Risers, row boat (flat bottom)	Sill, freight car	Top rails (sash)
Roof framing, silos	Sills, railway car	Tops, freezing tank
Roof ribs, freight cars	Sills, window	Tops, land rollers
Roofing, box cars	Sinos	Treads, stair
Roofing, freight cars	Sink aprons, house interior trim	Trunks
Roofing, house	Slats, bed	Upper belt rails (freight cars)
Rosettes, wall (stairway)	Slats, railway cattle cars	Upright, row boats (flat bottom)
Rough horses, stair	Slide, fly screen	Vats
Running boards, locomotive	Snow boards, engine pilot	Wainscot rail, house interior trim
Sash	Spindles, porch	Wainscotting
Scales	Stakes, gondola cars	Wainscotting cap, house interior trim
Scoop boards	Staves, silo	Wall cases
Scows	Staves, slack cooerage	Water tanks, railroad
Screens, door	Stems, canal boat	Window apron, house interior trim
Screens, window	Stem posts, row boat	Window stool, house interior trim
Scroll sawed balusters, porch	Stiles, door	Wire cloth display racks
Seat boards, light delivery wagon	Stops, door, house interior trim	
Seats, rowboat	Stops, window, house interior trim	
Seats, water closet	String boards, stair	
Sheathing		

PINE, NORWAY

Balusters, porch	Flat battens, house interior trim	Moulding, spring cove, house construction
Base blocks, house interior trim	Flooring, freight cars	Mullions, sash
Base board, house interior trim	Frames	Nosing, house interior trim
Base corners, house interior trim	Frames, front door side light	Parting stop, house interior trim
Base moulding, house interior trim	Frames, window	Partition moulds, house interior trim
Battens, o. g. barn	Frieze rail, porch	Panels, door
Bay brackets, house construction	Front doors, house	Panel strips, house interior trim
Beams, dining room ceiling	Gable brackets, house construction	Plate rail, dining room
Blind stops, house construction	Gable ornaments, house construction	Porch columns, built up
Bottom rail, porch	Grilles, house interior trim	Porch columns, solid
Bottom rail, sash	Head blocks, house interior trim	Porch newels, built up
Brackets, plate rail	Heading, plate glass shipping cars	Porch newels, solid
Brackets, porch	Jamb, door	Porch, spandrels
Cabs, locomotive	Lattice	Rails, door
Capping, sink, house interior trim	Mantels	Roof strips, freight car
Carpet strips, house interior trim	Meeting rail, sash	Scroll sawed balusters, porch
Casing, door	Mirror doors, house	Sink aprons, house interior trim
Casing, window	Moulding, bed, house construction	Slide, fly screen
Chair rail, house interior trim	Moulding, brick, house construction	Spindles, porch
Colonnades, house interior trim	Moulding, cap, house interior trim	Stiles, door
Corner blocks, house interior trim	Moulding, cove	Stops, door, house interior trim
Consoles	Moulding, crown, house construction	Stops, window, house interior trim
Cresting, porch roof	Moulding, drip cap, house construction	Top rail, porch
Door battens, freight car	Moulding, picture	Top rails, sash
Doors, folding	Moulding, plaster, house construction	Wainscot rail, house interior trim
Doors, sliding	Moulding, quarter round	Wainscotting cap, house interior trim
Face brackets, house construction	Moulding, screen	Window apron, house interior trim
Filllet, house interior trim		Window stool, house interior trim
Flasks, foundry		

PINE, PITCH

Bottom boards, farm wagon bodies	Boxes, soap	Flooring, house
Box shoeks	Cornice, house construction	Pallets, fire brick
Boxes, packing	Crating	Wainscotting, house construction
	Flats, hay wagon	

PINE, SCRUB

Battens, o. g. barn	Flooring	Frames, window
Box shoeks	Flooring, porch	Paper pulp
Boxes, packing	Flooring, railway cars	Roofers
Cases, packing	Frames, door	Running boards, electric car
Casing, door	Frames, front door side light	Scroll sawed balusters, porch
Casing, window	Frames, mirror	Siding, barn
Crating	Frames, picture	Thresholds
Excelsior		

PINE, SHORTLEAF

Astragals, folding door	Flooring, porch	Panel strips, house interior trim
Astragals, sliding door	Frames, cellar window	Paper pulp
Balusters, porch	Frames, cold storage doors	Parting strip, house interior trim
Balusters (stair)	Frames, door	Partition, house
Barn boards	Frames, front door side light	Partition moulds, house interior trim
Base blocks, house interior trim	Frames, land rollers	Parts, butter workers
Base board, house interior trim	Frames, lawn swings	Plate rail, dining room
Base corners, house interior trim	Frames, window	Planking, yacht
Base moulding, house interior trim	Framing, passenger cars	Porch columns, built up
Battens, o. g. barn	Frieze rail, porch	Porch columns, solid
Bay brackets, house construction	Front doors, house	Porch newels, built up
Beams, dining room ceiling	Gable brackets, house construction	Porch newels, solid
Beds, farm wagon	Gable ornaments, house construction	Porch spandrel
Bevel cribbing	Grilles, house interior trim	Props, clothes
Bevel siding, house	Gunwales, row boat (flat bottom)	Rails (door)
Blind stop, house construction	Hand cars	Reels, cable
Boards, lapping	Hand rails (stair)	Reels, wire rope
Booms, river craft	Handles, brush	Refrigerators
Booms, ship	Handles, long handled dust brush	Risers, row boat (flat bottom)
Bottom boards, foundry flask	Handles, mop	Risers, stair
Bottom boards, row boat	Handles, wall brush	Roof boards, silo
Bottom rails, porch	Hatch covers, river craft	Roofing, box cars
Bottom rails (sash)	Hatch covers, ship	Roofing, freight cars
Box boards	Hatch covers, yacht	Roofing, house
Box shooks	Head blocks, house interior trim	Roofing, railway car
Boxes, feed cutter	Head casing, house interior trim	Roofing, railway freight cars
Boxes, packing	Heading, slack cooorage	Rosettes, wall (stairway)
Boxes, soap	Insulation (refrigerator cars)	Rough horses (stairway)
Brackets, plate rail	Jams, door	Sash
Brackets, porch	Keel strips, row boats (flat bottom)	Screens, door
Brackets, stair	Ladders, river craft	Screens, window
Capping, sink, house interior trim	Ladders, ship	Scroll sawed balusters, porch
Carpet strip, house interior trim	Ladders, step	Seats, automobile
Casing, window	Lath	Seats, row boat
Casing, door	Lattice	Sheathing
Celling	Lining, box cars	Sheathing, house
Chair rail, house interior trim	Lining (cars)	Shelves, mantel
Colonnades, house interior trim	Lining, railway car	Shelving
Consoles	Lining, railway freight cars	Shiplap
Corner beads, house interior trim	Mantels	Shoe rails (stair)
Corner blocks, house interior trim	Meeting rails (sash)	Siding, barn
Cornice	Mirror doors, house	Siding, box cars
Cornice, house construction	Moulding, bed, house construction	Siding, dredge
Covers, tank	Moulding, brick, house construction	Siding, freight cars
Crating	Moulding, cap, house interior trim	Siding, house
Cresting, porch roof	Moulding, cove	Siding, railway car
Cross arms, telegraph pole	Moulding, crown, house construction	Sink aprons, house interior trim
Cross-ties, railroad	Moulding, drip cap, house construction	Slide, fly screen
Decking (cars)	Moulding, electric wire	Spindles, porch
Doors	Moulding, quarter round	Staves, slack cooorage
Doors, folding	Moulding, picture	Stiles (door)
Doors, freight cars	Moulding, plaster, house construction	Stops, door, house interior trim
Doors, sliding	Moulding, screen	Stops, window, house interior trim
Dust cap, house interior trim	Moulding, spring cove, house construction	String boards (stair)
Face brackets, house construction	Mullions (sash)	Stringers, railway cars
Fallow boards, foundry	Newel posts, angle	Timbers, ship
Fencing	Newel posts, starting	Top rail, porch
Fenders, boat and ship	Nosing, house interior trim	Top rails (sash)
Fillet, house interior trim	Panels (door)	Treads, stair
Flasks, foundry	Panels, stair work	Uprights, row boat (flat bottom)
Flat battens, house interior trim		Wainscoting
Floor boards, truck		Wainscoting cap, house interior trim
Floor boards, wagon		Wainscot rail, house interior trim
Flooring, freight cars		Window apron, house interior trim
Flooring, house		Window stool, house interior trim
Flooring, incubators		Transoms, row boat
Flooring, locomotive tender		

PINE, SUGAR

Astragals, folding door	Brackets, plate rail	Face brackets, house construction
Balusters, porch	Brackets, porch	Fillet, house interior trim
Base blocks, house interior trim	Capping, sink, house interior trim	Flat battens, house interior trim
Base board, house interior trim	Carpet strip, house interior trim	Frames, door
Base corners, house interior trim	Casing, door	Frames, front door side light
Base moulding, house interior trim	Chair rail, house interior trim	Frames, pipe organ
Battens, o. g. barn	Colonnades, house interior trim	Frames, window
Bay brackets, house construction	Consoles	Frieze rail, porch
Beams, dining room ceiling	Corner blocks, house interior trim	Front doors, house
Blind stop, house construction	Cresting, porch roof	Gable brackets, house construction
Bottom rail, porch	Doors, folding	Gable ornaments, house construction
Bottom rails, sash	Doors, sliding	Grilles, house interior trim
Boxing, pipe organ	Dust cap, house interior trim	

PINE, SHORTLEAF—Concluded

Head blocks, house interior trim	Moulding, plaster, house construction	Sills, pipe organ
Head casing, house interior trim	Moulding, quarter round	Sink aprons, house interior trim
Mullions, sash	Moulding, screen	Slide, fly screen
Jambs, door	Moulding, spring cove, house construction	Spindles, porch
Lattice	Nosing, house interior trim	Stiles, door
Mantels	Panel strips, house interior trim	Stops, door, house interior trim
Meeting rail, sash	Panels, door	Stops, window, house interior trim
Mirror doors, house	Parting stop, house interior trim	Swell boxes, pipe organ
Moulding, bed, house construction	Partition moulds, house interior trim	Top rail, porch
Moulding, brick, house construction	Plate rail, dining room	Top rails, sash
Moulding, cap, house interior trim	Porch columns, built up	Wainscot rail, house interior trim
Moulding, cove	Porch columns, solid	Wainscoting, cap, house interior trim
Moulding, drip cap, house construction	Porch newels, solid	Wind chests, pipe organ
Moulding, picture	Porch spandrels	Window apron, house interior trim
	Rails, door	Window stool, house interior trim
	Scroll sawed balusters, porch	

PINE, WESTERN YELLOW

Balusters, porch	Fillet, house interior trim	Moulding, spring cove, house construction
Base blocks, house interior trim	Flat battens, house interior trim	Mullions, sash
Base board, house interior trim	Frames, door	Nosing, house interior trim
Base corners, house interior trim	Frames, window	Panel strips, house interior trim
Base moulding, house interior trim	Frieze rail, porch	Panels, door
Battens, o. g. barn	Front doors, house	Parting strips, house interior trim
Bay brackets, house construction	Gable brackets, house construction	Partition moulds, house interior trim
Beams, dining room ceiling	Gable ornaments, house construction	Plate rail, dining room
Blind stop, house construction	Grilles, house interior trim	Porch columns, built up
Bottom rails, sash	Jambs, door	Porch columns, solid
Bottom rail, porch	Head blocks, house interior trim	Porch newels, built up
Brackets, plate rail	Head casing, house interior trim	Porch newels, solid
Brackets, porch	Lattice	Porch spandrels
Capping, sink, house interior trim	Mantels	Rails, door
Carpet strip, house interior trim	Meeting rails, sash	Scroll sawed balusters, porch
Casing, door	Mirror doors, house	Sink aprons, house interior trim
Casing, window	Moulding, bed, house construction	Slide, fly screen
Chair rail, house interior trim	Moulding, brick, house construction	Spindles, porch
Colonnades, house interior trim	Moulding, cap, house interior trim	Stiles, door
Consoles	Moulding, cove	Stops, door, house interior trim
Corner blocks, house interior trim	Moulding, crown, house construction	Stops, window, house interior trim
Cresting, porch roof	Moulding, drip cap, house construction	Top rail, porch
Cross-ties, railroad	Moulding, picture	Top rails, sash
Doors, folding	Moulding, plaster, house construction	Wainscot rail, house interior trim
Doors, sliding	Moulding, screen	Wainscoting cap, house interior trim
Dust cap, house interior trim		Window apron, house interior trim
Face brackets, house construction		Window stool, house interior trim

PINE, WESTERN WHITE

Astragals, folding door	Doors, folding	Moulding, cap, house interior trim
Astragals, sliding door	Doors, sliding	Moulding, cove
Balusters, porch	Dust cap, house interior trim	Moulding, crown, house construction
Base blocks, house interior trim	Face brackets, house construction	Moulding, drip cap, house construction
Base board, house interior trim	Fillet, house interior trim	Moulding, plaster, house construction
Base corners, house interior trim	Flat battens,, house interior trim	Moulding, screen
Ease moulding, house interior trim	Frieze rail, porch	Moulding, spring cove, house construction
Battens, o. g. barn	Front doors, house	Nosing, house interior trim
Bay brackets, house construction	Frames, door	Panel strips, house interior trim
Beams, dining room ceiling	Frames, front door side light	Parting stop, house interior trim
Blind stop, house construction	Frames, window	Partition moulds, house interior trim
Bottom rail, porch	Gable brackets, house construction	Plate rail, dining room
Brackets, plate rail	Gable ornaments, house construction	Porch columns, built up
Brackets, porch	Grilles, house interior trim	Porch columns, solid
Capping, sink, house interior trim	Head blocks, house interior trim	Porch newels, built up
Carpet strips, house interior trim	Head casing, house interior trim	Porch newels, solid
Casing, door	Jambs, door	Porch spandrels
Casing, window	Key bottoms, piano	Scroll sawed balusters, porch
Chair rail, house interior trim	Mantels	Sink aprons, house interior trim
Colonnades, house interior trim	Mirror doors, house	Slides, fly screen
Consoles	Moulding, bed, house construction	
Corner blocks, house interior trim	Moulding, brick, house construction	
Cresting, porch roof		
Cross-ties, railroad		

PINE, WESTERN WHITE—Continued.

Spindles, porch	Veneer cores, piano cases	Window apron, house interior
Stops, door, house interior trim	Wainscot rail, house interior trim	Window trim
Stops, window, house interior trim	Wainscoting cap, house interior trim	Window stool, house interior trim
Top rail, porch		

PINE, WHITE

Astragals, folding door	Consoles	Lining (railway box cars)
Astragals, sliding door	Corner blocks, house interior trim	Lap siding, house
Backs, buffets	Cornice work	Lattice
Backs, bureau	Crating	Mantels
Backs, china closets	Crates, bee	Matches
Backs, mirror	Cresting, porch roof	Mirror doors, house
Balusters, porch	Cross-ties, railroad	Models, machine
Balusters (stair)	Decking, yacht	Moulding, bed, house construction
Base blocks, house interior trim	Doors, dumb-waiter shafts	Moulding, brick, house construction
Base board, house interior trim	Doors, fire	Moulding, cap, house interior trim
Base corners, house interior trim	Doors, folding	Moulding, cove
Base moulding, house interior trim	Doors, freight cars	Moulding, crown, house construction
Battens, o. g. barn	Doors, sliding	Moulding, drip cap, house construction
Bay brackets, house construction	Doors, stable	Moulding, picture
Beams, dining room ceiling	Drain boards, sink	Moulding, plaster, house construction
Beds, light delivery wagon	Drain boards, soda fountain	Moulding, quarter round
Beds, sled	Dust cap, house interior trim	Moulding, screen
Bee hives	Ends, leaf tobacco cases	Moulding, spring cove, house construction
Bins, flour	Excelsior	Moulding, spring cove, house construction
Bins, grain	Face brackets, house construction	Moulding, spring cove, house construction
Bins, mill feed	Face boards, freight cars	Moulds, brick
Blind stop, house construction	Fillet, house interior trim	Moulds, foundry
Blinds, window	Flat battens, house interior trim	Newel posts, angle
Blocks, toy wagon	Flooring	Newel posts, starting
Boards, drawing	Flooring, carriage bodies	Nosing, house interior trim
Boards, lapping	Flooring, collapsible crates	Organs, interior parts-
Boats, row	Flooring, engine cabs	Pails, candy
Bodies, wagon	Flooring, freight cars	Panel strips, house interior trim
Bottom boards, coal flats	Flooring, incubators	Panels, stair work
Bottom boards, barge	Flooring, mine dump cars	Panels, wagon bodies
Bottom boards, foundry flasks	Flooring, road scrapers	Paper pulp
Bottom boards, row boat	Folding frames, baby bath tub	Parting stop, house interior trim
Bottom boards, scow	Forms, concrete	Partition moulds, house interior trim
Bottom rail, porch	Frames, door	Patterns
Bottoms, dredge	Frames, front door slide light	Patterns, rubber factory
Bottoms, farm wagon bodies	Frames, mirror	Pipe organs, interior parts
Bottoms, grape basket	Frames, picture	Pipe, wooden, water
Bottoms, leaf tobacco cases	Frames, tobacco	Pipes, organ
Bottoms, threshing machine	Frames, window	Planking, barge
Bottoms, toy wagons	Frieze rail, porch	Planking, river craft
Bottoms, toy wheelbarrows	Front doors, house	Planking, scow
Box shooks	Gable brackets, house construction	Planking, ship
Box shooks, tobacco	Gable ornaments, house construction	Planking, yacht
Boxes, battery	Grilles, house interior trim	Plate rail, dining room
Boxes, entomological	Guide posts, elevator	Porch columns, built up
Boxes, packing	Gunwales, boat	Porch columns, solid
Boxes, plant	Hatch covers, canal boats	Porch newels, built up
Boxes, shoe	Hatch covers, river craft	Porch newels, solid
Boxes, trunk	Hatch covers, ship	Porch spandrels
Boxes, weight (elevator)	Hatch covers, yacht	Posts, elevator
Brackets, plate rail	Head blocks, house interior trim	Presses, cider
Brackets, porch	Head casing, house interior trim	Props, clothes
Brackets, stair	Heading, plate glass shipping case	Rails, stair
Brackets, telegraph pole	Heading, tight cooperage	Rails, cable
Brake locks, mine car	Heading, slack cooperage	Rails, wire rope
Brooders	Hoppers, feed mill elevators	Risers, stair
Bull wheel carts, oil well machinery	Hoppers, mill feed	Rollers, land
Bungs	Hoppers, flour	Roof strips, freight car
Bushel crates	Hoppers, grain	Rosettes, wall (stairway)
Cabin finish, canal boats	Iceing vats, dairyman's	Rough horses, stair work
Cabins, canal boats	Interior finish, house	Rudders, river craft
Cabins, exterior, river craft	Insulation (railway refrigerator cars)	Rudders, ship
Cabin exterior, ships	Jambs, door	Rudders, yacht
Cabin, exterior, yachts	Jambs (elevator)	Running boards, freight cars
Capping, sink, house interior trim	Joiner bulkheads, ship	Screens, door
Carpet strip, house interior trim	Joiners, deck (ship)	Screens, window
Cases, coffin	Keels, canal boat	Scroll sawed balusters, porch
Cases, organ	Keels, river craft	Scows, coal
Cases, packing	Keels, ship	Scows, sand
Cases, sample	Keels, yacht	Seat boards, light delivery wagon
Cases, tobacco	Lids, grape basket	Seats, row boat
Cases, tool	Lining, cast iron pipe for coal mines	Shelves, dumb-waiter
Casing, door	Lining, dumb waiter shafts	Shelving
Casing, window	Lining, light delivery wagon	Shoe rails (stair)
Caskets, exterior		Sides (dumb-waiter)
Chair rail, house interior trim		Sides, engine cabs
Chests, clothes		Sides, farm wagon bodies
Cider mills		
Colonial columns		
Colonnades, house interior trim		

PINE, WHITE—Continued

Slides, leaf tobacco cases
 Slides, mine dump cars
 Sides, river barges
 Sides, row boat
 Sides, threshing machine
 Sides, wagon boxes
 Siding, barge
 Siding (freight box cars)
 Siding, house
 Siding (railway cattle cars)
 Siding, railway coaches
 Silos
 Slink aprons, house interior trim
 Slide, fly screen
 Spindles, porch
 Stakes, mine

Stakes, surveyors'
 Staves, slack cooperage
 Stools, bench
 Stops, door, house interior trim
 Stops, window, house interior trim
 Store fronts
 String boards (stair)
 Taffy sticks, confectioners'
 Tanks
 Templates
 Tool boxes, stone crusher
 Top rail, porch
 Top slats, light delivery wagon bodies
 Tops, leaf tobacco cases

Toy carts
 Toy furniture
 Treads, stair
 Trunks
 Vats
 Wainscot rail, house interior trim
 Wainscotting cap, house interior trim
 Wheels, water mill
 Wind chests, pipe organ
 Window apron, house interior trim
 Window stool, house interior trim
 Work boards, bar room

POPLAR, YELLOW

Actions, piano players
 Antique furniture, hidden work
 Apparatus parts (electric)
 Armor boxes, steel foundry
 Automobile bodies
 Backing, furniture
 Backing, mirror
 Backing, refrigerators
 Backs, bureau
 Backs, carriage seat
 Backs, clock case
 Backs, china closet
 Backs, dental cases
 Backs, hat brush
 Backs, mirror
 Backs, piano
 Backs, toy pianos
 Backs, wagon seats
 Balusters, porch
 Balusters (stair)
 Base blocks, house interior trim
 Base boards, house interior trim
 Base corners, house interior trim
 Base moulding, house interior trim
 Baskets, fruit and vegetable
 Bay brackets, house construction
 Beds, light delivery wagon
 Bedsteads
 Bellows, organ
 Benches, wash
 Bevel siding, house
 Blinds
 Blind stop, house construction
 Blinds, window
 Blocks, brush
 Blocks, hat
 Blowers, organ
 Blowers, player piano
 Boards, bosom
 Boards, lap
 Boards, lapping
 Boards, wash
 Bobbins
 Bobs, fishing
 Bodies, buggy
 Bodies, carriage
 Bodies, cart
 Bodies, dump wagon
 Bodies, hearse
 Bodies, toy automobiles
 Bodies, wagon
 Bottom boards, wagon bodies
 Bottom rail, porch
 Bottom rails (sash)
 Bottoms, boys' express wagons
 Bottoms, buggy bodies
 Bottoms, buggy seats
 Bottoms, carriage bodies
 Bottoms, clock case
 Bottoms, drawer
 Bottoms, light vehicle bodies
 Boxboards, heavy vehicles
 Box shoeks
 Boxes, bottle
 Boxes, butter
 Boxes, cake
 Boxes, coal sieve
 Boxes, cracker
 Boxes, creamery shipping
 Boxes, macaroni
 Boxes, packing
 Boxes, plug tobacco
 Boxes, wagon

Boxes, weight (elevator)
 Braces, boat wheel
 Brackets, plate rail
 Brackets, porch
 Brackets, stair
 Brushes
 Brushes, dust
 Bungs
 Bureaus
 Butter workers, dairyman's
 Cabinets
 Cabinets, dental
 Cabinets, medicine
 Cabinets, scale
 Cabinets, towel
 Cabinets, type
 Cabins, canal boats
 Cabins, exterior, river craft
 Cabins, exterior, ships
 Cabins, exterior, yachts
 Cab parts, locomotive
 Cabs, locomotive
 Capping, sink, house interior trim
 Carpet strips, house interior trim
 Cars, enslage
 Cases, blacking
 Cases, casket
 Cases, clock
 Cases, dental
 Cases, liquor
 Cases, optical
 Cases, packing
 Cases, silverware
 Casings
 Casings, door
 Casings, window
 Ceiling
 Ceiling, boats
 Chair rail, house interior trim
 Chairs, barber
 Chairs, kitchen
 Chests, organ
 Chiffoniers
 China closets, interior
 Cigar boxes
 Clog soles (shoes)
 Coffins
 Colonial columns
 Colonnades, house interior trim
 Commods
 Compartments, trunk
 Consoles
 Cores, veneer
 Corner blocks, house interior trim
 Cornice
 Costumers
 Counters, store
 Crates, beer
 Crates, fruit and vegetable
 Crates, mineral water
 Cresting, porch roof
 Cupboards, kitchen
 Cushion frames, vehicle
 Doors
 Desks, interior work
 Display forms, hosiery
 Display forms, shoe
 Doors, folding
 Doors, sliding
 Drawers, interior
 Drain boards, sink
 Dressers
 Drip boards

Dust cap, house interior trim
 Dust wheels, corn
 Elevators, feed mill
 Elevators, flour mill
 Electric cars, interior finish
 Excelsior
 Excelsior, packing
 Excelsior, ribbon (mattress stuffing)
 Face brackets, house construction
 Faucets
 Fillet, house interior trim
 Finish, boats
 Firklins
 Fixtures, bank
 Fixtures, bar
 Fixtures, display windows
 Fixtures, laboratory
 Fixtures, office
 Fixtures, store
 Flasks, foundry
 Flat battens, house interior trim
 Foot boards, wagon
 Front panels, light delivery wagons
 Fronts, kitchen cabinets
 Frames, billiard table
 Frames, camera
 Frames, coal sieves
 Frames, couch
 Frames, davenport
 Frames, door, house construction
 Frames, mirror
 Frames, lounges
 Frames, organ interior
 Frames, picture
 Frames, upholstered furniture
 Frames, window
 Frieze rail, porch
 Front doors, house
 Furniture (hidden work)
 Furniture, inside
 Gates, farm
 Gable brackets, house construction
 Gable ornaments, house construction
 Grain drills, parts
 Grilles, house interior trim
 Hand rails, porch
 Handles, machine brushes
 Head blocks, house interior trim
 Head casing, house interior trim
 Hender parts
 Holders, Christmas tree
 Hoppers, flour mill machinery
 Ice boxes
 Interior finish, house
 Interior finish, pipe organ
 Jambs, door
 Jambs (elevator)
 Keels, boat
 Key bottoms, piano
 Lath
 Lids, water closet
 Lining, light delivery wagons
 Lining, refrigerator
 Lining, telephone boxes
 Litter carriers
 Lodge furniture

POPLAR, YELLOW—Continued

Mantels	Pins, clothes	Sidings, wagon
Mantels (painted work)	Pipe organs, interior parts	Sink aprons, house interior trim
Meeting rails (sash)	Pipes, organ	Slide, fly screen
Mirror doors, house	Pipes (pipe organ)	Spars, boat
Mixers, dough	Plate rail, dining room	Spindles, porch
Models	Poles, yarn	Spools
Moulding, bed, house construction	Pool tables, hidden work	Spouting, flour mill
Moulding, brick, house construction	Porch blinds	Staging, boats
Moulding, cap, house interior trim	Porch columns, built up	Staves, cement barrels
Moulding, cove	Porch columns, solid	Staves, slack cooorage
Moulding, crown, house construction	Porch newels, built up	Staves, step ladder
Moulding, drip cap, house construction	Porch newels, sold	Stiles, door
Moulding, piano case	Porch posts	Stops, door, house interior trim
Moulding, picture	Porch spandrels	Stops, window, house interior trim
Moulding, plaster, house construction	Posts (elevator)	Straw carriers
Moulding, porch	Posts, porch	String boards (stair)
Moulding, quarter round	Pulpits, church	Strips, weather
Moulding, screen	Pumps	Tables, cafe
Moulding, spring cove, house construction	Quill boards	Tables, dining
Music cabinets, interior	Racks, display	Tables, enameled library
Mullions (sash)	Racks, roller towel	Tables, kitchen
Novelties	Rails (door)	Tables, lunch room
Newel posts, angle	Rails, porch	Tabourettes
Newel posts, starting	Rails, stair	Top boards (pipe organs)
Organ parts, interior	Rails, table	Top rail, porch
Outside finish (electric cars)	Reed organs, interior parts	Top rails (sash)
Packing cases	Reels, electric wire	Top slate, light delivery wagon bodies
Paddle wheels excursion boats	Reels, solder wire	Tons, table
Pails, candy	Refrigerators	Toy carts
Panel strips, house interior trim	Refrigerators, exterior	Toy furniture
Panel sides, passenger cars	Rims, split wood pulleys	Toy tops
Panels, veneer	Risers, stair	Toy wagons
Panel work, wagon sides	Rollers, farm machinery	Transoms, row boat
Paper pulp	Rosettes, wall (stairway)	Traps, mouse
Panels, automobile bodies	Ruling machines, bookbinders'	Traveling cases
Panels, auto-truck bodies	Running boards, automobile	Trays, trunk
Panels, carriage bodies	Sash	Treads, stair
Panels, coach	Screens, door	Troughs, bakers'
Panels, delivery wagon	Screens, window	Trunk boxes
Panels (door)	Scroll sawed balusters, porch	Type cases
Panels, furniture sides	Seat backs, buggy	Upper panels, light delivery wagon bodies
Panels, light wagon bodies	Seats, huggy	Vegetable slicers
Panels, stair work	Seats, automobile	Veneer
Panels, truck sleigh bodies	Seats, car	Veneer cores, organ cases
Panels, vehicle bodies	Seats, carriage	Veneer cores (piano cases)
Panels, wagon bodies	Seats, water closet	Veneer crossbanding
Parting strip, house interior trim	Sewing machine parts	Wainscot rail, house interior trim
Partitions	Shelving	Wainscotting, outside (railway cars)
Partitions, wagon	Shelves, book,	Wainscotting cap, house interior trim
Parts, cider mill	Shelves, cabinet	Walkers, baby
Parts, flour mill machinery	Shelving, dental case	Wardrobes
Parts, railway motor cars	Shoe rails (stair)	Wardrobes, inside finish
Passenger cars, interior work	Show cases	Wheelbarrows
Patterns	Shuttles	Window apron, house interior trim
Pedestals	Sideboards, built in	Window stool, house interior trim
Peel blades	Sides, drawer	Wood pulleys
Plano parts, interior	Sides, farm machinery	Wood rolls, paper mill machinery
Pilasters, mantel	Sides, flour mill machinery	
	Sides, threshing machine	
	Sides, wagon bodies	
	Sides, wagon box	
	Siding	
	Siding, house	
	Siding, passenger cars	
	Siding, railway freight cars	
	Sidings (wagon beds)	

RATTAN

Stocks, whip

REED

Stocks, whip

REDWOOD

Astragals, folding door	Carpet strip, house interior trim	Dust cap, house interior trim
Balusters, porch	Casing, door	Face brackets, house construction
Base blocks, house interior trim	Casing, window	Fillet, house interior trim
Base board, house interior trim	Caskets	Flat battens, house interior trim
Base corners, house interior trim	Cases, coffin	Frieze rail, porch
Base moulding, house interior trim	Cases, casket	Gable brackets, house construction
Bay brackets, house construction	Chair rail, house interior trim	Gable ornaments, house construction
Beams, dining room ceiling	Coffins	Head blocks, house interior trim
Bevel siding, house	Corner blocks, house interior trim	Head casing, house interior trim
Bottom rail, porch	Cornice	Incubators
Brackets, porch	Cresting, porch roof	Jams, door
Brackets, porch rail	Cross-ties, railroad	Mirror doors, house
	Doors, sliding	

REDWOOD—Concluded.

Moulding, bed, house construction	Nosing, house interior trim	Siding, freight car
Molding, brick, house construction	Panel strips, house interior trim	Spindles, porch
Molding, cap, house interior trim	Parting stops, house interior trim	Staves, silo
Molding, cove	Patterns	Stops, window, house interior trim
Molding, crown, house construction	Plate rail, dining room	Stops, door, house interior trim
Moulding, drip, cap, house construction	Porch columns, built up	Store fronts
Moulding, picture	Porch columns, solid	Top rail, porch
Moulding, plaster, house construction	Porch newels, built up	Trays, incubator
Moulding, quarter round	Porch newels, solid	Wainscot rail, house interior trim
Moulding, screen	Porch spandrels	Wainscoting cap, house interior trim
Moulding, spring cove, house construction	Ruling machines, bookbinders	Window apron, house interior trim
	Screens, door	Window stool, house interior trim
	Screen, window	
	Scroll sawed balusters, porch	
	Shade hangers	

ROSEWOOD.

Backs, clothes brush	Frames, mirror	Panels, automobile bodies
Backs, hair brush	Frames, picture	Parts (automobile bodies)
Backs, nail brush	Gavels	Pilot wheels, ship
Blocks, brush	Handles, drawing instruments	Pilot wheels, yacht
Bottlestoppers	Handles, surgical instruments	T-Squares (drawing)
Clubs, policeman	Levels, masons	Veneer

SASSAFRAS.

Knees, row boat	Knees, ship	Knees, yacht
Knees, river craft		

SPRUCE.

Balusters (stair)	Frames, dumb waiter	Planking, canoe
Bevel siding, house	Frames, window	Planking, railway cars
Bodies, electric cars	Gunwales, canoe	Planking, scow
Bodies, railway cars	Gunwales, row boat (flat bottom)	Poles, tent
Booms, river craft	Hatch covers, river craft	Rails, stair
Booms, ship	Hatch covers, ship	Keels, cable
Bottom boards, barge	Hatch covers, yacht	Keels, wire rope
Bottom boards, foundry flasks	Interior trim, house	Refrigerators
Bottom boards, row boat	Interior work, canal boat cabins	Ribs, piano
Bottom boards, scow	Keel strips, row boat (flat bottom)	Risers, row boat (flat bottom)
Bottom rail, sash	Key bases, piano	Risers, stair
Boxes, bottle	Ladders, extension	Rosettes, wall (stairway)
Boxes, packing	Ladders, river craft	Rough horses (stairway)
Brackets, stair	Ladders, ship	Running boards (electric cars)
Bridges, piano	Ladders, step	Sash, window
Cases, packing	Lath	Scaffolding (painters)
Ceiling, ship cabin	Leeboards, canoe	Sides, mine dump cars
Cornice, house	Lining, refrigerator	Sides, row boat
Crating	Masts, river craft	Sounding board ribs, piano
Cross arms, telegraph pole	Masts, ship	Sounding boards, piano
Cross-ties, railroad	Meeting rails, sash	Spars (ship)
Diagonal sweeps, piano	Mullion, sash	Staves, tight cooperage
Easels, school blackboard	Newel posts, angle	Stays, boat
Flasks	Newel posts, starting	String boards (stair)
Flasks, foundry	Oars, row boat	Studding (ship building)
Flooring, electric cars	Packing cases, plate glass	Tanks, wooden
Flooring, freight cars	Paddles, canoe	Top rails, sash
Flooring, mine dump cars	Planking, barge	Transoms, row boat
Flooring, railway passenger cars		Treads, stair
Frames, blackboard		Uprights, row boat (flat bottom)
Frames, cold storage door		

SPRUCE, SITKA.

Balusters, porch	Decking, boat	Moulding, bed, house construction
Base blocks, house interior trim	Doors, folding	Moulding, cap, house interior trim
Base board, house interior trim	Doors, sliding	Moulding, cove
Base corners, house interior trim	Dust cap, house interior trim	Moulding, crown, house construction
Base moulding, house interior trim	Fillet, house interior trim	Moulding, drip cap, house construction
Beams, dining room ceiling	Flat battens, house interior trim	Moulding, picture
Blind stops, house construction	Frames, door	Moulding, quarter round
Round rails, porch	Frames, front door side light	Moulding, spring cove, house construction
Brackets, plate rail	Frames, window	Nosing, house interior trim
Capping, sink, house interior trim	Frieze rail, porch	Panel strips, house interior trim
Carpet strip, house interior trim	Front doors, house	Parting stop, house interior trim
Casing, window	Front brackets, house construction	Partition moulds, house interior trim
Chair rail, house interior trim	Head blocks, house interior trim	Plate rail, dining room
Colonnades, house interior trim	Head casing, house interior trim	Porch columns, built up
Corner blocks, house interior trim	Jams, door	
Cornice work, house	Keels, boat	
Cresting, porch roof	Mirror doors, house	

SPRUCE SITKA—Concluded.

Porch columns, solid	Spindles, porch	Window apron, house interior trim
Porch newels, built up	Stops, door, house interior trim	Window stool, house interior trim
Porch spandrels	Stops, window, house interior trim	Poles, tent
Scroll sawed balusters, porch	Top rail, porch	Rails, stair
Seats, boat	Wainscoting cap, house interior trim	Reels, cable
Siding, house	Wainscoting rail, house interior trim	Reels, wire rope
Sink aprons, house interior trim		Refrigerator
Slide, fly screen		Ribs, piano
Spars, ship		

SUMACH.

Inlaid work, furniture

SYCAMORE.

Base blocks, house interior trim	Doors, sliding	Moulding, plaster, house construction
Base board, house interior trim	Dust cap, house interior trim	Moulding, quarter round
Base corners, house interior trim	Pillet, house interior trim	Moulding, screen
Base moulding, house interior trim	Fixtures, office	Moulding, spring cove, house construction
Basket parts	Fixtures, store	Nosing, house interior trim
Baskets, fruit	Flat battens, house interior trim	Packages, fruit
Baskets, vegetable	Frames, door	_packages, vegetable
Beams, dining room ceiling	Frames, front door side light	Pails, candy
Blind stop, house construction	Frames, window	Panel strips, house interior trim
Blocks, butcher	Front doors, house	Paper pulp
Boat parts	Furniture, case goods	Parting stop, house interior trim
Bottoms, drawer	Gable ornaments, house construction	Partition moulds, house construction
Boxes, packing	Grilles, house interior trim	Parts, washing machine
Boxes, plug tobacco	Handles, hoe	Plate rail, dining room
Brackets, plate rail	Handles, rake	Reed organs, interior parts
Buckets	Handles, saw	Refrigerators
Cabinet work	Head blocks, house interior trim	Sides, drawer
Cabins, interior, ships	Head casing, house interior trim	Sink aprons, house interior trim
Cabins, interior, yacht	Hoppers, fruit	Slide, fly screen
Capping, sink, house interior trim	Hoppers, vegetable	Stools, foot
Carpet strip, house interior trim	Jams, door	Stops, door, house interior trim
Cases, reed organ	Lath	Stops, window, house interior trim
Casing, door	Mantels	Wainscot rail, house interior trim
Casing, window	Meat blocks	Wainscoting cap, house interior trim
Chair rail, house interior trim	Mirror doors, house	Window apron, house interior trim
Chairs	Moulding, bed, house construction	Window stool, house interior trim
Colonnades, house interior trim	Moulding, brick, house construction	Veneer
Consoles	Moulding, cap, house interior trim	Venetian blinds
Cooperage stock	Moulding, cove	
Corner blocks, house interior trim	Moulding, crown, house construction	
Crating	Moulding, picture	
Doors, folding		

TAMARACK.

Base blocks, house construction	Frames, front door side light	Partition moulds, house construction
Base board, house interior trim	Frames, window	Parting stop, house interior trim
Base corners, house interior trim	Front doors, house	Plate rail, dining room
Base moulding, house interior trim	Grilles, house interior trim	Silos
Beams, dining room ceiling	Head casing, house interior trim	Sink aprons, house interior trim
Blind stop, house construction	Head blocks, house interior trim	Slide, fly screen
Brackets, plate rail	Jams, door	Stem pieces (boat)
Capping, sink, house interior trim	Keels, boat	Stem posts, river craft
Carpet strip, house interior trim	Knees, canal boat	Stem posts, ship
Casing, door	Knees, river craft	Stem posts, yachts
Casing, window	Knees, ship	Stems, river craft
Chair rail, house interior trim	Knees, yacht	Stems, yachts
Ceiling, house	Lath	Stems, ships
Colonnades, house interior trim	Mirror doors, house	Stops, door, house interior trim
Corner blocks, house interior trim	Moulding, bed, house construction	Stops, window, house interior trim
Cross-ties, railroad	Moulding, cap, house interior trim	Strainers, boat
Doors, folding	Moulding, cove	Tanks
Dust cap, house interior trim	Moulding, crown, house construction	Tubs
Excelsior	Moulding, picture	Wainscot rail, house interior trim
Pillet, house interior trim	Moulding, quarter round	Wainscoting cap, house interior trim
Flat battens, house interior trim	Moulding, spring cove, house construction	Window apron, house interior trim
Flooring, boats	Nosing, house interior trim	Window stool, house interior trim
Flooring, house	Panel strips, house interior trim	
Frames, door		

TEAKWOOD.

Armor backing, ship	Cabins, interior, ship	Rails, yacht
Armor blocking, ship	Cabins, interior, yacht	Rails, ship building

TUPELO.

Cigar boxes

WALNUT, BLACK.

Altars, church	Covers, switch box, Pullman	Panels, case
Arms, chair	coaches	Panels, ceiling, Pullman
Back posts, chair	Cupboard doors, Pullman	coaches
Backs, clothes brush	coaches	Panels, desk
Backs, hair brush	Dash boards (automobile)	Panels, window, Pullman
Backs, nail brush	Deck boards, automobile	coaches
Balusters (stairway)	Desk chairs	Patterns
Base board, house interior	Doors, sliding	Pews, church
trim	Doors, folding	Pilasters (piano)
Base moulding, house interior	Doors, upper birth (sleeping	Pillars, chair
trim	cars)	Pilot wheels, ship
Beams, dining room ceiling	Dust cap, house interior trim	Pilot wheels, yacht
Beds, folding exterior	Fillet, house interior trim	Plate rail, dining room
Bedsteads, exterior	Finish, interior (automobile	Princess dressers, exterior
Benches, piano	bodies)	Push button frames, Pullman
Bible stands, church	Flat battens, house interior	cars
Blocks, brush	trim	Rockers, chair
Bookcases, exterior	Flooring, parquetry	Sash, Pullman coaches
Book racks, revolving	Foot rests	Screens, fire
Brackets, plate rail	Foot stools	Seats, piano
Cabins, interior ships	Fore ends, gun	Settees
Cabins, interior, yachts	Frames, mirror	Settles
Cabinet making	Frames, picture	Sewing machine parts
Cabinets, electrical work	Furniture, church	Shelves, book
Cabinets, magazine	Grilles, house interior trim	Showcases
Cabinets, phonograph	Grilles, pullman coaches	Spindles, chair
Cabinets, smokers	Hall mirror batracks	Stands, chafing dish
Carpet strip, house interior	Handles, rolling pin	Sticks, toddy
trim	Handles, saddlers' tool	Stocks, air rifle
Cases, casket	Hand rails, stairway	Stocks, gun
Cases, clock	Head casing, house interior	Stools, piano
Cases, coffin	trim	Stops, window, house interior
Cases, dental	Heads, carpenter squares	trim
Cases, hall clock	Heads, T-squares (draftsman)	Tables, dining room
Cases, optical	Interior finish, Pullman cars	Tables, dropleaf
Cases, organ	Legs, piano	Tables, exterior
Cases, piano	Lunch tables, portable, pullman	Tables, library
Cases, reed organs	coaches	Tables, parlor
Casing, door	Mirror doors, house	Tables, tea
Casing, pipe organ	Mirror frames, pullman coaches	Throats, tennis racket
Casing, window	Moulding, bed, house construction	Tops, counters
Cellarettes	Moulding cap, house interior	Trays, serving
Chair arms, Pullman coaches	trim	Veneer
Chair rail, house interior trim	Moulding picture	Veneer, piano cases
Chairs, morris	Moulding, quarter round	Wainscot rail, house interior
Chests, hall	Moulding, screen	trim
Chests, medicine	Moulding, spring cove, house	Wainscoting, house interior
Chests of drawers, exterior	construction	trim
Cheval mirrors	Mouldings, piano	Wainscoting cap, house interior
Chiffoniers, exterior	Music shelf, piano	trim
Commodore, exterior	Nosing, house interior trim	Wall cases
Colonnades, house interior trim	Panel strips, house interior trim	Window apron, house interior
Colonnades, Pullman coaches	Panel wainscoting, Pullman	trim
Consoles	coaches	Window stool, house interior
		trim

WALNUT, CIRCASSIAN.

Beds, exterior	Chiffoniers, exterior	Panels, case
Bureaus, exterior	Dash boards, automobile	Panels, desk
Cabins, exterior, ships	Fore ends, gun	Plano cases, veneer
Cabins, interior, yachts	Frames, picture	Stocks, gun
Case work	Panels, bedstead	Veneer

WEICHSEL ROOTS.

Canes, walking	Handles, umbrella	Stems, smoking pipes
Handles, parasol		

WILLOW.

Bats, baseball	Pails, candy	Pulp, paper
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MANUFACTURERS.

The names and addresses of the wood users furnishing the information for this report have been listed in arrangement and order corresponding with the industries appearing in the preceding pages. Where the name of a manufacturer is given in several industries it is because he manufactures commodities belonging to more than one industry.

AGRICULTURAL IMPLEMENTS

Hertzler & Zook Co., Belleville	S. L. Allen & Co., Fifth St. & Glenwood Ave., Philadelphia
The A. B. Gaston Co., Cochranon	Philadelphia Lawn Mower Co., Thirty-first & Chestnut Sts., Philadelphia
Nonpareil Mfg. Co., Cochranon	Handle & Excelsior Co., Picture Rocks
A. G. Anchey's Sons, Codorus	Ellis Keystone Agl. Works, Pottstown
Doylestown Agricultural Co., Doylestown	I. T. Zerbe, Reamstown
Hobson & Co., Easton	Wm. H. Fisher, Rebeck
A. Buck's Sons Co., Elizabethtown	Noah C. Stabler, Red Lion
Theo. J. Ely Mfg. Co., Erie	Messinger Mfg. Co., Tatamy
George T. Sellers, Gap	Frank A. Rockwell, Troy
Hamburg Plow Works, Hamburg	Frick Co., Waynesboro
Hanover Bending and Mfg. Co., Hanover	John A. Hart, West Lebanon
Musser Lbr. Co., Marietta	A. B. Farquhar Co., Ltd., York
J. H. Albright & Sons, Mifflinburg	Hench & Dromgold, York
Monntville Mfg. Co., Mountville	Keystone Farm Machine Co., York
Miller Mfg. Co., Meyersdale	The Spangler Mfg. Co., York
Weaver & Co., New Oxford	York Novelty Co., York
J. W. Connor, Orangeville	
C. P. Fox, Perkaskie	

BASKETS AND VENEER PACKAGES FOR FRUIT AND VEGETABLES

Pape-Glair Wood Products Co., Brockwayville	E. T. Steele & Sons, 1228 Irwin Ave., N. S., Pittsburgh
Pease & Covell, Conneautville	H. E. McConnell, Torpedo
J. B. Steel & Co., Coudersport	
W. R. Wilcox, Lawrenceville	

BOARDS—CLOTH, HOSIERY, ETC.

A. H. Ballet, Allentown	Joseph T. Pearson, Kensington Ave., Cor. E. Boston, Philadelphia
J. F. Hammond & Son, Inc., 4534 Hedge St., Frankford Sta., Philadelphia	Phila. Packing Box Co., 2634 American St., Philadelphia
Herman Miller, 214-216 W. Dauphin, Philadelphia	Bethlehem Steel Co., South Bethlehem

BOOT AND SHOE FINDINGS

George E. H. Halliwell, 2451 Kensington Ave., Philadelphia	S. S. Redifer & Co., 139 Race St., Philadelphia
Philadelphia Last and Pattern Co., 316-18 Cherry St., Philadelphia	Redifer's Last Works, 237 N. Fourth St., Philadelphia
	William C. Root, 524 Race St., Philadelphia

BOXES AND GRATES, PACKING

Geo. M. Wechter, Akron	Carbondale Machine Co., Carbondale
Allentown Packing Box Co., Allentown	H. Adler Co., Carnegie
Allentown Reed, Harness and Mill Supply Co., Allentown	Superior Steel Co., Carnegie
The Yeager Furniture Co., Allentown	A. C. Kelly, Center Moreland
Penn. R. R. Co. (Foundries), Altoona	C. B. Corry & Son, Center Road Sta.
The Antocar Co., Ardmore	Chambersburg Engineering Co., Chambersburg
Ingersoll Rand Co., Athens	Geo. A. Minnick & Son, Chambersburg
Beaver Falls Planing Mill Co., Beaver Falls	Pittsburgh Plate Glass Co., Charleroi
J. L. McLaughlin & Sons, Bedford	American Steel Foundries, Chester
Bullock Swing and Chair Mfg. Co., Inc., Bellefonte	Federal Steel Foundry Co., Chester
P. B. Cridler & Son, Bellefonte	James M. Hamilton, Chester
Penn. Match Co., Bellefonte	Davis Lumber and Planing Mill, Christiana
Blairsville Enameled Ware Co., Blairsville	Gearhart Knitting Machine Co., Clearfield
Columbia Plate Glass Co., Blairsville	Harbison Walker Refractories Co., Clearfield
James Gardner, Jr., Co., Bolivar	Lukens Iron and Steel Co., Coatesville
West Penn. Steel Co., Brackenridge	Freed Heater Co., Inc., Collegeville
Braddock Machine and Mfg. Co., Braddock	The Keeley Stove Co., Columbia
Pitts Machine Tool Co., Braddock	N. H. Goodsell, Coudersport
Blaisdell Machinery Co., Bradford	Penn Furniture Co., Conneautville
Consolidated Window Glass Co., Bradford	Shamburg & Allen Mch. Co., Coraopolis
I. F. March's Sons, Bridgeport	Pittsburgh Plate Glass Co., Creighton
Bristol Patent Leather Co., Bristol	Dallastown Furniture Co., Dallastown
Standard Cast Iron Pipe and Foundry Co., Bristol	Merchant Cigar Box Co., Dallastown
Brockway Machine Bottle Co., Brockwayville	Pioneer Steam Cigar Box Factory, Dallastown
Greer & Garroway, Butler	H. L. Heiser, Denver
Pittsburgh Hickson Co., Butler	Downingtown Mfg. Co., East Downingtown
Standard Plate Glass Co., Butler	Hobson & Co., Easton
Phoenix Novelty Co., Cambridge Springs	Pittsburgh Meter Co., East Pittsburgh
Nufer Cedar Co., Canonsburg	Westinghouse Elec. and Mfg. Co., East Pittsburgh
The Belmar Mfg. Co., Canton	Westinghouse Machine Co., East Pittsburgh
Minnequa Furniture Co., Canton	C. E. Myers, East Prospect
American Welding Co., Carbondale	The Eddystone Mfg. Co., Eddystone
	Tindel-Morris Co., Eddystone
	C. Prouty & Co., Eldred

BOXES AND CRATES, PACKING—Continued

- A. Buck's Sons Co., Elizabethtown
 F. W. Crandall & Co., Elkland
 The Constable Bros. Co., Erie
 Theo. J. Ely Mfg. Co., Erie
 Erie City Mfg. Co., Erie
 Exhibition Showcase Co., Erie
 A. B. Feljemaker Organ Co., Erie
 Lovell Mfg. Co., Erie
 H. N. Thayer Co., Erie
 Washburn Mfg. Co., Erie
 Smith & Spahr, Eiters
 W. C. Laderer, Evans City
 Gray & Son Glass Co., Falls Creek
 Nufer Cedar Co., South Sharon, Farrell P. O.
 Felton Cigar Box Factory, Felton
 Pittsburgh Plate Glass Co., Ford City
 Wm. Shimer Son & Co., Freemansburg
 Girard Wreath Mfg. Co., Girard
 Allegheny Plate Glass Co., Glassmere
 Pittsburgh Steel Foundry, Glassport
 Enterprise Furniture Co., Glen Rock
 S. R. Smith Co., Grantham
 Greensburg Glass Co., Greensburg
 Greensburg Swing Co., Greensburg
 The Kelly & Jones Co., Greensburg
 McKay Carriage Co., Grove City
 Hamburg Plow Works, Hamburg
 H. E. Bair & Co., Hanover
 Hanover Cabinet Co., Hanover
 Hopkins Mfg. Co., Hanover
 Long Furniture Co., Hanover
 The W. O. Hickok Mfg. Co., Harrisburg
 Union Planing Mill Co., Harrisburg
 Atkinson Box and Lumber Co., Hawley
 Hawthorn Bottle Co., Hawthorn
 Boyd Shick, Hawthorn
 S. M. Kann, Hellam
 Prairie State Incubator Co., Homer City
 Wyman Kimble Planing Mill, Honesdale
 The L. C. Hasinger Co., Indiana
 W. S. Wilcox, Jamestown
 T. H. Hazlett Lumber Co., Jeannette
 Pennsylvania Rubber Co., Jeannette
 Union Planing Mill and Lumber Co., Jeannette
 The Lorain Steel Co., Johnstown
 Holzgate Bros. Co., Kane
 Kane Blind and Screen Co., Kane
 Kane Flint Bottle Co., Kane
 Kane Window Glass Co., Kane
 Pennsylvania Window Glass Co., Kane
 The Kittanning Plate Glass Co., Kittanning
 Samuel E. Bailey, Lancaster
 Benner Mfg. Co., Inc., Lancaster
 Inland City Cigar Box Co., Lancaster
 Lancaster Leaf Tobacco Case Co., Lancaster
 Geo. E. Wisner, Lancaster
 Dairymen's Supply Co., Lansdowne
 Herrman Ankam & Co., Lebanon
 Lebanon Valley Furniture Co., Lebanon
 Miller Organ and Piano Co., Lebanon
 H. M. Stauffer, Leola
 A. F. Heim Carriage Works, Lenhartsville
 D. M. Nesbit, Lewisburg
 Oneida Community, Ltd., Lititz
 Geo. R. Julius & Bros., Littlestown
 New York Standard Slate Works, Lynnpport
 Crescent Bottle Co., McDonald
 Nufer Cedar Co., McKeesport
 W. S. Russell Box and Lumber Co., McKeesport
 Rocks
 The Penn Box Co., Inc., McSherrystown
 Hires Condensed Milk Co., Malvern
 Musser Lumber Co., Marietta
 Masontown Glass Co., Masontown
 Reznor Mfg. Co., Mercer
 Mifflinburg Body and Gear Co., Mifflinburg
 Ruhl & Watson, Millmont
 C. A. Sweetland, Mills
 T. W. Waterhouse, Mill Village
 West Branch Novelty Co., Milton
 E. G. Werner & Sons, Mohnton
 Opalite Tile Co., Monaca
 Monessen Box Factory, Monessen
 Montgomery Table Works, Montgomery
 Crandall-Bennett-Porter Co., Montoursville
 Willson-Bennett-Porter Co., Montoursville
 Spring Brook Lumber Co., Moosic
 Robinson Mfg. Co., Muncy
 Sprout, Waldron & Co., Muncy
 S. Liebovitz & Sons, Myerstown
 Nazareth Paper Box Co., Nazareth
 The New Castle Box Co., New Castle
 New Holland Machine Co., New Holland
 Commercial Box Co., New Kensington
 S. J. Bailey, Nicholson
 W. K. Gresh & Sons, Norristown
 Norris Pattern and Machine Co., Norristown
 The Eclipse Co., North Girard
 National Transit Co. Shops, Oil City
 Oil Well Supply Co., Oil City
 United Lumber and Coal Co., Oil City
 Wightman Glass Co., Parkers Landing
 Trethaway Bros., Parsons
 Patton Clay Mfg. Co., Patton
 The Pen Argyle Clock Case Co., Pen Argyle
 Martin & Co., Petersburg
 The Albro-Clem Elevator Co., Seventh St. and
 Glenwood Ave., Philadelphia
 American Cuckoo Clock Co., 1665 Ruffner St.,
 Philadelphia
 American Steel Foundries, Fifth and Highland
 Aves., Philadelphia
 The Baldwin Locomotive Works, 500 North Broad
 St., Philadelphia
 James Barker, Inc., Sixth and Cayuga, Phila-
 delphia
 The Belter Trunk and Bag Co., 1641 N. Hancock
 St., Philadelphia
 Bodenstein & Kuemmerle, Inc., Lawrence St.
 and Girard Ave., Philadelphia
 J. G. Brill Co., Sixty-second and Woodland
 Aves, Philadelphia
 Carlson Wenstrom Mfg. Co., 2555-59 N. Syden-
 ham St., Philadelphia
 Carnarath Bell & Co., 613-15 Cherry St., Phila-
 delphia
 James W. Cooper Co., 1706-20 Washington Ave.,
 Philadelphia
 Chas. F. Datz Co., Inc., 482-84 N. Fifth St.,
 Philadelphia
 D. H. Davidson, 2005 Washington Ave., Phila-
 delphia
 Paul H. Deigendesch, 145 Florist St., Philadel-
 phia
 Devlin & Heron, 225 N. Juniper St., Philadel-
 phia
 Estate John Galbraith, 619 Commerce St., Phila-
 delphia
 Conrad Gottlieb, 64 N. Fourth St., Philadelphia
 J. T. Hammond & Son, Inc., 4534 Hedge St.,
 Frankford Sta., Philadelphia
 Edw. Harrington Son & Co., Seventeenth and
 Callowhill Sts., Philadelphia
 Samuel Jones & Sons, 2230 Hamilton St., Phila-
 delphia
 William J. Kees, 111 N. Orianna St., Philadel-
 phia
 Ferdinand Keller, 216-24 S. Ninth St., Philadel-
 phia
 Keystone Box Mfg. Co., 701-05 East Girard St.,
 Philadelphia
 Geo. W. Kugler & Sons Co., Inc., 919 New
 Market St., Philadelphia
 A. H. & F. H. Lippincott, Inc., Twenty-fourth
 and Locust Sts., Philadelphia
 T. B. Luzier & Son, 1645 N. Tenth St., Phila-
 delphia
 J. & W. McCauley, 636-38 Filbert St., Philadel-
 phia
 John Martin, 1436 N. 6th St., Philadelphia
 John Maxwell Estate, 425 Locust St., Philadel-
 phia
 Geo. Meisle & Bro., 217 New St., Philadelphia
 S. B. Mench, 2031 E. Fletcher, Philadelphia
 Joseph Miles, River Road, Manayunk Sta., Phila-
 delphia
 Thos. Mills & Bro., Inc., 1301 N. Eighth St.,
 Philadelphia
 William Myers, Quarry St., Philadelphia
 Clayton W. Nichols, 918 Beach St., Philadelphia
 Page & Rainy, 230 S. Second St., Philadelphia
 Joseph T. Pearson, Kensington Ave., Cor. E.
 Boston, Philadelphia
 Pennsylvania Box and Lumber Co., American
 and Cumberland, Philadelphia
 Frank Pettit Ornamental Iron Works, 809 Master
 St., Philadelphia
 Philadelphia Packing Box Co., 2634 American
 St., Philadelphia
 Provident Lumber Co., Water & Dickinson Sts.,
 Philadelphia
 T. B. Rice & Sons Co., Mifflin St. Wharf, Phila-
 delphia
 Scott Paper Co., Seventh and Glenwood Ave.,
 Philadelphia
 Isaac A. Sheppard & Co., Erie Ave. and Sep-
 viva St., Philadelphia
 Thos. D. Shoemaker, 1241 Day St., Philadelphia.

BOXES AND CRATES, PACKING—Continued

- Tait Bros., 917 E. Montgomery Ave., Philadelphia
H. Tiedemann, N. W. Cor. Nineteenth and Washington Ave., Philadelphia
Tioga Foundry Co., Twenty-second and Allegheny, Philadelphia
Treen Box Co., Tioga and Memphis Sts., Philadelphia
Emil Walther, 1106 N. Fourth St., Philadelphia
Joseph T. Ward, 5809-19 Baynton St., Philadelphia
Robert Ward, 115 Cuthbert St., Philadelphia
Weskott & Thomson, 112-114 N. Twelfth St., Philadelphia
Westmoreland Packing Case Co., 1932 E. Westmoreland St., Philadelphia
Wm. Wharton, Jr., & Co., Inc., 25th St. and Washington Ave., Philadelphia
Andrew Wilson, Wilde and Krams, Manayunk Sta., Philadelphia
The Winner Co., 2035-45 N. Seventh St., Philadelphia
Wirt & Knox Mfg. Co., 22-24 N. Fourth St., Philadelphia
Wm. Woodward, 3017 N. Lambert St., Philadelphia
John P. Little Co., Picture Rocks.
American Steel Foundries, Thirty-sixth St. and A. V. Ry., Pittsburgh
American Window Glass Co., Farmers' Bank Bldg., Pittsburgh
Anchor Box and Lumber Co., 112 Lincoln Ave., Millvale
Axthelm Mfg. Co., 242 Third Ave., Pittsburgh
Briggs Machinery Co., 238 Second Ave., Pittsburgh
A. M. Carrow Co., Penn and Third St., Pittsburgh
The Chaplin-Fulton Mfg. Co., 23-34 Penn. Ave., Pittsburgh
Conroy Prugh Co., 1430-36 Western Ave., N. S., Pittsburgh
Crescent Bottle Co., Pittsburgh
D. O. Cunningham Glass Co., Twenty-second and Jane St., S. S., Pittsburgh
Dauler, Close & Johns, 636 Smithfield St., Pittsburgh
Joha Dunlap Co., P. O. Box 1023, Pittsburgh
Eller Lumber and Mill Co., S. Twenty-third St., Pittsburgh
Epping-Carpenter Co., Forty-first and A. V. Ry., Pittsburgh
Fawcett Machine Co., 2823 Smallman St., Pittsburgh
Getty Fender & Sons, 278 Woodville Ave., Pittsburgh
Bernard Gloekler Co., 1127-33 Penn Ave., Pittsburgh
Iron City Sanitary Mfg. Co., 1514 Oliver Bldg., Pittsburgh
F. J. Kress Box Co., 2920 Liberty Ave., Pittsburgh
McConway & Tooley Co., 48th St. and A. V. Ry. Co., Pittsburgh
Macbeth-Evans Glass Co., 410 Liberty Ave., Pittsburgh
The Marine Mfg. and Supply Co., Water St., Pittsburgh
The Morris and Bailey Steel Co. at Willson, Pittsburgh
Mortimer Glass Co., 409 Lewis Bldg., Pittsburgh
Phoenix Glass Co., P. O. Box 757, Pittsburgh
Piccardo Macaroni Co., 179-187 Forty-first St., Pittsburgh
H. K. Porter Co., 49th St. and A. V. Ry., Pittsburgh
Richardson Mfg. Co., 855-57 Progress St., Pittsburgh
F. P. Schlein Machine Co., 32 W. Parkway, Pittsburgh
A. F. Schwerd Mfg. Co., 145 McClure Ave., N. S., Pittsburgh
Sigwart & Rolston Mch. Works, Cor. Garrison Pl. and Duquesne Way, Pittsburgh
The Simonds Mfg. Co., Twenty-fifth and Liberty Sts., Pittsburgh
Sommerfield Machine and Mfg. Co., 216 Second Ave., Pittsburgh
The Standard Scale and Supply Co., 243 Water St., Pittsburgh
U. S. Glass Co., Ninth and Bingham Sts., Pittsburgh
U. S. Sanitary Mfg. Co., Pittsburgh
Federated Glass Co., Point Marion
Jeannette Window Glass Co., Point Marion
The Morris Glass Co., Point Marion
Point Marion Window Glass Co., Point Marion
Alleghany Window Glass Co., Port Alleghany
Mississippi Glass Co., Port Alleghany
The Olean Glass Co., Port Alleghany
Ellis Keystone Agl. Works, Pottstown
Roberts, Winner & Co., Quakertown
Sieling Furniture Co., Railroad
Anchor Bending Works, Reading
Biehls' Carriage and Wagon Works, Reading
Abner S. Deysler, Reading
Leinbach Box Co., Reading.
Nolde & Hoost Co., Reading
Leshner-Naig Knitting Co., Ltd., Reamstown
Miller Bros., Red Lion
Red Lion Furniture Co., Red Lion
Noah C. Stabler, Red Lion
Oil City Asbestos Co., Reno
Jefferson Macaroni Co., Reynoldsville
Landis Bros., Rheems
M. H. Wiest & Son, Richland
Victor Box Mfg. Co., Richland Center
B. H. Harman, Rock Glen
Emanuel G. Fry, Rothsville
Buckwalter Stove Co., Royersford
Diamond Glass Co., Royersford
Grander Stove Co., Royersford
Keystone Meter Co., Royersford
W. H. Newborn & Co., Royersford
Royersford Spring Bed Co., Royersford
Jno. F. Fitzimons, Schellburg
Meck & Keever, Schuylkill Haven
Noah Law Box Factory, Seven Valleys
Harper Bros., Shade Gap
The National Malleable Castings Co., Sharon
Nufer Cedar Co., Sharon
Sheffield Glass Bottle Co., Sheffield
Elk Flint Bottle Co., Shinglehouse
Boher & Phillips, Shippensburg
Peerless Furniture Co., Shippensburg
Shrewsbury Furniture and Mfg. Co., Shrewsbury
American Slate Works, Slatington
National School Slate Co., Slatington
Thomas Zellner, Slatington
Empire Glass Co., Smethport
Smethport Glass Co., Smethport
Bethlehem Steel Co., South Bethlehem
The Graves & Elghmy Co., Springboro
Keystone Stove Foundry, Spring City
Spring City Glass Works, Ltd., Spring City
Becker Novelty Co., Spring Creek
Milton E. Shick, Stevens
Stewartstown Furniture Co., Stewartstown
Sunbury Table Works, Sunbury
Fidelity Glass Co., Tarentum
Pittsburgh Plate Glass Co., Tarentum
Messinger Mfg. Co., Tatamy
Titusville Handle Co., Titusville
J. O. Frost's Sons, Towanda
Frank A. Rockwell, Troy
Troy Engine and Machine Co., Troy
Hanson Furniture Co., Union City
Loomis Table and Furniture Co., Union City
The Novelty Wood Works Co., Union City
The Star Handle Co., Union City
Keystone Bottle Mfg. Co., Uniontown
Verona Tool Works, Verona
Granville Hahn, Walnutport
Griffiths Charcoal Iron Mills, Washington
Highland Glass Co., Washington
Washington Tin Plate Co., Washington
Emmert Mfg. Co., Waynesboro
Frick Co., Waynesboro
Landis Machine Co., Waynesboro
Landis Tool Co., Waynesboro
Osterberg Tin Plate Co., Waynesburg
D. W. Frazee, Wellsboro
Hoopes Bros. & Darlington, Inc., West Chester
W. B. Bertels & Son Co., Wilkes-Barre
George B. Breon, Williamsport
A. H. Hellman & Co., Williamsport
National Furniture Co., Williamsport
J. K. Rishel Furniture Co., Williamsport
West Branch Box and Lbr. Co., Williamsport
Westinghouse Air Brake Co., Wilmerding
Arnold & Tschop, Windsor
Williamson & Moyer, Womelsdorf
Nufer Cedar Co., Woodlawn
Cold Springs Bleaching and Finishing Works, Yardley
H. E. Boring & Bro., York
Aden Buser, York, R. D.
A. B. Farquhar Co., Ltd., York

BOXES AND CRATES, PACKING—Continued

H. W. Hefner & Son, York
 A. Kauffman & Bro., York
 Keystone Farm Machine Co., York
 Marion H. Long, York
 The Martin Carriage Works, York

Wallick & Gohn, York
 West York Furniture Mfg. Co., York
 York Carriage Co., York
 York Wagon Gear Co., York
 Youngsville Mfg. Co., Youngsville

BOXES, CIGAR

Geo. M. Wechter, Akron
 A. H. Balliet, Allentown
 F. S. Koons, Boyertown
 Monroe Jarrett, Cressman
 Merchant Cigar Box Co., Dallastown
 Pioneer Steam Cigar Box Factory, Dallastown
 H. L. Helsler, Denver
 John J. Hillegrass, East Greenville
 C. E. Myers, East Prospect
 M. Kinports, Ephrata
 Smith & Spahr, Erters
 Felton Cigar Box Factory, Felton
 Arthur C. Brown, Freeburg
 H. E. Bair & Co., Hanover
 S. M. Kann, Hellam
 F. A. Heim & Bros., Lancaster
 Inland City Cigar Box Co., Lancaster
 Geo. E. Wisner, Lancaster
 Geo. K. Julius & Bros., Littlestown
 Penn Box Co., Inc., McSherrystown
 C. Bear, Manheim
 Geo. W. Holtzman, Myerstown
 New Cumberland Box Co., New Cumberland
 W. K. Gresh & Sons, Norristown
 E. H. Leaman, Paradise
 F. Brecht's Sons, 109 N. Orianna, Philadelphia
 Gegner & Klingler, 223 S. American St., Philadelphia
 H. W. Jarrett & Co., 2200 Marshall St., Philadelphia
 Quaker City Cigar Box Co., 220 N. 2d St., Philadelphia

Henry H. Shepl Mfg. Co., N. E. Cor. 6th St. and
 Columbia Ave., Philadelphia
 Sheip & Vandergrift, Inc., 814-832 N. Lawrence,
 Philadelphia
 Keystone Box Co., 19 Miller, Pittsburgh
 D. J. Rex & Co., Boyd and Locust Sts., Pitts-
 burgh
 P. C. Smith & Bros., Corry and Kilbrick Sts.,
 Pittsburgh
 Joseph Wasser, No. 1 Miller St., Pittsburgh
 Womer & Bock, Pottsville
 W. B. Pichthorn, Reading
 L. B. Miller, Red Hill
 J. E. Detwiler, Red Lion
 Miller Bros., Red Lion
 M. H. Wiest & Son, Richland
 Victor Box Mfg. Co., Richland Center
 W. A. Kalbach & Sons, Robesonla
 Emanuel G. Fry, Rothsville
 Samuel Hauser, Schaefferstown
 Monroe D. Sellers, Sellersville
 Noah Law Box Factory, Seven Valleys
 H. S. Souder, Souderton
 Ertel Bros., Williamsport
 Arnold & Tschop, Windsor
 Williamson & Moyer, Womelsdorf
 James R. Huthmaker, Wyoming
 Aden Buser, York
 H. W. Hefner & Son, York
 A. Kauffman & Bros., York
 E. Myers & Co., York
 Wallick & Gohn, York

BRUSHES

H. Weitzer, Braman
 Earle Brush Co., Columbia
 C. A. Mahle & Son, Corry
 August Fligge, Hecla
 Holgate Bros. Co., Kane
 H. A. Williams, Lake Como
 Elder & Jenks, 415 Vine St., Philadelphia
 Thomas J. Fleming, 131 N. Tenth St., Philadel-
 phia

Theo. A. Gerike, 205 Quarry St., Philadelphia
 The Harvey & Watt Co., 1822 E. Venango St.,
 Philadelphia
 Nelms & Co., 407 Commerce St., Philadelphia
 Thomas Ott & Co., 1124-1132 Washington Ave.,
 Philadelphia
 Leon Rozzen, 1003 N. Second St., Philadelphia
 A. Steiert & Son, 1406 S. Front, Philadelphia

BUTCHERS' BLOCKS AND SKEWERS

P. B. Crider & Son, Bellefonte
 Reading Wood Pulley Co., Reading

Patterson Bros. Co., Wellsboro

CAR CONSTRUCTION

Adamsburg Gas Coal Co., Adamsburg
 Alden Coal Co., Alden Station
 W. Harry Brown, Alicia
 Bellfield Coal and Coke Co., Altoona
 Dunbar Coal Mining Co., Altoona
 Latrobe Coal Co., Altoona
 Lilly Coal Co., Altoona
 Penn. R. R. Car Shops, Altoona
 East Penn. Lumber Co., Inc., Analomink
 Fall Brook Coal Co., Antrim
 West Penn. Coal Mining Co., Apollo
 Neelir Coal Co., Argentine
 Central R. R. Co. of New Jersey, Wilkes-
 Barre, Ashley Br. P. O.
 Mrs. Louise Mensch, Auburn
 Pittsburgh and Southwestern Coal Co., Avella
 Charles M. Dodson & Co., Beaver Brook
 Beaver Run Coal Co., Beaverdale
 A. Davidson, Beaver Falls
 Penn. R. R. Co., Bellwood
 Geo. P. Brubaker, Berlin
 Connell Anthracite Mining Co., Bernice
 Wachua-Taylor Anthracite Coal Co., Bernice
 American Car and Foundry Co., Berwick
 Lehigh and New England R. R., Bethlehem
 Kettle Creek Coal Mining Co., Bitumen
 Bells Mill Coal Co., Blairsville
 Blairsville Coke Co., Blairsville
 Conemaugh Coal Co., Blairsville
 Graff Coal Co., Blairsville
 Kiskiminitas Coal Co., Blairsville
 Maher Coal and Coke Co., Blairsville

Roaring Run Mining Co., Blairsville
 American Car and Foundry Co., Bloomsburg
 Bloomsburg Car and Equip. Co., Bloomsburg
 Herman & Hassert, Inc., Bloomsburg
 Blossburg and Coal Run Coal Co., Blossburg
 Jenkins Bros., Blossburg
 Terry Coal Co., Blossburg, R. D.
 Improved Traction Eng. Co., Boynton
 McClane Coal Co., Bridgeville
 Franklin Coal Mining Co., Brisbin
 Brier Hill Coke Co., Brier Hill
 Schnykill Lehigh Coal Co., Brockton
 Toby Coal Mining Co., Brockwayville
 Monongahela R. R. Car Repair Shops, Browns-
 ville
 Union Connellsville Coke Co., Brownsville
 Lake Shore Gas Coal Co., Buena Vista
 Cascade Coal & Coke Co., Buffalo, N. Y.
 Standard Steel Car Co., Butler
 East Mountain Coal Co., Carbondale
 Wm. M. Cole, Carnegie
 P. & R. R. Repair Shops, Catawissa
 H. K. Wick & Co., Catfish
 Cumberland Valley R. R. Co., Chambersburg
 Cheat Haven Coal & Coke Co., Cheat Haven
 Cherry Tree Iron Works, Cherry Tree
 Hastings Coal & Coke Co., Cherry Tree
 H. J. Stone Coal Co., Childs
 Clearfield Bituminous Coal Corp., Clearfield
 Clearfield Clay Working Co., Clearfield
 Gosden Coal Co., Clearfield
 D. F. Gulch, Clearfield, R. D.

CAR CONSTRUCTION—Continued

- Clermont Sewer Pipe Co., Clermont
 Blain Run Coal Co., Coalport
 Evans Coal & Coke Co., Connellsville
 Francis Coal Co., Connetton
 Pittsburgh Coal Co., Coraopolis
 Jos. Walton, Pittsburgh, Crafton Br. P. O.
 McPetridge Bros. Coal Co., Creighton
 Pittsburgh Plate Glass Co., Creighton
 Penna. R. R. Co., Cresson
 Ford Colliers Co., Curtisville
 Washington Coal & Coke Co., Dawson
 Dixonville Coal Co., Dixonville
 George Minus, Jr., DuBois
 Reed Colliery Co., Dudley
 Dunbar Furnace Co., Dunbar
 H. V. Lukens, Duncannon, R. D.
 Oak Hill Coal Co., Duncott
 Carney & Brown Coal Co., Scranton, Dunmore
 Br. P. O.
 Hillside Coal & Iron Co., Dunmore Br. P. O.
 Keystone Mining Co., East Brady
 Monarch Coal Co., East Brady
 Springfield Coal Mining Co., Ebensburg
 Boynton Coal Co., Elk Lick
 Erie Car Works, Erie
 Mizener Coal Co., Erie
 Pittsburgh & Erie Coal Co., Erie
 F. H. Campbell, Espyville
 The Edward Dambach Co., Evans City
 Jos. E. Thropp, Everett
 Export Coal Co. (Hdqs. Pittsburgh), Export
 The Struthers Coal & Coke Co., Fairbank
 Eagle Coal Co., Fredell
 Ben Franklin Coal Co., Freeport
 Kerr Coal Company, Freeport
 Buffalo & Susquehanna R. R., Galeton
 The Taylor & McCoy Coal & Coke Co., Gallitzin
 Enterprise Coal Co., Garrett
 W. A. Merrill & Co., Garrett
 W. R. McTurk Coal Co., Girardville
 Cornell Coal Co., Glassmere
 Graceton Coke Co., Graceton
 Apollo Coal Co., Greensburg
 Atlantic Crushed Coke Co., Greensburg
 Jamison Coal & Coke Co., Greensburg
 Keystone Coal & Coke Co., Greensburg
 J. C. Reed, Greensburg
 Donohoe Coke Co., Greenwald
 Mutual Coal Mining Co., Grove City
 Standard Coal Mining Co., Grove City
 Harleigh Broadwood Coal Co., Harleigh
 Pond Creek Coal Co., Harleigh
 Penna. R. R. Co., Harburg
 Western Maryland Railway Co., Harrow
 Red Top Coal Co., Hastings
 Rich Hill Coal Co., Hastings
 J. S. Wentz & Co., Hazelbrook
 Evans Colliery Co., Hazleton
 Harwood Coal Co., Hazleton
 Hazle Mountain Coal Co., Hazleton
 A. Pardee & Co., Hazleton
 Estate of A. S. Van Winkle, Hazleton
 Penn-Mary Coal Co., Hellwood
 Hormel Coal Co., Hickman
 Maple Ridge Coal Co., Holsopple
 W. S. B. Hays, Homestead
 Knickerbocker Smokeless Coal Co., Hooversville
 Somerset Mining Co., Hooversville
 Frelin Coal Co., Houtzdale
 Ziegler Coal Co., Houtzdale
 The Huntingdon & Broad Top M. R. R. & C.
 Co., Huntingdon
 Huntingdon Coal Co., Huntingdon
 John Langdon, Huntingdon
 Irwin Foundry & Car Co., Irwin
 Broad Top Coal & Mineral Co., Jacob
 G. B. Markee Co., Jeddo
 N. Y. C. & H. R. R. R. Co., Jersey Shore
 Humbert Coal Co., Jessup
 Cambria Steel Co., Johnstown
 Citizens' Coal Co., Johnstown
 A. J. Haws & Sons, Johnstown
 The Lorain Steel Co., Johnstown
 Smokeless Coal Co., Johnstown
 Somerset & Cambria Coal Co., Johnstown
 Supnes Coal Co., Johnstown
 Great Lakes Coal Co., Kaylor
 Reading Iron Co., Kimmelton
 East Boston Coal Co., Kingston
 The Kingston Coal Co., (Wilkes-Barre), King-
 ston Br. P. O.
 Allegheny River Mining Co., Kittanning
 Stewart Coal Co., Knox Dale
 Orenstein-Arthur Koppel Co., Koppel
 Clearfield & Cambria C. & C. Co., LaJose
 F. A. Lane, Lanes Mills
 Geo. W. Swartz, Langdondale
 The Lehigh Coal & Navigation Co., Lansford
 Latrobe-Connellsville Coal & Coke Co., Latrobe
 Ligonier Coal Co., Latrobe
 Unity Coal Co., Latrobe
 Unity-Connellsville Coke Co., Latrobe
 Widnoon Coal Mining Co., Lawsonham
 Armstrong County Coal Co., Leechburg
 West Leechburg Steel Co., Leechburg
 Atlas Coke Co., Leetonia
 Leetonia Lumber Co., Leetonia
 Leetonia Railway Co., Leetonia
 W. E. Brown & Co., Ligonier
 Jas. Harris & Sons, Lilly
 Leachy Coal Mining Co., Lilly
 Meyersdale Coal Co., Listle
 Lloydell Coal Mining Co., Lloydell
 Logansport Coal Co., Logansport
 Raridan & East Brady C. Co., Logansport
 Northern Anthracite Coal Co., Lopez
 Loyalhanna Coal & Coke Co., Loyalhanna
 Brothers Valley Coal Co., Macdonaldton
 Puritan Coke Co., McClellandton
 Bowman Bros. Co., McKeesport
 Gatehouse & Shaft Coal Co., Madera
 Thos. McGlynn, Madera
 Johnetta Fdy. & Machine Co., Marianna
 Pittsburgh & Butler Street Railway Co., Mars
 Moosic Mountain Coal Co., Marshwood
 Maryland Coal Co., Maryland
 Spring Hill Coal Co., Mayfield
 T. H. Wachua, Mayfield
 Sharon Coal & Limestone Co., Mercer
 Atlantic Coal Co., Meyersdale
 Phillips Bros., Middleport
 Middletown Car Co., Middletown
 American Car & Foundry Co., Milton
 Buck Run Coal Co., Minersville
 Darkwater Coal Co., Minersville
 Pine Hill Coal Co., Minersville
 West End Coal Co., Mocanagua
 Wenona Coal Co., Monessen
 Monongahela Saw & Plg. Mill Co., Monongahela
 Dodson Coal Co., Morea Colliery
 National Mining Co., Morgan
 Morrisdale Coal Co., Morrisdale Mines
 Penna. R. R. Co., Morrisdale
 Shade Coal Mining Co., Mount Pleasant
 E. J. Goodyear & Sons, Munson
 Jim Aekley, New Albany
 Fairmount Coal Co., New Bethlehem
 The Leeburg Coal Co., New Castle
 Standard Steel Car Co., New Castle
 Valley Camp Coal Co., New Kensington
 Fayette Coke Co., New Salem
 Thompson C'ville Coke Co., New Salem, R. D.
 Penna. R. R. Co., Northumberland
 National Transit Co. Shops, Oil City
 East Broad Top R. R. & Coal Co., Orbisonia
 Ghem Coal Co., Osceola Mills
 Osceola Silica & Fire Brick Co., Osceola Mills
 S. B. Stine, Osceola Mills
 Lehigh Valley R. R. Co., Packerton
 New Jersey Zinc Co., Palmerton
 The Hedstrom Coal Mining Co., Parkers Landing
 Good Clay & Coal Co., Patton
 Mount Jessup Coal Co., Peckville
 Pencoyd Iron Works, Pencoyd
 Penfield Coal & Coke Co., Penfield
 Hockensmith Wheel & Mine Car Co., Penns Sta-
 tion
 Alliance Coal Mining Co., 437 Chestnut St.,
 Philadelphia
 The Baldwin Locomotive Works, 500 N. Broad
 St., Philadelphia
 The T. G. Brill Co., 62nd & Woodland Ave.,
 Philadelphia
 Chestnut Ridge Coal Co., West End Trust Bldg.,
 Philadelphia
 Colonial Collieries Co., North American Bldg.,
 Philadelphia
 Cymbric Coal Co., 1000 Franklin Bank Bldg.,
 Philadelphia
 Dixon Coal Co., 727 Land Title Bldg., Philadel-
 phia
 Ebensburg Coal Co., 727 Land Title Bldg., Phila-
 delphia
 Forge Coal Mining Co., 1000 Franklin Bank
 Bldg., Philadelphia
 Glenwood Coal Co., 1000 Franklin Bank Bldg.,
 Philadelphia
 Hale & Kilburn Co., 18th St. & Lehigh Ave.,
 Philadelphia

CAR CONSTRUCTION—Continued

- Highland Coal Mining Co., Real Estate Trust Bldg., Philadelphia
- Logan Coal Co., Harrison Bldg., Philadelphia
- Loyalhanna Coal & Coke Co., Land Title Bldg., Philadelphia
- Lehigh & Wilkes-Barre Coal Co., 716 Reading Terminal, Philadelphia
- Nanty Glo Coal Mining Co., 727 Land Title Bldg., Philadelphia
- Northern Central Railway, Philadelphia
- Pennsylvania R. R., West Philadelphia, Philadelphia
- Philadelphia Rapid Transit Co., Land Title Bldg., Philadelphia
- Phila. & West Chester Railway Co., Philadelphia
- W. H. Piper & Co., Real Estate Trust Bldg., Philadelphia
- Plymouth Coal Mining Co., Real Estate Trust Bldg., Philadelphia
- Shoemaker Coal Mining Co., 1507 Real Estate Trust Bldg., Philadelphia
- South Fork Coal Mining Co., Bullitt Bldg., 421 Chestnut St., Philadelphia
- Sterling Coal Co., 421 Chestnut St., Philadelphia
- Urey Ridge Coal Co., 1000 Franklin Bank Bldg., Philadelphia
- Ashman Coal Co., Phillipsburg
- Atherton-Barnes Co., Phillipsburg
- Madra-Hill Coal Mining Co., Phillipsburg
- R. H. Mull, Phillipsburg
- Victoria Coal Mining Co., Phillipsburg
- Wicks Bros. Coal Co., Phillipsburg
- Pennsylvania Railroad, Pitscairn
- Aliquippa & Southern R. R. Co., Second Ave. & Ross St., Pittsburgh
- Baltimore & Ohio R. R. Co., Glenwood Shops, Pittsburgh
- Bessemer Coal & Coke Co., 2212 Oliver Bldg., Pittsburgh
- Bessemer Coke Co., Oliver Bldg., Pittsburgh
- Blaine Coal Co., Fulton Bldg., Pittsburgh
- Bolivar Coal & Coke Co., Pittsburgh
- Buffalo, Rochester & Pittsburgh Ry. Co., Pittsburgh
- Carnegie Coal Co., 1315 Paix Bldg., Pittsburgh
- Diamond Coal & Coke Co., 1110 House Bldg., Pittsburgh
- The Fayette Coal Co., Fourth Ave. & Wood St., Pittsburgh
- James T. Fox, 121 Wabash St., Pittsburgh
- H. C. Frick Coke Co., Pittsburgh
- John M. Greek & Co., 510 Park Bldg., Pittsburgh
- Hostetter Connellsville Coke Co., Pittsburgh
- Isabella Connellsville Coke Co., Fifth Ave. & Wood St., Pittsburgh
- Jenner-Quemahoning Coal Co., First Nat'l Bank Bldg., Pittsburgh
- Middletown Car Co., Frick Bldg., Pittsburgh
- Montour R. R. Co., Pittsburgh
- Monongahela River Cons. Coal & Coke Co., Smithfield St., Pittsburgh
- Mountain Smokeless Coal Co., 2204 Oliver Bldg., Pittsburgh
- Naomi Coal Co., First Nat'l Bank Bldg., Pittsburgh
- Oliver & Snyder Steel Co., South Tenth & Muriel Sts., Pittsburgh
- Penn. & Lake Erie R. R., Pittsburgh
- Pennsylvania Railroad, 32nd & Carson Sts., Pittsburgh
- Phillips Mine & Mill Supply Co., 2227 Jane St., S. S., Pittsburgh
- Pittsburgh-Baltimore Coal Co., First National Bank Bldg., Pittsburgh
- Pittsburgh-Buffalo Co., Fourth floor Frick Bldg., Pittsburgh
- Pittsburgh Coal Co., Smithfield St., Pittsburgh
- Pittsburgh-Westmoreland Coal Co., Fulton Bldg., Pittsburgh
- H. K. Porter Co., 49th St. & A. V. Ry., Pittsburgh
- Preston Coal Co., Fulton Bldg., Pittsburgh
- Pressed Steel Car Co., Pittsburgh
- J. H. Sanford Coal Co., 1315 Park Bldg., Pittsburgh
- Somerset-Smokeless Coal Co., First Nat'l Bank Bldg., Pittsburgh
- United Coal Co., First Nat'l Bank Bldg., Pittsburgh
- United Connellsville Coke Co., Oliver Bldg., Pittsburgh
- The Vesta Coal Co., Third Ave. & Ross St., Pittsburgh
- Wabash Pittsburgh Ter. Ry. Co., Liberty & Ferry Sts., Pittsburgh
- James Walton, Crafton (Br. P. O.), Pittsburgh
- McCauley Coal Co., Pittston
- Yost Mining Co., Pittston
- Farrish Coal Co., Plymouth
- The Penker Coal Co., Portage, R. D.
- Union Railroad Co., Port Ferry
- Penna. R. R. Co., Pottsville
- The Phila. & Reading Coal & Iron Co., Pottsville
- Anita Coal Mining Co., Punxsutawney
- Bowersville Coal Co., Punxsutawney
- John McLeary & Co., Punxsutawney
- Punxsutawney Coal Mining Co., Punxsutawney
- Punxsutawney Fdy. & Machine Co., Punxsutawney
- Colonial Coal Co., Puritan
- Geo. Pearce & Sons, Puritan
- Bulah Shaft Coal Co., Ramey
- Girard Mammoth Coal Co., Ravenrun
- Philadelphia & Reading Ry. Co., Reading
- Jermyn & Co., Rendham
- Hugh McHugh, Rennerdale
- Penna. R. R. Co., Renovo
- Russell Car & Iron Plow Co., Ridgway
- Brandenburg Coal Mining Co., Rockwood
- Irvona Coal & Coke Co., Rose Bud
- Butcher Creek Coal Co., Saint Clair
- Mount Hope Coal Co., Saint Clair
- Saint Clair Coal Co., Saint Clair
- Shawmut Mining Co., Saint Marys
- Cochran Coal Co., Salina
- Bowman Coal Mining Co., Saltsburg
- M. S. Kemmerer & Co., Sandy Run
- E. Eichelberger & Co., Saxton
- Lehigh Valley Railroad Co., Sayre
- Lincoln Coal & Coke Co., Scottsdale
- Bulls Head Coal Co., Scranton
- Carney & Brown Coal Co., Dunmore, Scranton
- Delaware, Lackawanna & Western R. R. Co., Scranton
- Dolph Coal Co., Ltd., Scranton
- Hillside Coal & Iron Co., Dunmore, Scranton
- Lackawanna & Wyoming Valley R. R. Co., Scranton
- Nay Aug Coal Co., Scranton
- Pennsylvania Coal Co., Dunmore, Scranton
- People's Coal Co., Scranton
- Scranton Coal Co., Scranton
- Traders' Coal Co., Scranton
- Oxford Coal Co., Shaft
- H. H. Smith Co., Shaft
- Greenough Red Ash Coal Co., Shamokin
- Shipman Coal Co., Shamokin
- Pardee Coal Co., Sharon
- Westerman Filer Co., Sharon
- Shawmut Vitrified Paving Brick Works, Shawmut
- Tionesta Valley Railroad Co., Sheffield
- Thomas Colliery Co., Shenandoah
- James M. McIntyre, Six Mile Run
- Schipper Bros Coal Mining Co., Six Mile Run
- Baxter Ridge Coke Co., Smithfield
- H. R. Sackett C. & C. Co., Smithfield
- Smithfield Coal & Coke Co., Smithfield
- Clark Bros. Coal Mining Co., Smokerun
- Leland Coal Mining Co., Smokerun
- W. A. Barron, Somerset, R. D.
- Consolidation Coal Co., Somerset
- Sonnan Shaft Coal Co., Sonnan
- H. C. Stineman, South Fork
- O. M. Stineman, South Fork
- Detinger Bros., Spangler
- Woodland Coal & Coke Co., Spangler
- Mercer Iron & Coal Co., Stoneboro
- H. K. Underwood, Strattonville
- New York, Susquehanna & Western R. R. Co., Stroudsburg
- Moses Neyer, Summithill
- East Deer Coal Co., Tarentum
- Price-Panacoast Coal Co., Throop
- Susquehanna & New York R. R. Co., Towanda
- Upper Lehigh Coal Co., Upper Lehigh
- Browning Coke Co., Uniontown
- Brownsville Coke Co., Uniontown
- Husted-Semans Coal & Coke Co., Uniontown
- Mazez Coke Co., Uniontown
- Mount Hope Coke Co., Uniontown
- Newcomer Coke Co., Uniontown
- W. J. Parshall, Uniontown
- Prospect C. & C. Co., Uniontown
- Shannon C. & C. Co., Uniontown
- South Fayette Coke Co., Uniontown
- Sunshine Coal & Coke Co., Uniontown
- Tower Hill Connellsville Coke Co., Uniontown

CAR CONSTRUCTION—Continued

Waltersburg Coke Co., Uniontown
 Whyel Coke Co., Uniontown
 Pennsylvania R. R., Verona
 Vinton Colliery Co., Vintondale
 Oakes Bros. Coal Co., Volant, R. D.
 Genuine Connellsville Coke Co., Waltersburg
 Beaver Coal & Coke Co., Wampum
 Waynesburg & Washington Railroad Co., Waynesburg
 Lackawanna Coal & Coke Co., Wehrum
 A. J. Lundquist & Co., Wellsboro, R. D.
 Midvalley Coal Co., Wilburton
 Standard Moshannon Coal Co., Williamsport
 Central R. R. Co. of New Jersey, Ashley,
 Wilkes-Barre
 Lehigh Valley Coal Co. & Coxo Bros. & Co.,
 Inc., Wilkes-Barre
 Morris Run Coal Mining Co., Wilkes-Barre.
 W. H. Shepherd & Son, Wilkes-Barre
 Susquehanna Coal Co., Wilkes-Barre
 Vulcan Iron Works, Wilkes-Barre
 The Shenango Furnace Co., Wilpen

Berwind-White Coal Mining Co., Windber
 Rummel Coal Mining Co., Windber
 Carnwath Coal Co., Winburne
 *Cascade Coal & Coke Co. (Mines at Tyler and
 Sykesville, Penn.), Buffalo, N. Y.
 *Jefferson & Clearfield Coal & Iron Co., Roch-
 ester, N. Y.
 *Rochester & Pittsburgh Coal & Iron Co., Roch-
 ester, N. Y.
 *Allegheny Coal Co. (Mines at Cheswick, Penn.),
 Cleveland, Ohio
 *Warren-Leonard Coal Co., Cleveland, Ohio.
 *Warner-Youghiogheny Coal Co., Cleveland, Ohio
 *The Youghiogheny & Ohio Coal Co., Cleveland,
 Ohio
 *Island Run Coal Co., East Liverpool
 *Atlas Coke Co. (Works at Helen, Penn.), Lee-
 tonia, Ohio
 *McKeeffrey Coal Co., Leetonia, Ohio
 *LaBelle Coke Co., Steubenville, Ohio
 *The Witch Hazel Coal Co., Youngstown, Ohio

CASKETS AND COFFINS

Bangor Casket Mfg. Co., Bangor
 Boyertown Burial Casket Co., Boyertown
 Erie Burial Case Co., Erie
 F. H. Campbell, Espyville
 The Freedom Casket Co., Freedom
 Harrisburg Burial Case Co., Harrisburg
 Hazleton Mfg. Co., Hazleton
 J. S. Claypool Lbr. Co., Kittanning
 J. D. Bowers, New Holland
 J. C. Henninger, New Holland
 Penna. Burial Case Co., Reynoldsville
 Riegelsville Mfg. Co., Riegelsville
 C. L. Wilmot, Rome

A. & J. Janton, 1408-10 N. Eleventh St., Phila-
 delphia
 The Paxson & Comfort Co., 523 Arch St., Phila-
 delphia
 National Casket Co., 733 Chartiers St., North
 Diamond Sta., Pittsburgh
 C. G. Sellers, Saint Thomas
 United States Casket Co., Scottsdale
 John Benore, Scranton
 Sunbury Coffin and Casket Co., Sunbury
 Sunderland Lumber Co., Sunbury
 Bischoff Estate, Tamaqua
 Charles Fritz, Weisenburg
 L. B. Lacey, West Auburn

CHAIRS AND CHAIR STOCK

Boehm & Spiegel Co., Allentown
 Johnston & Swartz, Allentown
 The Yeager Furniture Co., Allentown
 A. C. Kelly, Center Moreland
 Clearfield Wooden-Ware Co., Inc., Clearfield
 Coraopolis Mfg. Co., Coraopolis
 Corry Chair Co., Corry
 U. S. Chair Co., Corry
 Keystone Handle Co., Corydon
 J. D. Westcott & Son, Endeavor
 E. T. Beers, Fallentimber
 Kurtz Furniture Co., Fullerton
 Greensburg Swing Co., Greensburg
 American Chair Manufacturing Co., Hallstead
 Wm. Kemper, Hampton
 Jesse Wolford, Hunterstown
 Indiana Bent Rung Ladder Co., Indiana
 W. DeFrehn & Sons, Johnstown
 Emporium Lumber Co., Keating Summit
 Salmon Creek Lumber Co., Kellettsville
 Penn. Swing & Ladder Co., Lancaster
 Lewisburg Chair Co., Lewisburg
 Lehtaler Bros., Loleta
 Glen Mawr Novelty Works, Mawrglen
 Willson-Bennett-Porter Co., Montoursville
 James Barker, Inc., Sixth & Cayuga, Phila-
 delphia
 Bloch Go-Cart Co., 1136-48 N. American St.,
 Philadelphia

Bodenstein & Kuemmerle, Inc., Lawrence St. &
 Girard Ave., Philadelphia
 James W. Cooper Co., 1706-20 Washington Ave.,
 Philadelphia
 John Grass Wood Turning Co., 222 Vine St.,
 Philadelphia
 J. Hetherington, 206 Quarry St., Philadelphia
 Sikes Furniture Co., 23rd & Passyunk, Phila-
 delphia
 I. H. Wisler & Son, 223 & 225 N. Sixth St.,
 Philadelphia
 A. G. Pera, 5958 Baum St., Pittsburgh
 Pittsburgh Hardwood Working Co., 34 Water
 St., Pittsburgh
 M. M. Whetstone, Schellsburg
 Mayes Novelty Factory, Sonestown
 The Tidouite Rocker Co., Ltd., Tidouite
 Titusville Elastic Chair Co., Titusville
 Titusville Handle Co., Titusville
 The Shreve Chair Co., Union City
 Standard Chair Co., Union City
 The Union City Chair Co., Union City
 Variety Turning & Furn. Mfg. Co., Union City
 Samuel Peterson, Warren
 E. B. Sherman, Williamsburg
 J. K. Rishel Furniture Co., Williamsport
 Simmons Wood Working Co., Williamsport
 D. N. Byers, Woodbury

CLOCKS

Then Pen Argyll Clock Case Co., Pen Argyll
 American Cuckoo Clock Co., 1665 Ruffner St.,
 Philadelphia

Fred Frick Clock Co., Waynesboro

DAIRYMEN'S, POULTERERS' AND APIARISTS' SUPPLIES

Charles Incubator Co., Columbia
 F. E. Westby, Corry
 Prairie State Incubator Co., Homer City
 W. S. Wilcox, Turnersville, Jamestown P. O.
 Dairymen's Supply Co., Lansdowne

W. R. Wilcox, Lawrenceville
 Roller Tray Incubator Co., Northampton
 Phoenixville Mch. Co., Phoenixville
 The Sharples Separator Co., West Chester
 H. W. White, Whites Valley

ELEVATORS

Sprout, Waldron & Co., Muncy
 The Albro-Clem Elevator Co., Seventh St. &
 Glenwood Ave., Philadelphia
 Atlas Elevator Co., 611 Cherry St., Philadelphia
 Eastern Elevator Co., 228 Callowhill, Philadel-
 phia

Energy Elevator Co., 218 New St., Philadelphia
 Walter E. Goodman, 922 Callowhill, Philadelphia
 Independence Elevator Co., 710 Cherry, Phila-
 delphia
 Keystone Elevator Co., 23rd & Sansom Sts.,
 Philadelphia

*These companies have collieries in Pennsylvania.

ELEVATORS—Continued

Onelda Elevator Co., 733 Cherry St., Philadelphia	Supplee Elevator Co., 3207 Spring Garden, Philadelphia
O'Neill Elevator Co., 628 Cherry St., Philadelphia	Marshall Bros. 21st & Mary Sts., S. S., Pittsburgh
Otis Elevator Co., 1105 Frankford Ave., Philadelphia	John G. Speidel, Reading

EQUIPMENT, PLAYGROUND

Noll Bros. & Smith, Bausman	McKay Gilmore Furniture Co., Grove City
Bullock Swing & Chair Mfg. Co., Inc., Bellefonte	Penn Swing & Ladder Co., Lancaster
Hertzler & Zook Co., Belleville	Glen Mawr Novelty Works, Mawrglen
Clearfield Novelty Works, Clearfield	Eclipse Pulley Co., Meyersdale
Clearfield Woodenware Co., Inc., Clearfield	Penn Wheelbarrow Co., 4741 Kansas St., Pittsburgh
Cornopolis Mfg. Co., Cornapolis	R. M. Bowser & Son, Renfrew
Standard Novelty Works, Duncannon	The Specialty Mfg. Co., Titusville
East Greenville Mfg. Co., East Greenville	J. C. McQuaid, West View
A. Buch's Sons Co., Elizabethtown	Keystone Farm Machine Co., York
Greensburg Swing Co., Greensburg	

EXCELSIOR

J. K. Hornbeck, Equinunk	Handle & Excelsior Co., Picture Rocks
Hotchkiss & Son, Lawrenceville	Prompton Excelsior Co., Prompton
Gormley Brothers, Hoadleys	M. Elmore, White Mills

FIXTURES

Anton Loeper, Ashland	Harry R. Rust, 724-26 Ludlow St., Philadelphia
Adam Waldner, Ashland	Sanitary Specialties Co., 1824 E. Clearfield St., Philadelphia
Penn. R. R. Car Shops, Altoona	C. J. & A. Schad, 519 Bainbridge St., Philadelphia
Kurtz Bros., Bethlehem	Segall & Son, 729 Jefferson St., Philadelphia
Hoover Bros. Mfg. Co., Berrysburg	Louis Sher, 2132 S. Eighth St., Philadelphia
A. B. Hartman, Bloomsburg	Silberman & Fleisher, 1218 Mascher, Philadelphia
Federal Equipment Co., Carlisle	John E. Sjostrom Co., Inc., 1719 N. Tenth St., Philadelphia
Walton Lumber Co., Charleroi	Smedley Bros. Co., Church & Tacony Sts., Philadelphia
St. Francis Industrial School, Eddington	H. Dan'l Sorg, S. W. cor. Front & Montgomery Aves., Philadelphia
Exhibition Show Case Co., Erie	Robert Tarlo & Son, 413-17 S. Fifth St., Philadelphia
Johannesen Mfg. Co., Erie	H. Tiedemann, N. W. cor. Nineteenth St. & Washington Ave., Philadelphia
M. Schultz, Gallitzin	V. W. Mfg. Co. (John B. Vernon, Partner), 1616 North St., Philadelphia
Glen Mfg. Co., Glen Rock	Harry Walter, 1711 N. 31st St., Philadelphia
L. B. Walbert, Hancock	Weisner, Weis & Co., 240 Cherry St., Philadelphia
Henry Shaffer Lumber Co., Kittanning	A. Witt & Sons, 721 N. Front St., Philadelphia
The Wohlens Planing Mill Co., Lancaster	Frederick V. Yeager, 9-13 S. 36th St., Philadelphia
H. E. Walters, Middleburg	P. R. R. Co., Pitcairn
Middletown Furniture Co., Middletown	Barnes Safe & Lock Co., 327 Third Ave., Pittsburgh
Montgomery Table Works, Montgomery	S. Delp's Sons, Fourth & Liberty, Pittsburgh
Stokes Mfg. Co., Montgomery	Bernard Gloekler Co., 1127 Pennsylvania Ave., Pittsburgh
Basch & Co., 402 Cherry, Philadelphia	Kates & Co., Grant Block, Pittsburgh
B. Bernheim & Sons, 1401 N. Third St., Philadelphia	Kund & Eiber Mfg. Co., 204-24 Warrington Ave., Pittsburgh
Meyer Cossoy, 624 Filbert St., Philadelphia	Geo. B. Monks Co., 8-10 Ketchum, Pittsburgh
John Ernst & Co., 2208 Germantown Ave., Philadelphia	National Electric Shoe Hatching Mch. Co., 422 First St., Pittsburgh
J. Fisher & Co., 1216-18 N. Fifth St., Philadelphia	Pittsburgh Hardwood Working Co., 33-34 Water St., Pittsburgh
Chas. C. Geissler, 62 N. Fourth St., Philadelphia	P. & L. E. R. E., Pittsburgh
Interior Milling Co., 2531 Poplar St., Philadelphia	Union R. R. Co., Port Perry
Irons Co., 1401 Germantown Ave., Philadelphia	Josiah Frederick, Pottstown
Karcher & Rehn Co., Twelfth & Hamilton Sts., Philadelphia	Penna. R. R. Co., Pottsville
Kasansky & Bloom, 231-33 N. Lawrence St., Philadelphia	R. M. Bowser & Son, Renfrew
Stephen F. Ketran, 12 S. 24th St., Philadelphia	The Woodwork Supply Co., Reynoldsville
Keystone Display Rack Co., 1132 Farrish, Philadelphia	John Benore, Scranton
J. Kirchof & Co., 448 N. Twelfth St., Philadelphia	Brown Bros., Scranton
Francis D. Kramer, 1601 Spring Garden St., Philadelphia	Pock Lbr. Mfg. Co., Scranton
A. H. & F. H. Lippincott, Inc., 24th & Locust Sts., Philadelphia	Valverde Mfg. Co., Scranton
George E. Lucas, 2013 Montgomery Ave., Philadelphia	J. R. Newbold & Co., Sellersville
John J. McCloskey, 149 N. Fourth St., Philadelphia	The National Malleable Castings Co., Sharon
Mallock & Coddington, 611 Cherry St., Philadelphia	Bethlehem Steel Co., South Bethlehem
Miller & England Co., 1124-32 Washington Ave., Philadelphia	Bischoff Estate, Tamaqua
Northern Central Railway (Address, Mt. Vernon Car Shop, Baltimore, Md.), Philadelphia	Penna. R. R., Verona
Pennsylvania Store Fixture Co., 1304 N. Second St., Philadelphia	Meas Furniture Co., Warren
Julius A. Raith's Sons, 304 Master St., Philadelphia	Warren Veneer & Panel Co., Warren
Ridgway Refrig. Co., 3519 N. Lawrence St., Philadelphia	E. T. Long & Co., Wilkes-Barre
William Russell Woodworking Co., 3015-29 Chestnut St., Philadelphia	F. B. Sherman, Williamsburg
	Dittmar Furniture Co., Williamsport
	Geo. W. Gilbert, York
	George A. Swartz, York
	Youngsville Mfg. Co., Youngsville

FRAMES AND MOLDING, PICTURE

Wyman Kimble Planing Mill, Honesdale
 William G. Hermann, 1111 Ridge Ave., Phila-
 delphia
 Kirkpatrick Mfg. Co., Third St. & Glenwood
 Ave., Philadelphia
 J. E. McClees & Co., 1507 Walnut, Philadelphia

Conroy Prugh Co., 1430-36 Western Ave., N. S.,
 Pittsburgh
 American Slate Works, Slatington
 National School Slate Co., Slatington
 L. M. Castner, Williamsport

FURNITURE

Keystone Mfg. Co., Albion
 G. H. Bear Furniture Co., Allentown
 Gottlieb Buehler & Co., Allentown
 C. A. Dorney Furn. Co., Allentown
 Johnston & Swartz, Allentown
 E. J. Schneck & Sons, Allentown
 The Yeager Furniture Co., Allentown
 Penna. R. R. Car Shops, Altoona
 M. Foet & Son, Altoona
 John E. Caruso, Ardmore
 Athens Furniture Co., Athens
 Hoover Bros. Mfg. Co., Berrysburg
 A. B. Hartman, Bloomsburg
 Hawley-Slate Furn. Co., Bloomsburg
 A. D. Deemer Furniture Co., Brookville
 H. Crawford & Sons, Canton
 Minnequa Furn. Co., Canton
 H. J. & W. A. Krumenacker, Carrolltown
 P. Nicklas' Sons, Chambersburg
 Henry Sierer & Co., Chambersburg
 E. M. Smith, Chambersburg
 Keystone Cabinet Co., Chester
 The New Farson Mfg. Co., Chester
 Penn Furniture Co., Conneautville
 Coraopolis Mfg. Co., Coraopolis
 K-P-L Furniture Mfg. Co., Corry
 J. F. Else, Cowan
 Dallastown Furniture Co., Dallastown
 R. M. Prowles, Dry Run
 East Greenville Mfg. Co., East Greenville
 Rutter Bros., Turtle Creek, East Pittsburgh
 Brown Furniture Co., East Stroudsburg
 B. F. Beers, Fallentimber
 Kurtz Furniture Co., Fullerton
 Garland Furniture Co., Garland
 Reaser Furniture Co., Gettysburg
 Dize Furniture Co., Glen Rock
 Enterprise Furniture Co., Glen Rock
 Hess Brothers, Grantville
 J. C. Reed, Greensburg
 Daniel A. Burkey & Sons, Hamburg
 Hanover Cabinet Co., Hanover
 Long Furniture, Hanover
 Penna. R. R. Co., Harrisburg
 S. A. Huntsinger, Hegins
 Penwarden Mfg. Co., Honesdale
 Hughesville Furniture Co., Hughesville
 Indiana Bent Rung Ladder Co., Indiana
 Henry Shaffer Lumber Co., Kittanning
 Lebanon Valley Furniture Co., Lebanon
 Leighton Lumber Co., Leighton
 LeRaysville Furniture & Toy Mfg. Co., LeRays-
 ville
 Lowry & Akeman, Ligonier
 C. F. Bucher, Littlestown
 Clinton Furniture Co., Lock Haven
 Wm. S. Clevenger, McConnellsburg
 M. T. Wertz, Malta
 Mansfield Novelty Works, Mansfield
 Chas. Neast & Co., Mauch Chunk
 Mill Run Lumber Co., Meadville
 West Branch Novelty Co., Milton
 Isaac C. Decker, Montgomery
 Montgomery Lounge Co., Montgomery
 Montgomery Table Works, Montgomery
 Montgomery Mfg. Co., Montgomery
 Stokes Mfg. Co., Montgomery
 Berry Bros., Montoursville
 Crandall-Bennett-Porter Co., Montoursville
 Woolever Bros., Montoursville
 Mount Wolf Furniture Co., Mount Wolf
 Muncy Mfg. Co., Ltd., Muncy
 J. D. Bowers, New Holland
 J. C. Hennings, New Holland
 Lillo Bros. Co., Oakdale
 J. G. Moyer & Sons Co., Perkasio
 American Cabinet Works, 227 Buttonwood St.,
 Philadelphia
 James Barker, Inc., Sixth & Cayuga, Philadel-
 phia
 Jacob Behrend, 124 W. Allen St., Philadelphia
 George W. Brenn, 1306-08 N. Marshall, Philadel-
 phia
 Burt Brothers, 2000 S. Ninth St., Philadelphia
 James W. Cooper Co., 1706-20 Washington Ave.,
 Philadelphia
 Henry Dilg, 828 Wood St., Philadelphia

John A. Dubs, 269 S. Fifth St., Philadelphia
 Ebert Furniture Co., Sixth & Moore Sts., Phila-
 delphia
 Christian Gebert, 141 E. Cumberland St., Phila-
 delphia
 John Grass Wood Turning Co., 222 Vine St.,
 Philadelphia
 Hale & Kilburn Co., 18th & Lehigh Ave., Phila-
 delphia
 J. S. Hardig & Son, 5109 Germantown Ave.,
 Germantown, Philadelphia
 Hoehling Bros., 314 S. Lawrence, Philadelphia
 G. Horn & Co., 422 N. Orianna St., Philadelphia
 Walter E. Hunt, 1615 Chestnut St., Philadelphia
 Peter Josten, 1014 N. Third Ave., Philadelphia
 Kasansky & Bloom, 231-233 Lawrence St., Phila-
 delphia
 Kaufmann Mfg. Co., 710-12 N. Percy St., Phila-
 delphia
 Ferdinand Keller, 216-24 S. Ninth St., Phila-
 delphia
 John Knoell & Sons, 171 Jefferson St., Phila-
 delphia
 Henry Krann Furniture Co., Sixth & Master
 Sts., Philadelphia
 Lincoln Furniture Co., 415 Brown St., Philadel-
 phia
 McCracken & Hall, 1120 Washington Ave., Phila-
 delphia
 Thos. Mills & Bro., Inc., 1301 N. Eighth St.,
 Philadelphia
 Peter C. Osada & Co., 1422 S. Front St., Phila-
 delphia
 Page & Rainey, 230 S. Second St., Philadelphia
 Morris Platt & Co., 1406 S. Front St., Phila-
 delphia
 Pooley Furniture Co., Indiana Ave., 16th & 17th
 Sts., Philadelphia
 John H. Ragatz & Son, 212 Chancellor St., Phila-
 delphia
 Henry H. Sheip Mfg. Co., N. E. Cor. Sixth St.
 & Columbia Ave., Philadelphia
 A. Wagenbaur, 534 N. Second St., Philadelphia
 The Winner Co., 2035-45 N. Seventh St., Phila-
 delphia
 Burrows Bros. & Co., Ltd., Picture Rocks
 John P. Little Co., Picture Rocks
 Colonial Art Furniture Co., 3906 Fifth Ave.,
 Pittsburgh
 Dauler, Close & Johns, 636 Smithfield St., Pitts-
 burgh
 D. DeSimone, 230 Lorimer Ave., Pittsburgh
 Julius Eisenberger, 560 Homewood Ave., Pitts-
 burgh
 Eastend Art Furniture Co., 4524 Forbes St.,
 Pittsburgh
 A. G. Pera, 5568 Baum St., Pittsburgh
 Pittsburgh Hardwood Working Co., 33-34 Water
 St., Pittsburgh
 H. N. Twitmyer, Pleasant Gap
 Sieling Furniture Co., Railroad
 Philadelphia & Reading R. R. Co., Reading
 Red Lion Furniture Co., Red Lion
 Noah C. Stabley, Red Lion
 C. G. Sellers, Saint Thomas
 M. M. Whetstone, Schellsburg
 Charles S. Metzgar, Sciota
 Robinson Bros., Sharpsville
 Boher & Phillips, Shippensburg
 Peerless Furniture Co., Shippensburg
 Shippensburg Table & Mfg. Co., Shippensburg
 Shrewsbury Furniture & Mfg. Co., Shrewsbury
 Pennsylvania State College, State College
 Stewartstown Furniture Co., Stewartstown
 Tillman Hontz, Summit Hill
 Sunbury Table Works, Sunbury
 Tidionte Furniture Mfg. Co., Tidionte
 J. O. Frost's Sons, Towanda
 Benj. Danahower, Trexler
 W. F. Dildine, Turbotville
 Rutter Bros., East Pittsburgh, Turtle Creek Br.
 P. O.
 Loomis Table & Furniture Co., Union City
 The Novelty Wood Works Co., Union City
 Variety Turning & Furniture Mfg. Co., Union
 City

FURNITURE—Continued

Elmer Yingling, Waynesboro
 Conewango Furniture Co., Warren
 Geo. L. Folkman, Warren
 Mens Furniture Co., Warren
 Phenix Furniture Co., Warren
 Warren Table Works, Warren
 Watsontown Table & Furniture Co., Watsontown
 Enreka Mfg. Co., Weissport
 F. B. Sherman, Williamsburg
 A. H. Heilman & Co., Williamsport
 Keystone Furniture Co., Williamsport

National Furniture Co., Williamsport
 J. K. Rishel Furniture Co., Williamsport
 Williamsport Furniture Co., Williamsport
 D. N. Byers, Woodbury
 H. E. Boring & Bro., York.
 Home Furniture, York
 Keystone Farm Machine Co., York
 Pa. Furniture Co., York
 West York Furniture Mfg. Co., York
 Forest Furniture Mfg. Co., Youngsville
 Youngsville Mfg. Co., Youngsville

GATES AND FENCING

Chester Fence Co., Chester Heights
 Rutter Bros., Turtle Creek, East Pittsburgh
 Eyan Moore, Elwyn
 Henry Shaffer Lumber Co., Kittanning
 Northern Central Railway (Address, Mt. Vernon
 Car Shop, Baltimore, Md.), Philadelphia

East End Planing Mill Co., Sexton
 Rutter Bros., East Pittsburgh, Turtle Creek
 Br. P. O.
 Geo. W. Gilbert, York

HANDLES

Penna. R. R. Car Shops, Altoona
 J. L. McLaughlin & Sons, Bedford
 Hertzler & Zook Co., Belleville
 Cumberland Valley R. R. Co., Chambersburg
 M. B. Landis & Co., Copersburg
 Codorus Handle Co., Codorus
 Keystone Handle Co., Corydon
 E. H. Leathers, Curtin
 Ringer & Co., Delmont
 C. Prouty & Co., Eldred
 J. H. Young Lumber Co., Emlenton
 J. D. Westcott & Son, Endeavor
 Theo. J. Ely Mfg. Co., Erie
 Erie City Mfg. Co., Erie
 Washburn Mfg. Co., Erie
 F. H. Campbell, Espyville
 Penna. Saw Co., Frackville
 Marsteller Bros. Lumber Co., Fredonia
 Girard Wrench Mfg. Co., Girard
 M. D. Hoke, Hokes Mills
 Howard Handle & Spoke Co., Howard
 The L. C. Hasinger Co., Indiana
 Robinson & Stryke, Keating Summit
 Sheldon Handle Co., Kinzua
 Lehentaler Bros., Loleta
 American Fork and Hoe Co., North Girard
 Penn Mfg. Co., North Girard
 Hammond & Son, Ogontz
 J. G. Moyer & Sons Co., Perkaskie

The John Buckley Hub, Spoke & Wheel Co.,
 969-975 N. Second St., Philadelphia
 Chas. P. Foulkrod, 2235 Wood St., Philadelphia
 Germantown Tool Works, 518 Commerce St.,
 Philadelphia
 John Grass Wood Turning Co., 222 Vine St.,
 Philadelphia
 Nelms Co., 407 Commerce St., Philadelphia
 N. C. Railway (Address, Mt. Vernon Car Shop,
 Baltimore, Md.), Philadelphia
 Thomas Ott & Co., 1124-1132 Washington Ave.,
 Philadelphia
 Leon Rozzen, 1003 N. Second St., Philadelphia
 Handle & Excelstor Co., Picture Rocks
 The J. C. Russell Shovel Co., 336 Fourth Ave.,
 Pittsburgh
 F. F. Childs, Pittsfield
 Colebrookdale Iron Co., Pottstown
 Reading Wood Pulley Co., Reading
 Wm. Rose & Bros., Sharon Hill
 Bethlehem Steel Co., South Bethlehem
 Geo. H. Lancaster, South Sterling
 L. Hammond, Spangler
 Titusville Handle Co., Titusville
 Fred Cafilich, Union City
 The Star Handle Co., Union City
 Union Furnace Handle Co., Union Furnace
 Samuel Peterson, Warren
 Chas. Fritz, Welsenburg
 F. B. Sherman, Williamsburg

INSTRUMENTS, MUSICAL

A. B. Feljemaker Organ Co., Erie
 A. Gottfried & Co., Erie
 Kellmer Piano Co., Hazleton
 Miller Organ & Piano Co., Lebanon
 Bates & Culley, 708-18 Mercy St., Philadelphia
 Cunningham Piano Co., 4948 Parkside Ave.,
 Philadelphia
 C. S. Haskell, 1520-22 Kater St., Philadelphia

Knette Engineering Co., 60th & Baltimore Ave.,
 Philadelphia
 The Lester Piano Co., 1306 Chestnut, Philadel-
 phia
 Painter & Ewing, 1105 Spring Garden, Philadel-
 phia
 Chas. F. Durner, Quakertown
 Weaver Organ & Piano Co., York

INSTRUMENTS, PROFESSIONAL AND SCIENTIFIC

Penna. R. R. Co. (Foundries), Altoona
 Logan Iron & Steel Co., Burnham
 Theo. Altender & Sons, 945 Ridge Ave., Phila-
 delphia
 Charles A. Anderson, 1629 N. Tenth St., Phila-
 delphia
 Nathan Cohen, 1126 N. Orianna, Philadelphia
 John Grass Wood Turning Co., 222 Vine St.,
 Philadelphia
 T. H. Grigg, Lancaster Ave. & Baring St.,
 Philadelphia

Joseph B. Levy, 1429 21st St., Philadelphia
 Lippincott Pencil Co., 220 N. 23rd St., Phila-
 delphia
 Thos. Mills & Bro., Inc., 1301 N. Eighth St.,
 Philadelphia
 Smedley Bros. Co., Church & Tacony Sts., Frank-
 ford, Philadelphia
 Martin H. Walrath, Broad & Cambria Sts.,
 Philadelphia
 Bethlehem Steel Co., South Bethlehem
 Verona Tool Works, Verona

INSULATOR PINS AND BRACKETS

The L. C. Hasinger Co., Indiana
 Robinia Pin Co., Newville

S. J. Bailey, Nicholson
 J. W. Endsley, Somerfield

LADDERS

Appolo Step Ladder Co., Appollo
 Coraopolis Mfg. Co., Coraopolis
 American Mfg. & Novelty Co., Erie
 Indiana Bent Rung Ladder Co., Indiana
 Penna. Swing and Ladder Co., Lancaster
 Pencoyd Iron Works, Pencoyd

Nathan Cohen 1126 N. Orianna, Philadelphia
 John P. Little Co., Picture Rocks
 Acme Mfg. Co., Marshall Ave., N. S., Pitts-
 burgh
 Bethlehem Steel Co., South Bethlehem

LAUNDRY APPLIANCES

Keystone Mfg. Co., Albion
 Apollo Step Ladder Co., Apollo
 Clearfield Wooden-Ware Co., Inc., Clearfield
 Coudersport Mangle Roller Mfg. Co., Coudersport
 East Greenville Mfg. Co., East Greenville
 American Mfg. and Novelty Co., Erie
 Lowell Mfg. Co., Erie
 The Wagner Curtain Stretcher Co., Greensburg
 Wyman Kimble Planing Mill, Honesdale
 S. H. Everett, McEwensville
 Motz Lumber Co., Monessen
 Stokes Mfg. Co., Montgomery
 Miller Mfg. Co., Myersstown
 The Eclipse Co., North Girard
 The Empire Co., North Girard

Gen. Mfg. Co., North Girard
 Frank Hopkins, North Girard
 L. Hopkins Mfg. Co., North Girard
 Penn. Mfg. Co., North Girard
 J. T. Hammond & Son, Inc., 4534 Hedge St.,
 Frankford, Philadelphia
 John P. Little Co., Picture Rocks
 Acme Mfg. Co., Marshall Ave., N. S., Pittsburgh
 Josiah Frederick, Pottstown
 Household Mfg. Co., Rogersford
 Mayes Novelty Factory, Sonestown
 Sonestown Mfg. Co., Sonestown
 The Specialty Mfg. Co., Titusville
 D. W. Frazee, Wellsboro
 Atlas Wooden Novelty Co., Williamsport
 Sonestown Manufacturing Co., Williamsport

MACHINERY AND APPARATUS, ELECTRICAL

Penna. R. R. Co. (Foundries), Altoona
 Westinghouse Elec. Mfg. Co., East Pittsburgh
 Chas. P. Foulkrod, 2235 Wood St., Philadelphia
 Louis Kirchgaber, 613-15 Cherry St., Philadelphia

Standard Underground Cable Co., Westinghouse
 Bldg., Pittsburgh
 The Union Switch and Signal Co., Swissvale,
 Pittsburgh
 Hazard Manufacturing Co., Wilkes-Barre

MACHINE CONSTRUCTION

S. Flory Mfg. Co., Bangor
 Keystone Driller Co., Beaver Falls
 Blaisdell Machinery Co., Bradford
 Boward & Seyfang Mfg. Co., Bradford
 Carbondale Mch. Co., Carbondale
 The Wolf Co., Chambersburg
 P. G. Frederick & Co., Chiloera
 Wangaman Mfg. Co., Clarendon
 Clearfield Machine Shops, Clearfield
 Downingtown Mfg. Co., Downingtown
 The Eddystone Mfg. Co., Eddystone
 Wilnot Engineering Co., Hazleton
 McInanahan-Stone Machine Co., Hollidaysburg
 American Road Machine Co., Kennett Square
 Edwards Mfg. Co., Laceyville
 Curtis E. Showalter, Landisburg
 Robinson Mfg. Co., Muncy
 Sprunt, Waldron & Co., Muncy
 New Holland Machine Co., New Holland
 Weaver & Co., New Oxford

Oil Well Supply Co., Oil City
 New Jersey Zinc Co., Palmerton
 James Barker, Inc., Sixth and Cayuga, Philadelphia
 Ajax Mfg. Co., 348 Jarville, N. S., Pittsburgh
 Thomas Carlins Sons Co., 1600 River Ave., Pittsburgh
 Mackintosh, Hemphill & Co., Twelfth and Etna,
 Pittsburgh
 Sigwart & Rolston Mch. Works, Cor. Garrison
 Place and Duquesne Way, Pittsburgh
 Ellis Keystone Agl. Works, Pottstown
 Philadelphia & Reading R. R. Co., Reading
 Landis Bros., Rheems
 Mayes Novelty Factory, Sonestown
 H. C. Mapes, Tionesta
 Frick Co., Waynesboro
 Geiser Mfg. Co., Waynesboro
 A. B. Farquhar Co., Ltd., York
 Hench & Drumgold, York

MANUAL TRAINING PRACTICE (SLOYD)

School, Altoona
 School, Beaver Falls
 School, Braddock
 School, Butler
 School, Conshohocken
 School, Cory
 School, DuBois
 School, Erie
 Technical High School, Harrisburg
 Schwab Industrial School, Homestead
 School, Johnstown

School, Lebanon
 School, Monessen
 School, New Castle
 Carnegie Tech. School, Pittsburgh
 Schools, Pittsburgh
 School, Reading
 Technical High School, Adams Ave., Scranton
 School, Sharon
 Penn. State College, State College
 Radnor Township High School, Wayne
 Schools, Williamsport

MINE EQUIPMENT

Alden Coal Co., Alden Station
 W. Harry Brown, Alicia
 Latrobe Coal Co., Altoona
 Fall Brook Coal Co., Antrim
 Lake Ariel Lumber Co., Ariel
 Pittsburgh & Southwestern Coal Co., Avella
 Charles M. Dodson & Co., Beaver Brook
 Beaver Run Coal Co., Beaverdale
 Connell Anthracite Mining Co., Bernice
 Big Run Mfg. Co., Big Run
 Bells Mill Coal Co., Blairsville
 Blairsville Coke Co., Blairsville
 Conemaugh Coal Co., Blairsville
 Graff Coal Co., Blairsville
 Maher Coal & Coke Co., Blairsville
 Roaring Run Mining Co., Blairsville
 Blossburg & Coal Run Coal Co., Blossburg
 Jenkins Bros., Blossburg
 Terry Coal Co., Blossburg R. D.
 McCrane Coal Co., Bridgeville
 Brier Hill Coke Co., Bridgeville
 E. J. Walker & Co., Brisbin
 Schuylkill Lehigh Coal Co., Brockton
 McKnight Coal Co., Brockwayville
 Champion Connellsville Coke Co., Brownsville
 Union Connellsville Coke Co., Brownsville

Lake Shore Gas Coal Co., Buena Vista
 East Mountain Coal Co., Carbondale
 Casey Coal Co., Carnegie
 Cheat Haven Coal & Coke Co., Cheat Haven
 Clearfield Bituminous Coal Corp., Clearfield
 Clearfield Clay Working Co., Clearfield
 Goshen Coal Co., Clearfield
 Blain Run Coal Co., Coalport
 Evans Coal & Coke Co., Connellsville
 R. Manetta Coal Co., Connellsville
 Manetta Connellsville Coke Co., Connellsville
 Pittsburgh Plate Glass Co., Creighton
 E. H. Leathers, Curtin
 Ford Collieries Co., Curtisville
 Washington Coal & Coke Co., Dawson
 George Minns, Jr., DuBois
 Oak Hill Coal Co., Duncott
 Carney & Brown Coal Co., Scranton, Dunmore
 Br. P. O.
 Hillside Coal & Iron Co., Scranton, Dunmore
 Br. P. O.
 Keystone Mining Co., East Brady
 Monarch Coal Co., East Brady
 Island Run Coal Co., East Liverpool
 Springfield Coal Mining Co., Ebensburg
 Ellsworth Collieries Co., Ellsworth
 Crescent Coal Co., Epton

MINE EQUIPMENT—Continued

- Export Coal Co., Export
 Clinton Falls Coal Co., Forest City
 Eagle Coal Co., Fredell
 Kerr Coal Co., Freeport
 H. D. Brady, Gallitzin
 The Taylor & McCoy Coal & Coke Co., Gallitzin
 Enterprise Coal Co., Garrett
 W. K. McTurk Coal Co., Girardsville
 Cornell Coal Co., Glassmere
 Graceton Coke Co., Graceton
 Apollo Coal Co., Greensburg
 Atlantic Crushed Coke Co., Greensburg
 Keystone Coal & Coke Co., Greensburg
 Rich Hill Coal Co., Hastings
 J. S. Wentz & Co., Hazelbrook
 Harwood Coal Co., Hazleton
 Hazle Mountain Coal Co., Hazleton
 A. Pardee & Co., Hazleton
 Estate of A. S. Van Wickle, Hazleton
 Penn-Mary Coal Co., Hellwood
 McLanahan-Stone Mach. Co., Hollidaysburg
 Penna. Smokeless Coal Co., Hollisopple
 W. S. B. Hays, Homestead
 Huntingdon Coal Co., Huntingdon
 John Langdon, Huntingdon
 The L. C. Hasinger Co., Indiana
 Broad Top Coal & Mineral Co., Jacob
 G. B. Markee Co., Jeddo
 Humbert Coal Co., Jessup
 Cambria Steel Co., Johnstown
 Suppes Coal Co., Johnstown
 Great Lakes Coal Co., Kaylor
 East Boston Coal Co., Kingston
 Allegheny River Mining Co., Kittanning
 Stewart Coal Co., Knox Dale
 The Lehigh Coal & Navigation Co., Lansford
 Latrobe-Connessville Coal & Coke Co., Latrobe
 Unity-Connessville Coke Co., Latrobe
 Widnoon Coal Mining Co., Lawsonham
 Armstrong County Coal Co., Leechburg
 Jas. Harris & Sons, Lilly
 Lloydell Coal Mining Co., Lloydell
 Logansport Coal Co., Logansport
 Raridan & East Brady C. Co., Logansport
 Northern Anthracite Coal Co., Lopez
 Puritan Coke Co., McClellandtown
 Bowman Bros. Co., McKeesport
 Moosic Mountain Coal Co., Marshwood
 Spring Hill Coal Co., Mayfield
 T. H. Wachua, Mayfield
 Atlantic Coal Co., Meyersdale
 Phillips Bros., Middleport
 Buck Run Coal Co., Minersville
 Darkwater Coal Co., Minersville
 Pine Hill Coal Co., Minersville
 West End Coal Co., Mconanqua
 Dodson Coal Co., Morea Colliery
 National Mining Co., Morgan
 The Leesburg Coal Co., New Castle
 Thompson Connessville Coke Co., New Salem,
 R. D.
 Olyphant Coal Co., Olyphant, R. D.
 The Hedstrom Coal Mining Co., Parkers Landing
 Mt. Jessup Coal Co., Peckville
 Penfield Coal & Coke Co., Penfield
 Colonial Collieries Co., Philadelphia
 Forze Coal Mining Co., 1000 Franklin Bank
 Bldg., Philadelphia
 Highland Coal Mining Co., Real Estate Trust
 Bldg., Philadelphia
 Lehigh & Wilkes-Barre Coal Co., 716 Reading
 Terminal, Philadelphia
 W. H. Piper & Co., Real Est. Trust Bldg.,
 Philadelphia
 Shoemaker Coal Mining Co., 1507 Real Estate
 Trust Bldg., Philadelphia
 South Fork Coal Mining Co., Bullitt Bldg., 421
 Chestnut St., Philadelphia
 Bessemer Coke Co., Oliver Bldg., Pittsburgh
 Blaine Coal Co., Fulton Bldg., Pittsburgh
 Carnegie Coal Co., 1315 Paix Bldg., Pittsburgh
 H. C. Erick Coke Co., Pittsburgh
 John M. Greek & Co., 310 Park Bldg., Pittsburgh
 Hostetter Connessville Coke Co., Pittsburgh
 Monongahela River, Consolidated Coal & Coke
 Co., Smithfield St., Pittsburgh
 Mountain Smokeless Coal Co., 2204 Oliver Bldg.,
 Pittsburgh
 Oliver & Snyder Steel Co., South Tenth & Murlet
 Sts., Pittsburgh
 Pittsburgh-Baltimore Coal Co., First National
 Bank Bldg., Pittsburgh
 Pittsburgh Coal Co., Smithfield St., Pittsburgh
 Pittsburgh-Westmoreland Coal Co., Fulton Bldg.,
 Pittsburgh
 Sampson & Hormel, Wilksburg, R. D., Pitts-
 burgh
 J. H. Sanford Coal Co., 1315 Park Bldg., Pitts-
 burgh
 Somerset Smokeless Coal Co., First National
 Bank Bldg., Pittsburgh
 United Coal Co., First National Bank Bldg.,
 Pittsburgh
 United Connessville Coke Co., Oliver Bldg.,
 Pittsburgh
 The Vesta Coal Co., Third Ave. and Ross St.,
 Pittsburgh
 McCauley Coal Co., Pittston
 Yost Mining Co., Pittston
 Roaring Run Mining Co., Plainsville
 Parrish Coal Co., Plymouth
 The Penker Coal Co., Portage, R. D.
 Philadelphia & Reading Coal & Iron Co., Potts-
 ville
 Anita Coal Mining Co., Punxsutawney
 Bowersville Coal Co., Punxsutawney
 Cortez Coal Co., Punxsutawney
 John McLeavy & Co., Punxsutawney
 Geo. Pearce & Sons, Puritan
 Bulah Coal Co., Ramey
 Bulah Shaft Coal Co., Ramey
 Gitard Mammoth Coal Co., Ravenrun
 Jermyn & Co., Rendham
 Irona Coal & Coke Co., Rosebud
 Butcher Creek Coal Co., St. Clair
 Mount Hope, Coal Co., St. Clair
 The St. Clair Coal Co., St. Clair
 Shawmut Mining Co., St. Marys
 Bowman Coal Mining Co., Saltsburg
 M. S. Kemmerer & Co., Sandy Run
 Lincoln Coal & Coke Co., Scottdale
 Carney & Brown Coal Co., Dunmore, Scranton
 The Delaware, Lackawanna & Western R. R.
 Co., Mining Dept., Scranton
 Dolph Coal Co., Ltd., Scranton
 Hillside Coal & Iron Co., Dunmore, Scranton
 Nay Aug Coal Co., Scranton
 Pennsylvania Coal Co., Dunmore, Scranton
 Peoples Coal Co., Scranton
 Scranton Coal Co., Scranton
 Oxford Coal Co., Shaft
 H. H. Smith & Co., Shaft
 Greenough Red Ash Coal Co., Shamokin
 Shipman Coal Co., Shamokin
 Thomas Colliery Co., Shenandoah
 J. B. Anderson & Son, Shickshinny
 Baxter Ridge Coke Co., Smithfield
 Leland Coal Mining Co., Smokerun
 Consolidation Coal Co., Somerset
 H. C. Stineman, South Fork
 O. M. Stineman, South Fork
 H. A. Underwood, Strattonville
 East Deer Coal Co., Tarentum
 D. L. Ruff, Tarrs
 Price Pancoast Coal Co., Throop
 Brownsville Coke Co., Uniontown
 Hope Coke Co., Uniontown
 Hinstead-Semans Coal & Coke Co., Uniontown
 Olive Coal Co., Uniontown
 W. J. Parshall, Uniontown
 Prospect Coal & Coke Co., Uniontown
 South Fayette Coke Co., Uniontown
 Waltersburg Coke Co., Uniontown
 Whirl Coal Co., Uniontown
 Vinton Colliery Co., Vintondale
 Genuine Connessville Coke Co., Waltersburg
 Lackawanna Coal & Coke Co., Wehrum
 A. J. Lundquist & Co., Wellsboro R. D.
 H. W. White, Whites Valley
 Midvalley Coal Co., Wilburton
 Cox & Bros. & Co., Inc., Wilkes-Barre
 Lehigh Valley Coal Co., Wilkes-Barre
 Susquehanna Coal Co., Wilkes-Barre
 Sampson & Hormel, Pittsburgh, Wilksburg
 Br. P. O.
 Berwind-White Coal Mining Co., Windber
 W. J. Stein, Woodville
 *Jefferson & Clearfield Coal & Iron Co., Ro-
 chester, N. Y.
 *Rochester & Pittsburgh Coal & Iron Co., Roch-
 ester, N. Y.
 *Warner-Leonard Coal Co., Cleveland, Ohio
 *Atlas Coke Co., Works at Helen, Pa., Leetonia,
 Ohio

*These companies have collieries in Pennsylvania.

PATTERNS AND FLASKS

- International Motor Co., Allentown
 Penn. R. I. Co. (Foundries), Altoona
 Penn. R. I. Co. (Juniata Shops), Altoona
 The Autocar Co., Ardmore
 S. Flory Mfg. Co., Bangor
 Keystone Driller Co., Beaver Falls
 Hertzler & Zook Co., Belleville
 Gruber Wagon Works, Bernville
 Blainsville Enamelware Co., Blainsville
 Herman & Hassert, Inc., Bloomsburg
 Improved Traction Engine Co., Boynton
 West Penn. Steel Co., Brackenridge
 Braddock Machine & Mfg. Co., Braddock
 Blaisdell Machinery Co., Braddock
 Bovard & Seyfang Mfg. Co., Bradford
 Standard Cast Iron Pipe & Foundry Co., Bristol
 Logan Iron & Steel Co., Burnham
 Standard Steel Works Co., Burnham
 California Foundry & Machine Co., California
 American Welding Co., Carbondale
 The Carbondale Mch. Co., Carbondale
 Chambersburg Engineering Co., Chambersburg
 The Wolf Co., Chambersburg
 Cherry Tree Iron Works, Cherry Tree
 American Steel Foundries, Chester
 Federal Steel Foundry Co., Chester
 Penn. Steel Casting & Machine Co., Chester
 Clearfield Fire Brick Co., Clearfield
 Clearfield Machine Shops, Clearfield
 Harbison Walker Ref. Co., Clearfield
 Luckens Iron & Steel Co., Coatesville
 Freed Heater Co., Inc., Collegeville
 The Keeley Stove Co., Columbia
 Coraopolis Mfg. Co., Coraopolis
 Shamburg & Allen Mach. Co., Coraopolis
 Downingtown Mfg. Co., Downingtown
 Westinghouse Electric Mfg. Co., East Pittsburg
 Pennsylvania Iron Works Co., Eddystone
 The Eddystone Mfg. Co., Eddystone
 A. Buch's Sons Co., Elizabethtown
 L. L. Fisk, Emporium
 General Electric Co., Erie
 National Foundry Co., Erie
 Frank R. Glisson, Exton
 Fleetwood Metal Body Co., Fleetwood
 American Steel Foundries, Franklin
 Wm. Shimer, Son & Co., Freemansburg
 Buffalo & Susquehanna R. R., Galeton
 Pittsburgh Steel Foundry, Glassport
 The Kelley & Jones Co., Greensburg
 The W. O. Hickok Mfg. Co., Harrisburg
 Wilmot Engineering Co., Hazleton
 McLanahan-Stone Mach. Co., Hollidaysburg
 Hyde Park Foundry & Machine Co., Hyde Park
 F. & E. Trump, Jersey Shore
 Cambria Steel Co., Johnstown
 The Lorain Steel Co., Johnstown
 American Road Machine Co., Kennett Square
 Orenstein Arthur Koppel Co., Koppel
 Crucible Steel Casting Co., Lansdowne
 Sanitary Co., of America, Infield
 Rosenfranz Machine Co., McKeesport
 Taylor-Wilson Mfg. Co., McKees Rocks
 Johnetta Fdy. & Machine Co., Marianna
 Robinson Mfg. Co., Muncy
 Sprout, Waldron & Co., Muncy
 Union Spring & Mfg. Co., New Kingston
 The Alan Wood, Iron & Steel Co., Norristown
 Norris Pattern and Machine Co., Norristown
 National Transit Co. Shops, Oil City
 Oil Well Supply Co., Oil City
 Osceola Silica & Fire Brick Co., Osceola Mills
 S. B. Stine, Osceola Mills
 New Jersey Zinc Co., Palmerton
 American Bridge Co. and Pencoyd Iron Works,
 Pencoyd
 Geo. R. Allen, 13th & Buttonwood, Philadelphia
 American Pattern Works, 3336 Market St., Philadelphia
 Edwin A. Anderson, 203 Quarry St., Philadelphia
 The Baldwin Locomotive Works, 500 N. Broad
 St., Philadelphia
 James Barker, Inc., Sixth & Cayuga, Philadelphia
 Charles P. Biggin Co., 1329 Harlan St., Philadelphia
 E. Bromily & Son, Orthodox & Gaul, Philadelphia
 Edw. L. Caley, 945 Ridge Ave., Philadelphia
 Clarks Iron Foundry, 35th & Grays Ferry Road
 Frank P. Cooper, 139 Reed St., Philadelphia
 Oliver I. Dill, 406 N. Tenth St., Philadelphia
 The Eynon Evans Mfg. Co., 15th & Clearfield,
 Philadelphia
 Fairmount Patterns Works, 1922 Brandywine
 St., Philadelphia
 Richard Fields, 814 Buttonwood, Philadelphia
 R. G. Fleischmann, 407 Cherry St., Philadelphia
 Girard Iron Works, 22d & Master Sts., Philadelphia
 John Grass Wood Turning Co., 222 Vine St.,
 Philadelphia
 George G. Gumpert, 240 Cherry St., Phila.
 Hale & Kilburn Co., 18th & Lehigh Ave.,
 Philadelphia
 William L. Halsam, 506 N. 12th St., Philadelphia
 Edw. Harrington, Son & Co., 17th and Callow-
 hill, Philadelphia
 William C. Hormel, 1407 Vine St., Philadelphia
 Humphreys Christman Co., 635 N. Watt St.,
 Philadelphia
 Thomas J. Hunter Co., 148 N. 7th St., Phila-
 delphia
 Walter S. Kalbach, 2227 Wood St., Philadelphia
 T. B. Luzier & Son, 1645 N. 10th St., Philadel-
 phia
 John McConville, 215 N. 2d St., Philadelphia
 H. A. May Foundry Co., 30th & Chestnut Sts.,
 Philadelphia
 Meerbach & Schneider, 1612 Vandyke St., Phila-
 delphia
 Thos. Mills & Bro., Inc., 1301 N. 8th St., Phila-
 delphia
 Frank Pettit Ornamental Iron Works, 809 Mas-
 ter St., Philadelphia
 Quaker City Pattern Works, 504 N. 12th St.,
 Philadelphia
 Isaac A. Sheppard & Co., Erie Ave. & Sepviva,
 Philadelphia
 J. Thompson & Co., Van Horn & Sophia Sts.,
 Philadelphia
 Tioga Foundry Co., 22d & Allegheny, Philadel-
 phia
 Union Machine Works & Iron Fdy., 1821 S.
 Water St., Philadelphia
 V. W. Mfg. Co., 1616 North St., Philadelphia
 W. J. Webb, 821 Cherry St., Philadelphia
 Wm. Wharton, Jr. & Co., Inc., 25th & Wash-
 ington Ave., Philadelphia
 Wilkes Bros., Philadelphia
 Phoenix Iron Co., Philadelphia
 Phoenix Machine Co., Phoenixville
 American Steel Foundries, 36th & A. V. Ry.,
 Pittsburgh
 Axthelm Mfg. Co., 242 Third Ave., Pittsburgh
 Best Mfg. Co., Pittsburgh
 Thomas Carlins Sons Co., 1600 River Ave., Pitts-
 burgh
 Duquesne Steel Foundry Co., 1104 Arrott Bldg.,
 Pittsburgh
 Epping-Carpenter Co., 41st & A. V. Ry., Pitts-
 burgh
 Fort Pitt Mal. Iron Co., Box No. 1054, Pitts-
 burgh
 Iron City Sanitary Mfg. Co., 1514 Oliver Bldg.,
 Pittsburgh
 Lewis Foundry & Machine Co., Box. No. 1597,
 Pittsburgh
 McConway & Tooley Co., 48th & A. V. Ry.,
 Pittsburgh
 McDowell & Co., Galveston & Western, N. S.,
 Pittsburgh
 Mackintosh, Hemphill & Co., 12th & Etna Sts.,
 Pittsburgh
 The Marine Mfg. & Supply Co., Water St.,
 Pittsburgh
 The Phoenix Glass Co., Box 757, Pittsburgh
 Pittsburgh Elec. & Mch. Wks., Barker Place,
 Pittsburgh
 Pittsburgh Malleable Iron Co., Pittsburgh
 H. K. Porter Co., 49th & A. V. Ry., Pittsburgh
 G. & J. Rieseck, 16th St., Pittsburgh
 Sigwart & Rolston Mch. Works, Cor. Garrison
 Place & Duquesne Way, Pittsburgh
 The Simonds Mfg. Co., 25 Liberty Sts., Pitts-
 burgh
 Slentz Mfg. Co., 326 3rd Ave., Pittsburgh
 Sommerfeld Mach. & Mfg. Co., 216 2d Ave.,
 Pittsburgh
 Standard Pattern Co., 28th St., Pittsburgh
 Union Fdy. & Machine Co., Pittsburgh
 Union Switch & Signal Co., Braddock Ave.,
 Swisssale, Pittsburgh
 H. R. Walter Lbr. Co., Fayette & Manhattan
 Aves., Pittsburgh
 Punxsutawney Fdry. & Machine Co., Punxsu-
 tawney
 Roberts, Winner & Co., Quakertown

PATTERNS AND FLASKS—Continued

Philadelphia & Reading Ry. Co., Reading	Verona Steel Castings Co., Verona
The S. G. V. Co., Reading	Frick Co., Waynesboro
John G. Speidel, Reading	Geiser Mfg. Co., Waynesboro
Buckwalter Stove Co., Royersford	Landis Machine Co., Waynesboro
Grauder Stove Co., Royersford	Landis Tool Co., Waynesboro
S. G. Barker & Son, Scranton	General Refractories Co., West Decatur
Delaware, Lackawanna & Western R. R. Co., Scranton	Lehigh Valley Coal Co. & Coxe Bros. & Co., Inc., Wilkes-Barre
The National Malleable Castings Co., Sharon	Vulcan Iron Works, Wilkes-Barre
Sharon Foundry Co., Sharon	Simmons Wood Working Co., Williamsport.
Bethlehem Steel Co., South Bethlehem	Westinghouse Air Brake Co., Wilmerding
Keystone Stove Fdy., Spring City	Harbison-Walker Ref. Co., Woodland
The Pennsylvania Steel Company, Steelton	A. B. Farquhar Co., Ltd., York
Union Switch & Signal Co., Pittsburgh, Swiss- vale Br. P. O.	Hench & Druggold, York
Messinger Mfg. Co., Tatamy	Pullman Motor Car Co., York
The Westinghouse Machine Co., Trafford	

PIPES, TOBACCO

William Kaffer, 1123 N. Orianna, Philadelphia	Shaw & Leopold, Randolph & Montgomery, Philadelphia
L. Nax, 146 Noble, Philadelphia	

PLANING MILL PRODUCTS

(Including Sash, Doors and Blinds, and General Millwork)

W. M. Stover, Aaronsburg	W. H. Mellatt, Breezewood
A. A. Albright & Son, Allentown	I. F. March's Sons, Bridgeport
Butz-Frederick & Co., Allentown	Anderson Lumber Co., Brookville
Altoona Concrete Construction & Supply Co., Altoona	J. C. Lucas, Brookville
Altoona Construction Co., Altoona	Vanleer Bros., Brookville
H. S. & C. S. Barthley, Altoona	Brownsville Construction Co., Brownsville
D. Counsman & Son, Altoona	Irwin Arnold, Buffalo Mills
R. D. Elder Lumber Co., Juniata (Br. P. O.), Altoona	J. H. Patchin, Burnside
J. B. Fluke & Son, Altoona	Butler Planing Mill Co., Butler
J. C. Ivory, Altoona	Cornelius Lumber Co., Butler
Penn. Railroad Car Shops, Altoona	John R. Powell's Sons, California
Penn. Railroad Juniata Shops, Altoona	C. W. Blystone & Son, Cambridge Springs
H. S. Nunemaker, Alum Bank	Phoenix Novelty Co., Cambridge Springs
Ohio Valley Lumber Co., Ambridge and Economy	G. M. Coon, Canton
East Penn. Lumber Co., Inc., Analomink	E. Crawford & Sons, Canton
D. L. Saylor & Sons, Annville	The Holt Lumber Co., Carbondale
W. W. Wallace & Co., Apollo	J. A. Hoole, Carbondale
Adam Waldner, Ashland	Robert F. Nemiire, Carbondale
Babcock Lumber Co., Ashtola	N. B. Robinson, Carbondale
J. J. Weber, Ashville	The Beetem Lumber & Manufacturing Co., Car- lisle
Comeby & Harris, Athens	Carnegie Mill & Lumber Co., Carnegie
C. F. Thayer, Atlantic	H. J. & W. A. Krumenacker, Carrolltown, R. D.
H. J. Hawthorn, Bainbridge	G. M. Green, Cassville
Samuel F. Friedline, Bakersville	Franklin Goldsmith & Son, Catasauqua
John Stauffer, Bally	Zettle Bros., Center Hall
Bangor Lumber Manufacturing Co., Bangor	A. C. Kelly, Center Moreland
Wise Lumber & Coal Co., Bangor	G. S. Cole, Center Road Station
Barnesboro Lumber Co., Barnesboro	G. P. Blackburn, Cessna, R. D.
T. F. Polley, Bear Lake	Blair & Raifensider, Chambersburg
Anderson & Cook, Beaver	J. A. Hollinger, Chambersburg
Beaver Falls Planing Mill Co., Beaver Falls	Geo. A. Minnick & Son, Chambersburg
Commercial Sash & Door Co., Beaver Falls	H. O. Swartzwelder, Chaneyville
J. S. Mitchell & Sons, Beaver Falls	Charleroi Lumber Co., Charleroi
Rhodes & Garvin, Beaver Falls	Walton Lumber Co., Inc., Charleroi
Reed & Spaid, Beavertown	J. A. Phillips & Co., Cheltenham
Arnold Planing Mill, Bedford	Stracey G. Glauser & Son, Chester
Bedford Planing Mill Co., Bedford	James M. Hamilton, Chester
Bellefonte Lumber Co., Bellefonte	B. W. Kinports, Cherry Tree
P. B. Crider & Son, Bellefonte	E. Somerville, Cherry Tree
T. R. Hamilton, Bellefonte	P. G. Frederick Co., Chicora
Belle Vernon Planing Mill Co., Belle Vernon	Davis Lumber & Planing Mill, Christiansa
Joseph M. Young & Co., Belleville	Waugaman Manufacturing Co., Clarendon
Jonas Benfer, Benfer	J. C. McElhattan, Clarion
R. T. Smith & Son, Benton	Summit Lumber Co., Clarks Summit
Berwick Lumber & Supply Co., Berwick	F. J. Egan, Claysville
Harry Fahringer, Berwick	Clearfield Millwork & Lumber Co., Clearfield
Berwyn Millwork & Lumber Co., Berwyn	Gearhart & Wrigley, Clearfield
E. L. Jawver, Biglerville	Samuel State, Cloe
Andre Lumber Co., Blairsville	S. Hagarty's Sons, Coalport
Columbia Plate Glass Co., Blairsville	J. W. Meyer, Coburn
A. B. Hartman, Bloomsburg	Andrew Vonada, Coburn
Richter Bros., Blossburg	Shafer Bros. & Nelson, Cochran
H. A. Cline, Bolivar	J. Jay Wisler, Columbia
S. W. McLean, Bolivar	E. E. Peckham, Columbia Cross Roads
Enreka Lumber Co., Boswell	Confluence Lumber Co., Confluence
Maust Lumber Co., Headquarters, Elk Lick, Boynton	R. H. DeArment, Conneaut Lake
Braddock Lumber Co., Braddock	V. H. Dennis, Conneaut Lake
McBride Bros., Braddock	Moss Bros. Conneaut Lake
Price & Alman, Braddock	Connellsville Planning Mill Co., Connellsville
H. C. Bemis, Bradford	Fayette Lumber Co., Connellsville
Tuna Manufacturing Co., Bradford	Keystone Planing Co., Connellsville
	South Connellsville Lumber Co., Connellsville
	Wm. Potts Jones, Conshohocken
	The A. L. Miller Co., Conshohocken
	Isaac D. Shaffer, West Conshohocken Consho- hocken

PLANING MILL PRODUCTS—Continued

- The A. L. Miller Co., Conshohocken
 Wm. Shilling, Cool Spring
 McKown & Beattie, Coraopolis
 H. A. Button, Coudersport
 James S. Swinley, Cowanesque
 Ingram Lumber & Supply Co., Pittsburgh, Crafton (Br. P. O.)
 Ed O'Brien, Cresson
 George C. Abraham, Damascus
 Danville Lumber Co. (Mill at Milanville), Danville
 Collingdale Millwork Co., Darby.
 Stubbs & Culp, Delta
 Denver Planing Mill, Denver
 Allen Lumber Co., Donora
 H. E. Quickel, Dover
 Frank J. Gerlitzki, Doylestown
 F. L. Worthington, Doylestown
 J. C. Doyle, Dry Run
 A. D. Orner Woodworking Co., Dubois
 G. W. Piper Sons, Dubois
 George Smyers, Dubois
 George H. Bingham, Scranton, Danmore (Br. P. O.)
 Ziegler Lumber Co., Duquesne
 Graham Lumber Co., East Brady
 Fitzgerald-Speer Co., Easton
 J. Monroe Young, Easton
 Rutter Bros., 225 Monroeville Ave., Turtle Creek, East Pittsburgh
 East Stroudsburg Lumber Co., Inc., East Stroudsburg
 S. M. Milliken, East Waterford
 Ebensburg Planing Mill Co., Ebensburg
 Robert J. Wade, Edinboro
 Elizabeth Planing Mill Co., Elizabeth
 H. H. Brant, Elizabethtown
 I. T. Buffington, Elizabethtown
 National Supply & Construction Co., Ellwood City
 Ulrich Sloan's Planing Mill, Emlenton
 L. L. Flisk, Emporium
 B. T. Gealy, Enon Valley
 Ephrata Planing Mill Co., Ephrata
 George Carroll & Bro. Co., Erie
 The Constable Bros. Co., Erie
 A. A. Deming, Erie
 Lyman Felheim, Erie
 James D. Johnson & Co., Erie.
 Kirchner Bros., Erie
 D. S. Milloy, Erie
 D. Schlosser Co., Erie
 Henry Shenk Co., Erie
 Collins Bros., Espyville
 The Edward Dambach Co., Evans City
 Earleston Planing Mill Co., Everett
 Everett Planing Mill Co., Inc., Everett
 Export Lumber Co., Export
 McCormick Lumber Co., Fairchance
 B. F. Beers, Fallentimber
 Falls Creek Planing Mill Co., Falls Creek
 Fawn Grove Lumber Co., Fawn Grove
 James Patterson, Fayette City
 Finleyville Planing Mill Co., Finleyville
 A. T. Mullix, Lincoln Falls, Forksville R. D.
 Joe S. Rotz, Fort Loudon
 Haupt Bros. & Co., Frackville
 American Steel Foundries, Franklin
 The James Lumber Co., Franklin
 Marsteller Bros. Lumber Co., Fredonia
 W. T. Mohler, Freedom
 Freeport Planing Mills Co., Freeport
 A. King & Sons, Freeport
 Friedens Planing Mill Co., Friedens
 M. Schultz, Gallitzin
 Albert Adsit, Geneva
 W. L. Adsit, Geneva
 George W. Stolsmith, Gettysburg
 Glassport Lumber Co., Glassport
 Glen Manufacturing Co., Glen Rock
 Glen White Coal & Lumber Co., Glenwhite
 W. G. Doughman, Gramplan
 Greencastle Elevator Co., Greencastle
 J. C. Reed, Greensburg
 South Greensburg Lumber Co., Greensburg
 Struble & Walhour, Greensburg
 Chas. C. Baker, Greenville
 Hellman Lumber Co., Greenville
 King Planing Mill & Supply Co., Grove City
 McKay Gilmore Furniture Co., Grove City
 L. B. Walbert, Hancock
 John F. Rohrbaugh & Co., Hanover
 Union Planing Mill Co., Inc., Harrisburg
 E. B. Koons, Harveyville
 Stuttmatter Bros., Hastings
 Atkinson Box & Lumber Co., Hawley
 H. F. Bright Lumber Co., Hazleton
 Hazleton Manufacturing Co., Hazleton.
 Kellner Plano Co., Hazleton
 Pennsylvania-Maryland Coal Co., Hellwood
 Herndon Manufacturing Co., Herndon
 James B. Condron, Hollidaysburg
 M. S. Hunter & Sons, Hollidaysburg
 Noah Ott, Hollisopple
 M. H. Risinger, Homer City.
 Feath & Kerr, Homestead
 George M. Hall & Co., Homestead
 Homestead Lumber Co., Homestead
 Pennard Manufacturing Co., Honesdale
 H. G. Hamer, Hooversville
 Chas. E. Pletcher, Howard
 M. Gillis, Hughesville.
 Huntingdon Millwork & Lumber Co., Huntingdon
 W. J. O'Mara, Huntingdon
 W. F. Laidig, Hustontown
 Benjamin Gilson, Hydetown
 James M. Ahlbum, Hyndman
 Hallegas & Rush, Hyndman
 W. S. Daugherty, Indiana
 Indiana Lumber & Supply Co., Indiana
 W. K. Sparks, Indian Head
 Irwin Lumber Co., Irwin
 M. J. Snodgrass, Jamestown
 T. H. Hazlett Lumber Co., Jeannette
 Union Planing Mill & Lumber Co., Jeannette
 W. C. Nicholson & Co., Jermyn
 Camerer & Lambert, Jersey Shore
 Cambria Steel Co., Johnstown
 Conemaugh Lumber Co., Johnstown
 Johnstown Millwork & Lumber Co., Johnstown
 Johnstown Planing Mill Co., Johnstown
 The Thomas Kinzey Lumber Co., Johnstown
 The Lorain Steel Co., Johnstown
 David Ott & Co., Johnstown
 Wm. H. Smith Bros., Johnstown
 Levi M. Thomas, Johnstown P. O.
 Kane Blind & Sereen Co., Kane
 Peterson & Skooglund, Kane
 Emporium Lumber Co., Keating Summit
 C. G. Gawthrop Co., Kennett Square.
 J. F. Seward & Co., Wilkes-Barre, Kingston (Br. P. O.)
 John B. Senger & Sons, Kinzers
 P. S. Patterson, Kirby R. D.
 American Planing Mill Co., Kittanning
 Hellman Bros. Lumber Co., Kittanning
 Henry Shaffer Lumber Co., Kittanning
 West Kittanning Lumber Co., Kittanning
 W. W. Rowman, Knox
 I. M. Edgecomb's Sons, Knoxville
 H. F. Kreamer, Kreamer
 Heffner & Savage, Kutztown
 J. H. Kirk & Co., Kutztown
 A. L. Vandervort, Laceyville
 Whipple Bros., Laceyville
 John F. Johnson, Laidig
 Herr, Draper & Co., Lancaster
 Keystone Planing Mill Co., Lancaster
 The Wohlson Planing Mill Co., Lancaster
 Jacob W. Dresher, Lansdale
 Wm. C. Shuster, Jr., Landsdowne
 George C. Anderson & Sons, Inc., Latrobe
 Miller Bros., Inc., Lebanon
 Leechburg Lumber Co., Leechburg
 Leighton Lumber Co., Leighton
 E. K. Frazer, Lemoyne
 H. M. Stauffer, Leola
 Le Raysville Furniture & Toy Mfg. Co., Le Raysville
 Kulp Planing Mill Co., Lewistown
 R. N. Miller, Liberty
 Lohr Bros., Ligonier
 International Silo Co., Litesville
 Keath-Shields Planing Mill Co., Lititz
 Neidmyer Bros., Lititz
 C. F. Bucher, Littlestown
 George R. Julius & Bro., Littlestown
 K. D. Batchelder, Lock Haven
 Clinton Furniture Co., Lock Haven
 Hippie Estate, Lock Haven
 H. W. Ruggles, Wilkes-Barre, Luzerne (Br. P. O.)
 Frank L. Underwood, Luzerne
 N. F. Shillingford, McAllisterville
 P. F. Black, McConnellsburg
 Wm. S. Clevenger, McConnellsburg
 Spangler & Harris, McConnellsburg
 Downie & McCord, McKeesport
 John Calvert, McKees Rocks
 John Davis & Co., McKees Rocks
 Elmer Nesbitt, McLane

PLANING MILL PRODUCTS—Continued

- Nathan Shelly, Manheim
 Hummer Bros., Manheim
 E. L. Grabbie, Manor
 S. M. Blakeslee, Manorville
 George Zacherl, Marble
 B. F. Heistand & Sons, Marietta
 M. A. Snyder, Markinton
 The Mars Land & Lumber Co., Mars
 Bolger Grabbus & Co., Martinsburg
 Chas. Neast & Co., Mauch Chunk
 George H. Cutter Lumber Co., Meadville
 The Walter G. Harper Lumber Co., Meadville
 Mlier & Devore, Meadville
 Mill Run Lumber Co., Meadville
 W. E. Morrison & Son, Meadville
 L. F. Smith, Meadville
 George W. Sauter, Menges Mills
 D. W. Faust & Sons, Mercersburg
 O. H. Allen, Meshoppen
 J. M. Stillwell, Mesoppen
 Meyersdale Planing Mill, Meyersdale
 Kern & Triss, Middleburg
 Aaron Stetler's Estate, Middleburg
 John E. Brindle, Mifflin
 Enoch Miller, Mifflinburg
 Elmer C. Rudy, Millinburg
 Rowe Bros., Milford
 A. Douden Planing Mill Co., Millersburg
 Millersburg Manufacturing Co., Millersburg
 J. F. Kerr, Marsh Run, Millerstown P. O.
 Ruhl & Watson, Millmont
 C. A. Swetland, Mills
 Bennett Lbr. & Mfg. Co., Pittsburgh, Millvale
 (Br. P. O.)
 L. W. Waterhouse, Mill Village
 Edward Buck, Millville
 Orville Robbins, Millville
 D. Glinger & Sons, Milton
 Jacob Fetter's Sons, Milton
 Anthracite Lumber Co., Minersville
 Motz Lumber Co., Monessen
 Westmoreland Lumber Co., Monessen
 Monongahela Saw & Planing Mill Co., Monon-
 gahela
 Yolie Bros., Monongahela
 Penn Furniture Co., Montgomery
 William T. Lundy, Montoursville
 W. H. Lundy, Montoursville
 Spring Brook Lumber Co., Moosic
 L. W. Hart, Morris
 P. H. Hart, Nauvo, Morris P. O.
 T. B. Stockham & Bro., Morrisville
 C. P. Van Brunt Manufacturing Co., Moscow
 Geiger Gibson & Co., Mount Carmel
 Mount Carmel Lumber Co., Mount Carmel
 Lemley Bros., Mount Morris
 H. J. Heiser (Mill at Shadle), Mount Pleasant
 Mills
 A. S. Welsh, Mount Union
 Edward F. Ives, Muncy
 Isaac B. Haak, Myerstown
 S. E. Price & Co., Nanticoke
 Susquehanna Lumber Co., Nanticoke
 Nazareth Planing Mill Co., Nazareth
 C. O. Solomon, New Berlin
 E. B. McDaniel Co., New Brighton
 Maisoff Bros. Co., New Brighton
 D. H. Fair, New Buena Vista
 Kline Lumber & Construction Co., New Castle
 Mahoning Valley Lumber Co., New Castle
 New Castle Lumber & Construction Co., New
 Castle
 Shenango Lumber Co., New Castle
 Wallace Bros., Mahoningtown Sta., New Castle
 Thomas Kirscher, New Florence
 W. E. Jones, New Park
 Newport Planing Mill, Newport
 A. W. & W. M. Watson Co., Newtown
 George & Clyde Pratt, Nicholson
 Rought-Wright Co., Nicholson and Factoryville
 H. J. & Wm. Krunenacker, Nicktown
 W. A. Baler, Nisbet R. D.
 Grater Body Co., Norristown
 Stow Lumber & Coal Co., North East
 O. M. Webber Co., Inc., North Wales
 Lillo Bros. Co., Oakdale
 C. F. Reed & Bro., Oakmont
 J. W. Bailey, Ohlonye
 Forland & D'mond Lumber Co., Oil City
 Caldwell Lumber Co., Oil City
 Catted Lumber & Coal Co., Oil City
 Wilson & Carothers, Orblsonia
 L. F. Micklef, Orttanna
 Osceola Lumber Co., Osceola Mills
 R. J. Walker, Osceola Mills
 Wm. Adams, Osterburg
 Harry Hilaman, Oxford
 W. G. Sigler, Paintersville
 New Jersey Zinc Co. (of Pennsylvania), Pal-
 merton
 Early & Wengel, Palmyra
 Palmyra Woodwork Manufacturing Co., Palmyra
 Wm. Fotts & Son, Parkersburg
 A. P. Reid, Parkersburg
 J. W. Logan & Sons, Parnassus
 Twist & Hippensteel, Wilkes-Barre, Parsons
 (Br. P. O.)
 Fitzgerald-Speer Co., Pen Argyl
 Harry Shaffer, Penn Run
 Pennsburg Manufacturing Co., Pennsburg
 J. E. Myers, Penns Station
 C. P. Fox, Perkasie
 S. K. Stonecke, Perkiomenville
 Daniel Adams, 2940 North Marshall St., Phila-
 delphia
 Ellwood Allen Lumber Co., Trenton Avenue &
 Ann St., Philadelphia
 Isaac Ambrose, 1113 Siebel, Philadelphia
 Chas. A. Anderson, 1629 North 10th St., Phila-
 delphia
 Bailey & Co., 210 New St., Philadelphia
 John Barber, 230 Chancellor St., Philadelphia
 Gustave Berger, 1143 N. Front Street, Philadel-
 phia
 John M. Cronwell, 1136 Harrison Street, Phila-
 delphia
 D. R. Crumrine, 301 Edgewood, Philadelphia
 E. M. Culbertson & Son, 2328 N. Sydenham St.,
 Philadelphia
 John A. Dubs, 269 S. Fifth St., Philadelphia
 Esenwein & Hoorse, 1019 W. Susquehanna Ave.,
 Philadelphia
 Chas. Feline & Co., York Road and Butler,
 Philadelphia
 Fite & Arbio Co., 20th and Glenwood,
 Philadelphia
 Fritz & La Rue, 1124 Chestnut St., Philadelphia
 Frederick Gerry & Co., Schuylkill Ave. and Peltz
 Street, Philadelphia
 Wm. E. Gibson, 3527 Market St., Philadelphia
 T. H. Grigg, Lancaster Ave. and Baring St.,
 Philadelphia
 Hale & Kilburn Co., 18th Street and Lehigh
 Ave., Philadelphia
 Hall Bros. & Wood, 54th and Lancaster Ave.,
 Philadelphia
 Edward P. Henson & Co., 921 N. Delaware
 Philadelphia
 Hoeling Bros., 314 S. Lawrence, Philadelphia
 Ernest Hoffman (Est), 1124-32 Washington Ave.,
 Philadelphia
 Solomon Horn, 615 Pine Street, Philadelphia
 Chas. D. Hughes, 3072 Janney St., Philadelphia
 Joseph W. Jauney, 1147 Beach St., Philadelphia
 Jones, Doll & Co., 203 North 22d Street, Phila-
 delphia
 S. S. Keely & Sons, Main and Umbria Streets,
 Philadelphia
 Kensington Planing Mill, 1925 E. York Street,
 Philadelphia
 Louis Kirchengraber, 613-15 Cherry St., Phila-
 delphia
 Charles B. Kline, 28 South 16th St., Philadel-
 phia
 George W. Kugler & Sons Co., 919 New Market
 Street, Philadelphia
 Dudley W. Lance, 721 W. Tioga St., Phila-
 delphia
 Richard Lloyd, 105 North 22d St., Philadelphia
 T. B. Luzier & Son, 1645 North 10th Street,
 Philadelphia
 Joseph Miles, River Road, Manayunk Station,
 Philadelphia
 A. F. Miller, 239 S. Hutchinson, Philadelphia
 Peter C. Osada & Co., 1422 S. Front Street,
 Philadelphia
 John Parker & Son, 16th and Filtzwater Streets,
 Philadelphia
 Pennsylvania Sash and Door Co., 25th and Col-
 lowhill Streets, Philadelphia
 Philadelphia Screen Manufacturing Co., 56th
 Street and Woodlawn Avenue, Philadelphia
 Stacey Reeves & Sons, 1611 Filbert Street,
 Philadelphia
 A. W. Renninger, 2309 North 6th St., Philadel-
 phia
 William Russel Woodworking Co., 3015-29 Chest-
 nut Street, Philadelphia
 Seymour Bros., 3402 Lee Street, Philadelphia
 Shep & Vandergrift, Inc., 814-832 W. Lawrence
 Street, Philadelphia

PLANING MILL PRODUCTS—Continued

- Silberman & Fleisher, 1218 Mascher Street, Philadelphia
 Smedley Bros. Co., Church and Tacony Streets, Frankford Sta., Philadelphia
 George W. Smith & Co., Inc., 3307 Powelton Ave., Philadelphia
 Frank C. Snedaker & Co., 9th and Tioga Sts., Philadelphia
 Robert Tarle & Son, 413-17 S. Fifth Street, Philadelphia
 Tucker & Staehle, 167 East Allen St., Philadelphia
 William I. Underwood & Co., Cottman and Keystone Sts., Tacony Sta., Philadelphia
 Martin H. Walrath, Broad and Cambria Sts., Philadelphia
 Joseph T. Ward, 5809-19 Baynton Street, Philadelphia
 Watson & Robinson, 49 Queen Street, Germantown Sta., Philadelphia
 A. Wilt & Sons, 721 N. Front St., Philadelphia
 Fred V. Yeager, 9-13 S. 36th St., Philadelphia
 D. Grebe & Son, Phillipsburg
 Phillipsburg Planing Mill Co., Phillipsburg
 Phoenix Machine Co., Phoenixville
 George C. Fry & Son, Picture Rocks
 Chas. Werner, Pine Grove
 Leshner Lumber & Supply Co., Pitscairn
 Ahlers Lumber Co., 928 E. Ohio St., N. S., Pittsburgh
 Ben Avon Lumber Co., Spruce Street & Brighton Road, N. S., Pittsburgh
 Robert J. Barnes Co., S 18th & Mary Streets, Pittsburgh
 Andrew Bensen, 150 South 18th St., Pittsburgh
 Smith Bovard, 6616 Kelly St., Pittsburgh
 Bruckman Lumber Co., Pittsburgh
 Edward A. Caler, 621 Industry St., Pittsburgh
 Diebold Lumber & Manufacturing Co., 99 Wash Street, Pittsburgh
 b. M. Diebold Lumber Co., E. Liberty Station, Pittsburgh
- G. D. Dubarry & Co., 41st St. & A. V. Ry., Pittsburgh
 Eller Lumber & Mill Co., So. 23rd St., Pittsburgh
 Henry J. Frey, Kaiser & Haslage Aves., Pittsburgh
 Green & Evans Lumber Co., Ltd., 107 Warrington Ave., Pittsburgh
 Jacob Haney, 912 Lincoln St., Pittsburgh
 R. W. Hare, 632 Penn Ave., Pittsburgh
 L. J. Higgins Lumber Co., 33rd & Liberty Ave., Pittsburgh
 Edwin M. Hill, 2601 Penn Ave., Pittsburgh
 Interior Finish Co., Beaver Ave. & Fayette St., Pittsburgh
 T. W. Jones, 2603 Penn Ave., Pittsburgh
 The Keystone Lumber Co., S. 17th & Merriman Sts., Pittsburgh
 R. A. McCa1 Lumber Co., Putnam near Frankstown Ave., Pittsburgh
 Frank McFeeley, 520 W. Rellance St., Pittsburgh
 The May Lumber Co., 1201 Irwin Ave., Pittsburgh
 George B. Monks, 8-12 Ketchum St., N. S., Pittsburgh
 North Avenue Stair Co., 809 North Ave., N. S., Pittsburgh
 Pittsburgh & Lake Erie R. R., Pittsburgh
 Pennsylvania Door and Sash Co., 900 Second Ave., Pittsburgh
 Phoenix Glass Co., P. O. Box 757, Pittsburgh
 A. F. Schwerd Manufacturing Co., 145 McClure Ave., N. S., Pittsburgh
 M. Simon's Sons, 121-127 Anderson St., N. S., Pittsburgh
 H. R. Walter Lumber Co., Fayette & Manhattan Aves., Pittsburgh
 Wigman Lumber Co., S. 18th & Wharton St., Pittsburgh
 Young & Schmidt, 3209 Carson St., Pittsburgh

Pittsburgh Branch Post Offices.

- Ingram Lbr. & Supply Co., 3 Prospect Ave., Ingram, Crafton, Pittsburgh
 Bennett Lbr. & Mfg. Co., 213 Sedgewick St., Millvale, Pittsburgh
 Colonial Floor Co., 1840-44, Sharpsburg, Pittsburgh
 Daniel Whitmore & Co., Hiel Ave., Wilkinsburg, Pittsburgh
 Wilkinsburg Stair & Mfg. Co., Penn Ave. & Penn. R. R., Wilkinsburg, Pittsburgh
 W. F. Youngk Co., 903 Hay St., Wilkinsburg, Pittsburgh
 The Exeter Lumber Co., Inc., Pittston
 J. E. Patterson & Co., Pittston
 Wyoming Valley Lumber Co., Pittston
 J. W. Cook & Sons, Platea
 Clark Bros. & Co., Plymouth
 John A. Clarke, Point Marlon
 A. K. Jenkins & Co., Point Marlon
 Point Marlon Lumber Co., Point Marlon
 Leroy Pearson, Portland
 H. G. Miller, Potter Brook
 E. S. Potter, Potter Brook
 L. M. Moll, Potts Grove
 Josiah Frederick, Pottstown
 William Buechley & Son, Pottsville
 Kreig Bros., Pottsville
 The Sailor Planing Mill & Lumber Co., Pottsville
 Walter Wertley Cons, Pottsville
 James K. Long & Son, Lindsey Station, Punxsutawney
 McKean, Hare & Son, Punxsutawney
 Peoples Planing Mill, Punxsutawney
 Punxsutawney Planing Mill Co., Punxsutawney
 Sllas Miller, Purcell
 G. F. Smith, Purcell
 Henry A. Good, Quincy
 Neversink Planing Mill, Reading
 Northeastern Planing Mill Co., Reading
 Philadelphia & Reading Railway Co., Reading
 Sheeder Planing Mill Co., Reading
 C. C. Bierly, Rebersburg
 D. J. Rumbel, Red Hill
 Noah C. Stabley, Red Lion
 Joseph M. Young & Co., Reedsville
 Isaac H. Lebo, Reinholds Station R. D.
 Philip Reitz, Reitz
 L. D. Stine, Reitz R. D.
- Oil City Woodworking Co., Reno
 J. H. Baird, Renovo
 The Woodward Supply Co., Reynoldsville
 Arthur Westgate, Riceville
 W. B. Shrawder, Richfield
 Hyde-Murphy Co., Ridgway
 Riegelsville Mfg. Co., Riegelsville
 Wallace A. Hoover, Riverside
 Wallace Hoover & Bro., Riverside
 Planing Mill Co., Roaring Spring
 H. C. Fry Glass Co., Rochester
 David Hawk, Rochester Mills
 J. P. Growall, Rockwood
 Schrock Bros., Rockwood
 O. O. West, Rogersville
 C. L. Willmot, Rome
 Bush Bros., Royersford
 McKelvey & Peters, Rural Valley
 Henry Umboldt, Sacramento
 Byron W. Stebbins, Saegerstown
 Schaut Bros. Manufacturing Co., Saint Mary's
 L. H. Knapp, Salona
 Kimmell & Cornelius, Saltito
 George H. Rhea, Saltsburg
 Baker & Cary, Sayre
 I. S. Hart, Sayre
 Charles S. Metzgar, Sciota
 W. A. Pentz, Scotland
 Broadway Planing Mill, Scottdale
 J. W. Kuth, Scottdale
 John Benore, Scranton
 George H. Bingham, Dunmore (Br. P. O.)
 Scranton
 Brown Bros., Scranton
 Burcher & Robinson, Scranton
 Delaware Lackawanna & Western R. R., Scranton
 De Witt Lumber Co., Scranton
 Hagen Lumber Co., Scranton
 Mason & Snowdon Lumber Co., Scranton
 Nay Aug Lumber Co., Scranton
 Peck Lumber Manufacturing Co., Scranton
 Washburn, Williams Co., Scranton
 J. B. Woolsey & Co., Scranton
 East End Planing Mill Co., Saxton
 Harper Bros., Shade Gap
 W. G. Piper, Shade Gap
 Ralph W. Barnhart, Shamokin
 East End Lumber Co., Shamokin

PLANING MILL PRODUCTS—Continued

H. P. Raup & Sons, Shamokin
 Shamokin Lumber Manufacturing Co., Shamokin
 W. G. Berkey, Shanksville
 Walker & Lowry, Shanksville
 Chas. C. Baker, Sharon
 John Cook & Son, Sharon
 Rine Cook & Son, Sharon
 J. M. Hoagland & Co., Sharon
 Wallis & Carley Co., Sharon
 A. Wisbart & Sons Co., Sharon
 C. C. Weaver, Sharon
 Bixby & Son, Sharon Center
 E. L. Gaines & Son, Sharpsville
 Frank W. Wiley, Sheakleyville
 G. R. Wood's Sons Co., Sheffield
 Shickshinny Lumber Co., Shickshinny
 D. B. Becker Planing Mill, Shillington
 Builders Home Supply Co., Shinglehouse
 W. S. Snoke, Shippensburg
 J. P. Kilmer & Son, Shunk
 C. F. Schulze, Silver Creek
 John H. Glassmyer, Sinking Spring
 L. L. Texter, Silgo
 W. J. Ruble, Ruble Mills, Smithfield P. O.
 C. W. Mitchell, Snedekerville
 Berkeble Lumber Co., Somerset
 Globe Column & Mfg. Co., Somerset
 Somerset Door & Column Co., Somerset
 Somerset Lumber Co., Somerset
 Hemsing & Son, Souderton
 Brown-Borhek Lumber Co., South Bethlehem
 Robert Pfeifle, South Bethlehem
 Perry Gilpin, South Sterling
 Geo. H. Lancaster, South Sterling
 D. H. Deaner, Springhope
 C. P. Long, Spring Mills
 Steelton Planing Mill, Steelton
 Stewarttown Lumber & Mfg. Co., Stewarttown
 John T. Long, Summerhill
 Andrew Breslin, Summithill
 Tilman Hontz, Summithill
 Malick & Erdman, Sunbury
 Sunbury Planing Mill Co., Sunbury
 Deakin & Ash, Susquehanna
 J. B. Svkes, Sykesville
 Henry Becker, Tamaqua
 J. A. Schilbe, Tamaqua
 Hough & Leard Co., Ltd., Tarentum
 The Tarentum Lbr. Co., Tarentum
 E. H. Harman, Thompsonstown
 Ben Lesher, Thompsonstown

Wilkes-Barre Branch Post Offices.

J. F. Seward & Co., Kingston, Wilkes-Barre
 H. W. Ruggles, Luzerne, Wilkes-Barre
 Frank L. Underwood, Luzerne, Wilkes-Barre
 Twist & Hippensteel, Parsons, Wilkes-Barre
 Hart Planing Mill Co., North Ave. & Pitt St.,
 Wilkesburg (Br. P. O.) Pittsburgh
 Dan'l Whitmore & Co., Wilkesburg (Br. P. O.)
 Wilkesburg Stair & Mfg. Co., Wilkesburg
 (Br. P. O.)
 W. F. Youngk Co., Wilkesburg (Br. P. O.)
 F. B. Sherman, Williamsburg
 John Coleman, Williamsport
 W. E. Crooks & Sons, Williamsport
 Goertz Carving Co., Williamsport
 Loyalsock Planing Mill Co., Williamsport
 Simmons Wood Working Co., Williamsport
 William Slack, Williamsport
 Vallamont Bldg. & Planing Mill Co., Williams-
 port

PLUMBERS' WOODWORK.

Westmoreland Lumber Co., Monessen
 Standard Sanitary Mfg. Co., New Brighton
 Hale & Kilburn Co., 18th & Lehigh Ave.,
 Philadelphia

Sanitary Specialties Co., 1824 E. Clearfield St.,
 Philadelphia
 Smedley Bros. Co, Church & Tacony Sts.,
 Frankford, Philadelphia
 West York Furniture Mfg. Co., York

PRINTING MATERIAL.

The W. O. Hiekkok Mfg. Co., Harrisburg
 Joseph Adams, 1226 N. Alden, Philadelphia
 American Electrotype Co., 706 Market St.,
 Philadelphia
 American Type Founders, 17 and 19 S. Sixth St.,
 Philadelphia
 Chas. S. Belz Co., 14 and 16 S. 5th St.,
 Philadelphia
 Duncan & Co., 621 Commerce St., Philadelphia
 Franklin Electrotype Co., 224 So. 5th St.,
 Philadelphia

Gatchel & Manning, 6th & Chestnut Sts.,
 Philadelphia
 Hanson Brothers, 704 Sansom St., Philadelphia
 Royal Electrotype Co., 620 Sansom St., Phila-
 delphia
 Henry H. Sheip Mfg. Co., N. E. Cor. 6th St.
 & Columbia Ave., Philadelphia
 Sheip & Vandergrift Co., 816 Lawrence St.,
 Philadelphia
 Weskott & Thompson, 112-114 N. 12th St.,
 Philadelphia
 Geo. W. White, 721 Walnut St., Philadelphia

PULLEYS AND CONVEYORS.

P. & R. R. R. Repair Shops, Catawissa
 Edwards Mfg. Co., Laceyville
 Eclipse Pulley Co., Meyersdale
 Coliditz-McMinn & Co., 702 W. Canal St.,
 Philadelphia

W. W. Patterson Co., 54 Water St., Pittsburgh
 Pittsburgh Block & Mfg. Co., 818 South Ave.,
 North Side, Pittsburgh
 Reading Wood Pulley Co., Reading
 Bethlehem Steel Co., South Bethlehem

PUMPS.

Connellsville Mch. & Car Co., Connellsville
 The Monongahela River Consolidated Coal and
 Coke Co., 48 Market St., Pittsburgh

G. R. Wood's Sons Co., Sheffield
 Standard Wood Pipe Co., Williamsport

REFRIGERATORS AND KITCHEN CABINETS.

J. D. Naftzinger, Centerport
 Stevenson Co., Chester
 Banta Refrigerator Co., Clearfield
 R. F. Kleinginna, Du Bois
 W. H. Kelchner, Mifflinville
 J. Fisher and Co., 1216-18 N. 5th St., Phila-
 delphia
 Hale & Kilburn Co., 18th St. and Lehigh Ave.,
 Philadelphia
 John Knoell & Sons, 171 Jefferson St., Phila-
 delphia
 A. H. & F. H. Lippincott, Inc., 24th & Locust
 Sts., Philadelphia
 McCracken & Hall, 1120 Washington Ave.,
 Philadelphia

Thos. Mills & Bro., Inc., 1301 N. 8th St.,
 Philadelphia
 Ridgway Refrigerator Co., 3519 N. Lawrence
 St., Philadelphia
 C. J. & A. Schad, 519 Bainbridge St., Phila-
 delphia
 H. Daniel Long, S. W. Cor. Front & Mont-
 gomery St., Philadelphia
 Standard Refrigerator Co., 2543-45-47 Germantown
 Ave., Philadelphia
 S. Delp's Sons, Fourth and Liberty Sts., Pitts-
 burgh
 Bernard Gloekler Co., 1127 Penn. Ave., Pitts-
 burgh
 The Specialty Mfg. Co., Titusville
 H. A. Boyer, West Hanover

ROLLERS AND CURTAIN POLES.

Webb Mfg. Co., Brookville
 Bernard McCurdy, 9th & Arch Sts., Phila-
 delphia
 Smedley Bros. Co., Church & Tacony Sts.,
 Frankford, Philadelphia

Thomas Ott & Co., 1124-1132 Washington Ave.,
 Philadelphia
 R. M. Bowser & Son, Renfew
 Geo. H. Lancaster, South Sterling

SADDLES AND HARNESS.

Barton Mfg. Co., Ivyland
 Eagle Scotch Hame Manufacturers, 235 No.
 Lawrence St., Philadelphia

H. M. Easterbrook, 311 Cherry St., Philadelphia
 Hessler Wagon Works, Inc., 857 E. Girard Ave.,
 Philadelphia

SHIP AND BOAT BUILDING.

A. Long & Son, Albion
 Rift Climbing Boat Co., Athens
 Ray Hoffman, Bloomsburg
 W. N. Foust & Son, Conneaut Lake
 Hauser Bros., Delaware Water Gap
 Dravosburg Dock Co., Dravosburg
 Paasch Bros., Erie
 John S. Sheppard, Essington
 Harrisburg River, Coal, Sand & Stone Co.,
 Harrisburg
 Geo. V. Tompkins, Marcus Hook
 The Lehigh Coal & Navigation Co., Mauch
 Chunk
 Collins, Darrah & Co., Nebraska
 Wm. Cramp & Sons, Ship & Eng. Bldg. Co.,
 Beach and Ball Sts., Philadelphia
 William Glass & Son, 779 N. 28th St., Phila-
 delphia
 Wesley Glenn, S. L. Tacony St., Philadelphia
 U. S. Navy Yard (Hull Division), Philadelphia

E. F. Ward & Sons, Philadelphia
 Hazelwood Dock Co., Pittsburgh
 The Monongahela River Consolidated Coal and
 Coke Co., 8 Market St., Pittsburgh
 Neville Dock Co., 1218 Park Building, Pitts-
 burgh
 R. C. Price & Co., Foot Federal St., Pitts-
 burgh
 James Rees & Sons Co., Pittsburgh
 H. R. Walter Lbr. Co., Fayette & Manhattan
 Aves., Pittsburgh
 J. M. Samsel, Point Pleasant
 Peck Lbr. Mfg. Co., Scranton
 J. P. Coryell, Shamokin Dam
 Bethlehem Steel Co., South Bethlehem
 Forest Barge Co., Tionesta
 U. S. Boat Yards, Lock No. 4
 Douglass & Yale, Union Dale
 Wyatt Stroman, Yorkhaven

SHUTTLES, SPOOLS, AND BOBBINS.

Allentown Bobbin Works, Allentown
 Allentown Reed, Harness & Mill Supply Co.,
 Allentown
 Clover Leaf Mfg. Co., Carbondale
 Arnold & Bro., Coopersburg

Excelsior Bobbin & Spool Co., Newtown
 J. B. Brusher, Norristown
 Jas. H. Billington & Co., Randolph & Jefferson
 Sts., Philadelphia
 B. R. Dover, 1126 N. Orianna, Philadelphia

SPORTING AND ATHLETIC GOODS.

A. C. Kelly, Center Moreland
 Oneida Community, Ltd., Litzitz
 Clark Herd Mfg. Co., 2419 Front St., Phila-
 delphia
 Chas. P. Faulkrod, 2235 Wood St., Philadelphia
 John Grass Wood Turning Co., 222 Vine St.,
 Philadelphia
 Frank Rosatto Co., 222 So. 8th St., Philadelphia

Geo. Wuerthele & Sons, 1724 East St., N. S.,
 Pittsburgh
 Wm. Wuerthele, 418 Diamond St., Pittsburgh
 Geo. H. Rhea, Saltsburg
 Holmes & Giffilan, Smethport
 Becker Novelty Co., Spring Creek
 J. H. Park, Warren

TANKS AND SILOS.

- Penn. R. R. Car Shops, Altoona
 P. & R. Ry. Repair Shops, Catawissa
 Downington Mfg. Co., Downington
 Grater Body Co., Norristown
 Amos H. Hall Son & Co., 2915-2933 N. Second
 St., Philadelphia
 E. F. Schlichter Co., 10 S. 18th St., Philadelphia
 Woolford Wood Tank Mfg. Co., 1429 Chestnut
 St., Philadelphia
- H. Elsesser & Bros., 1324 Ohio St., N. S.,
 Pittsburgh
 Fleming Tank Co., 3115 Liberty Ave., Pitts-
 burgh
 H. R. Walter Lbr. Co., Fayette & Manhattan
 Aves., Pittsburgh
 Rouseville Supply Co., Rouseville
 John Benore, Scranton
 International Silo Co., Linesville
 F. P. Case & Son, Troy

TOYS.

- Standard Novelty Co., Duncannon
 F. W. Crandall & Co., Elkland
 Barton Mfg. Co., Iryland
 Benner Mfg. Co., Inc., Lancaster
 Glen Mavr Novelty Works, Mavrglen.
 Le Raysville Furn. & Mfg. Co., Le Raysville
 Mansfield Novelty Works, Mansfield
 L. Hopkins Mfg. Co., North Glard
 S. L. Allen & Co., 5th St. and Glenwood Ave.,
 Philadelphia
 A. Schoenut Co., 2215 Adams St., Philadelphia
- J. T. Hammond & Son, Inc., 4534 Hedge St.,
 Frankford, Philadelphia
 A. Mecky Co., 1705 Allegheny Ave., Philadel-
 phia
 Penn. Wheelbarrow Co., 4741 Kansas St., Pitts-
 burgh
 Weaver Specialty Co., 6344 Aurelia St., E. E.,
 Pittsburgh
 Geo. H. Lancaster, South Sterling
 Hawes Mfg. Co., Towanda
 Keystone Farm Machine Co., York

TRUNKS AND VALISES.

- Fiber Specialty Co., Kennett Square
 S. J. Bailey, Nicholson
 The Belber Trunk & Bag Co., 1641 N. Hancock
 St., Philadelphia
 S. Berkowitz, 1838 So. 9th St., Philadelphia
 Robert McGuinn & Co., 437 Market St., Phila-
 delphia
- Cramer and Sherr, 123 So. 3rd St., Philadelphia
 B. Podol, 1103 N. 2nd St., Philadelphia
 J. H. Seitz & Son, 414 & 438 Brown St., Phila-
 delphia
 B. R. & B. Trunk Co., 32-40 Isabella St., Pitts-
 burgh
 South Montrose Mill Co., South Montrose

VEHICLES AND VEHICLE PARTS.

- International Motor Co., Allentown
 Est. of W. Wolf, Allentown
 Lewis Wolf's Sons, Allentown
 Balzer Koelle, Altoona
 Russell Delozier, Altoona
 Penn. R. R. Co. (Foundries), Altoona
 Penn. R. R. Car Shops, Altoona
 J. L. Saylor & Son, Annuville
 T. M. Werner, Annuville
 The Autocar Co., Ardmore
 L. C. Brenner, Bainbridge
 W. Ira Baker, Bakersville
 W. G. Sterling, Bakerstown
 Joseph Litterhouse, Bally
 S. S. Lynch, Bausman
 Jacob F. Schmitt, Beaver Meadows
 J. O. Klinger, Beaver Springs
 Bedford Planing Mill Co., Bedford
 F. H. Brightbill, Bedford
 A. G. Brightbill & Son, Bedford
 W. S. Fletcher, Bedford
 Isaac K. Meyer, Redminister
 H. J. Horton & Co., Belleville
 S. F. Appleman, Benton
 Long Wagon Co., Benton
 Wm. E. Gruber, Bernville R. D.
 Gruber Wagon Works, Bernville R. D.
 Trescott Carriage Works, Berwick
 A. K. Huntzinger, Blainport
 Edw. Stevens, Bowmansdale
 Boyertown Carriage Co., Boyertown
 Pittsburgh Machine Tool Co., Braddock
 C. A. Adams, Bridgeton R. D.
 Chas. B. Sossong Co., Bridgeville
 Standard Cast Iron Pipe & Foundry Co., Bristol
 J. D. McSparrin, Brockwayville
 Brookville Mfg. Co., Brookville
 C. W. Scott Co., Bryn Mawr
 A. F. Fey, Carbondale
 H. J. & W. A. Krumenacker, Carrolltown
 A. C. Kelly, Center Moreland
 J. G. Reber, Centerport
 C. H. Schantz, Center Valley
 Walton Lumber Co., Charleroi
 M. Ocheltree, Chester
 S. M. Congleton, Chester Heights
 Schaller Bros., Clark
 Clearfield Novelty Works, Clearfield
 R. H. Grater, Collegeville
 Frank J. Bower, Collomsville
 Columbia Wagon Co., Columbia
 Coraopolis Mfg. Co., Coraopolis
 F. E. Neffe, Condersport
 Z. H. Markley, Cressman
 John G. Stoll, Deodote
- J. K. Hinkle, Dillsburg
 Huston Irwin Mfg. Co., Du Bois
 Hobson & Co., Easton
 J. Monroe Young, Easton
 St. Francis Industrial School, Eddington
 C. Prouty & Co., Eldred
 C. Bailey & Co., Ellinsport
 A. Buch's Sons Co., Elizabethtown
 Martin & Heagy Mfg. Co., Elizabethtown
 Swab Carriage Co., Elizabethville
 Swab Wagon Co., Elizabethville
 Horace Handwork, Elverson
 Acme Wagon Co., Emlgsville
 J. H. Young Lumber Co., Emlenton
 H. N. Thayer Co., Erie
 W. C. Laderer, Evans City
 F. M. Ott & Son, Everett
 B. F. Beers, Fallentimber
 S. A. Mowers, Fayetteville
 Finleyville Planing Mill Co., Finleyville
 Fleetwood Metal Body Co., Fleetwood
 Myers Carriage Co., Franklin
 A. Reynolds, Franklin
 Fredonia Bending Works, Fredonia
 R. M. Whitney, Galeton
 M. Schultz, Gallitzin
 George T. Sellers, Gap
 George Kelnard, Geigers Mills
 D. W. Bryan, Gillett
 J. N. Kramer, Coodville
 Stoyers Carriage Shop, Greenville
 Grim & Bro., Grinville
 F. C. Behrman, Groffs Store
 McKay Carriage Co., Grove City
 Scott & Kemmerer, Hamburg
 Hanover Bending & Mfg. Co., Hanover
 Hopkins Mfg. Co., Hanover
 Eureka Coal Wagon Co., Harrisburg
 C. A. Fair Carriage & Auto Works, Harrisburg
 C. A. Sefton Carriage Works, Harrisburg
 C. E. Shaffer Est., Harrisburg
 Penna. R. R. Co., Harrisburg
 F. N. Watts, Harrisburg
 Samuel Fahs, Highspire
 Jas. B. Condon, Hollidaysburg
 Penwarden Mfg. Co., Honesdale
 Wm. Nelms, Honey Brook
 Bowers & Leathers, Howard
 Howard Handle & Spoke Co., Howard
 Chas. E. Pletcher, Howard
 M. Gillis, Hughesville
 Conner Vehicle Co., Indiana
 John F. Klein, Ironbridge
 T. H. Hazlett Lbr. Co., Jeannette
 C. H. Decker, Jersey Shore

VEHICLES AND VEHICLE PARTS—Continued.

- Chas. Shoup, Jersey Shore
 Conemaugh Lbr. Co., Johnstown
 Kauch Handwerk & Co., Jordan
 American Road Machine Co., Kennett Square
 Jacobs & Coley Wilkes-Barre, Kingston Br.
 P. O.
 H. W. Miller, Kittanning
 H. Shaffer Lumber Co., Kittanning
 E. R. Kroninger, Kutztown
 E. Miller's Sons, Kutztown
 Edwin A. Kramer, Kutztown
 J. H. Kirk & Co., Kylertown
 Roy M. Flank, Lampeter
 Samuel E. Bailey, Lancaster
 Downey Bros. Spoke & Bending Co., Lancaster
 Edwin Egerly, Lancaster
 Michael Hoover, Lancaster
 Stoll Bros., Lancaster
 S. M. Skeen, Lancaster
 John R. Cooper, Landenberg
 Automatic Wagon & Truck Co., Lansdowne
 Latrobe Carriage Co., Latrobe
 Monyar Carriage Co., Latrobe
 The Fauber Coach Works, Lebanon
 A. F. Helm Carriage Works, Lenhartsville
 T. L. Blocker & Sons, Littlestown
 S. D. Mehring, Littlestown
 Frank L. Underwood, Wilkes-Barre, Luzerne Br.
 P. O.
 N. F. Shillingford, McAllisterville
 A. Mauser & Bro., McEwensville
 L. Loeffler, McKeesport
 Otto Sippel, McKees Rocks
 J. W. Gerhard, Macungie
 H. P. Frank, Maytown
 Sload & Bro., Maytown
 The Eberly & Orris Mfg. Co., Mechanicsburg
 J. K. Hinkel, Mechanicsburg
 J. B. Koller & Co., Mechanicsburg
 Fred Seidel Estate, Mechanicsburg
 Seidel & Hinkel, Mechanicsburg
 Hopp Carriage Co., Mifflinburg
 Mifflinburg Body & Gear Co., Mifflinburg.
 D. B. Miller, Mifflinburg
 Elmer C. Rudy, Mifflinburg
 Potter Wagon Works, Mifflintown
 Charles S. Pearson, Milford
 Edward Buck, Millville
 John Eves & Co., Millville
 Valley Machine & Turning Co., Monongahela
 J. Howard Ames, Morgantown
 Wm. H. Albrigt, Mount Penn
 Mountville Mfg. Co., Mountville
 Jacob M. Ames, Neffsville
 C. H. Felten, New Baltimore
 Darlington & Hoffman, New Bloomfield
 B. S. Struckman, New Buena Vista
 Shenango Lumber Co., New Castle
 H. A. Buffenmyer, New Holland
 Graff & Weaver, New Holland
 Wm. Huntley, New Milford
 C. H. Mathews, Newportville
 Clarence Randall, Newtown
 McGowan & Heuscher, Newtown
 Horace Ervin, Ogontz
 Harry Williams & Son, Ogontz
 Eagle Spoke Works, Oil City
 Kramer Wagon Co., Oil City
 J. W. Connor, Orangeville
 S. B. Wise Sons, Orstown
 Johnson Carriage Co., Oxford
 Wilson Bros., Oxford
 Martz & Fisher, Paxinos
 J. G. Meyer & Sons Co., Perkasee
 Max M. Betz & Son, 1041 Frankford Ave., Phila-
 delphia
 Bloch Go-Cart Co., 1136-48 N. American St.,
 Philadelphia
 The John Buckley Hub, Spoke & Wheel Co.,
 969-75 N. 2nd St., Philadelphia
 J. Haynes Caffrey, 1712 Fairmount Ave., Phila-
 delphia
 Finnesey & Kobler, Inc., S. W. Cor. 26th &
 Parrish Sts., Philadelphia
 Fulton-Walker Co., 1931 Filbert St., Phila-
 delphia
 Geo. W. Garrett & Sons, 39th & Lancaster Ave.,
 Philadelphia
 Hale and Kilburn Co., 18th St. & Lehigh Ave.,
 Philadelphia
 H. Kaiser & Co., Inc., 23rd & Race Sts.,
 Philadelphia
 Kessler Wagon Works, Inc., 857 E. Girard Ave.,
 Philadelphia
 Morris Truck & Wheel Co., 2016 S. Bancroft St.,
 Philadelphia
 Louis Oehme, 3045 Richmond St., Philadelphia
 Petzelt & Keyser, N. E. Cor. 24th & Locust,
 Philadelphia
 Pennsylvania R. R. (West Phila. Shops), Phila-
 delphia
 Rech-Marbaker Co., Eight St. & Girard Ave.,
 Philadelphia
 Rodenhause's Excelsior Wagon Wks., 1437
 Hutchinson St., Philadelphia
 Frank Schanz, 408 N. Randolph St., Philadelphia
 The Schwarz Wheel Co., Margaret St., & P. R.
 R., Philadelphia
 Southwork Truck Co., 911-913 Ellsworth, Phila-
 delphia
 Sowney Bros., 1204 & 22 Frankford Ave., Phila-
 delphia
 Martin H. Walrath, Broad & Cambria, Phila-
 delphia
 Wm. Wenkenbach's Sons, 1310 Germantown Ave.,
 Philadelphia
 C. F. Buffington & Bros., Pillow
 Jno. Deisenroth, 48 8th St., Pittsburgh
 Doehle Wagon Co., 1055 Ohio St., Pittsburgh
 Eagle Transfer Co., 101 Galveston Ave., Pitts-
 burgh
 Geo. J. Elsenhauer, 220 Brighton Road, Pitts-
 burgh
 H. J. Evans, 314-315 E. Reliance St., Pittsburgh
 Frazier & Foltz, 2614 Smallman St., Pittsburgh
 L. Glesenkamp Sons & Co., 320 Penn. Ave.,
 Pittsburgh
 R. J. Hayden, 4110 Liberty Ave., Pittsburgh
 Wm. L. Heusel Wagon Co., 1st & Middle St.,
 N. S., Pittsburgh
 W. J. Hittner, 3402 Penn. Ave., Pittsburgh
 Jno. H. Huy's Sons, Basin & Weisler Sts.,
 Ewalt Station, Pittsburgh
 Lewis Kauffman, 1206 East St., Pittsburgh
 Kholos Wagon Co., 2215 Forbes St., Pittsburgh
 H. Lange Wagon Co., 504 Second Ave. &
 S. St. Clair St., Pittsburgh
 W. H. Leonard & Son, 218 43rd St., Pittsburgh
 H. Linde, So. 24th & Sidney, Pittsburgh
 McClinton & Co., 309 Sandusky St., Pittsburgh
 Metz & Miller, 313 Penn. Ave., Pittsburgh
 Monongahela River Consolidated Coal & Coke
 Co., No. 8 Market St., Pittsburgh
 Penn. Wheelbarrow Co., 4741 Kansas St., Pitts-
 burgh
 John Sauter, 414 Duquesne Way, Pittsburgh
 G. A. Schnabel & Sons, 3069 Penn. Ave., Pitts-
 burgh
 Frank Sismour, 884 Main St., Pittsburgh
 E. J. Thompson Co., Louisa St., Pittsburgh
 H. R. Walter Lumber Co., Fayette & Manhattan
 Ave., Pittsburgh
 J. G. Weir & Son, 1325 Liberty St., Pittsburgh
 C. West & Co., 420 Duquesne Way, Pittsburgh
 Wilkinsburg Carriage Works, 500 Penn. Ave.,
 Wilkinsburg, Pittsburgh
 F. F. Childs, Pittsfield
 H. N. Tritmyer, Pleasant Gap
 H. W. Millard, Pomeroy
 Pennsylvania R. R. Co., Pottsville
 P. McKean Harl & Son, Lindsay Sta., Punxsu-
 tawney
 Punxsutawney Fdy. & Mach. Co., Punxsutawney
 Anchor Bending Works, Reading
 Biehl's Carriage & Wagon Works, Reading
 Keystone Vehicle Co., Reading
 The S. G. V. Co., Reading
 Wetherhold & Bros., Reading
 Harvey S. Smith, Rehuck
 D. J. Rumbel, Red Hill
 Alvin Fauth, Red Lion
 Noah C. Stabler, Red Lion
 J. & H. C. Dieble, Reynoldsville.
 Schrock Bros., Rockwood
 Levi Hackerty, Rohrerstown
 L. D. Fields, Roxbury
 L. W. Huber, Rural Valley
 McKelvey & Peters, Rural Valley
 E. C. Beckley, Saint Clairsville
 John Beure, Scranton
 Blume Wagon Works, Scranton
 A. R. Gould & Sons, Scranton
 Mason & Snowdon Lbr. Co., Scranton
 Steup Bros., Sewickley
 Frank K. Morgan, Shamokin
 Shamokin Wagon Works, Shamokin
 J. M. Hoagland & Co., Sharon
 E. M. Seyfert, Shartlesville

VEHICLES AND VEHICLE PARTS—Continued.

W. E. Sell, Sbelocta
 The Parker Mfg. Co., Souderton
 L. Hammond, Spangler
 The Graves & Eighmy Co., Springboro
 Kramer & Son, Springboro
 Ephraim Fluck, Springtown
 Albert Miller & Co., Springtown
 A. D. Shollenberger, Steinsville
 F. B. Hess, Stockertown
 Levi Raezer, Talmage
 Christ & Becker, Tamaqua
 Eagle Carriage Works, Tamaqua
 The Tarentum Lbr. Co., Tarentum
 Martin Hub Works, Tidioute
 J. C. Scowden, Tionesta
 Titusville Handle Co., Titusville
 J. F. Cupp, Trout Run
 Fred Calfisch, Union City
 The Star Handle Co., Union City
 J. M. Howard & Son, Uniontown
 Thos. Matthews, Untontown
 G. W. Baum, Urban
 J. M. Davis, Walnut Bottom
 Samuel Peterson, Warren

John S. Pross, Warrington
 Hoopes Bro. & Darlington, Inc., West Chester
 Jacobs & Colley, Kingston, Wilkes-Barre
 Frank L. Underwood, Luzerne, Wilkes-Barre
 Wilkingsburg Carriage Works, 500 Penn. Ave.,
 Pittsburgh, Wilkingsburg Br. P. O.
 Loyalsock Planing Mill Co., Williamsport
 J. L. Rush & Son, Willow Grove
 Willow Grove Bending Co., Willow Grove
 J. R. Barnhart, Worthington
 A. D. Benton, Worthington
 John F. Stephens, Woodbine R. D.
 Werner & Leshner, Yeagertown
 W. A. Eberly Wheel Works, York
 Eureka Bending & Wheel Works, York
 A. B. Farquhar Co., York
 Hoover Wagon Co., York
 The Martin Carriage Works, York
 Ness Bros. & Co., York
 Pullman Motor Car Co., York
 Ervin Smith & Co., York
 York Carriage Co., York
 York Wagon Gear Co., York

WEIGHING APPARATUS.

Penn. R. R. Car Shops, Altoona
 Penn. R. R. Co. (Junliata Shops), Altoona
 Louis Kirchgaber, 613-15 Cherry St., Phila-
 delphia

The Standard Scale & Supply Co., 243 Water
 St., Pittsburgh

WHIPS, CANES, AND UMBRELLA STICKS.

Chicora Whip Co., Ltd., Chicora
 T. H. Gilpin, Greentown
 Laanna Mfg. Co., Laanna
 Wm. G. Bayha, 333-35 N. Fourth St., Phila-
 delphia
 James S. Catterson, 1136 Catherine St., Phila-
 delphia
 M. Horwitz, 305 Montrose St., Philadelphia

The Harvey V. Watt Co., 1804-26 E. Venango St.,
 Philadelphia
 L. Schneider Co., 4701 Worth St., Frankford
 L. Silverstone & Co., 1126 N. Orianna St., Phila-
 delphia
 Geo. H. Lancaster, South Sterling
 Wells Whip Co., Wellsville

WOODENWARE AND NOVELTIES.

Keystone Mfg. Co., Albion
 Allentown Reed Harness & Mill Supply Co.,
 Allentown
 The Belmer Mfg. Co., Canton
 The H. Sheldon Mfg. Co., Canton
 Catawissa Specialty & Mfg. Co., Catawissa
 Clearfield Woodenware Co., Inc., Clearfield
 Corry Pall Co., Corry
 F. E. Westley, Corry
 East Greenville Mfg. Co., East Greenville
 C. Prouty & Co., Eldred
 Lovell Mfg. Co., Erie
 Hanover Bending and Mfg. Co., Hanover
 Laanna Mfg. Co., Laanna
 E. H. Alpha, Lakeville
 Oneida Community Ltd., Lititz
 Glen Mawr Novelty Works, Mawrglen
 Norris Pattern & Machine Co., Norristown
 The Eclipse Co., North Girard
 The Empire Co., North Girard
 Penn Mfg. Co., North Girard

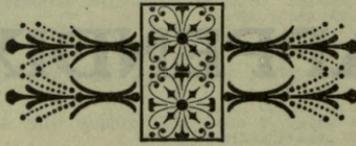
John C. Dettra & Co., Oaks
 John P. Little Co., Piteure Rocks
 Nathan Cohen, 1126 N. Orianna St., Philadelphia
 John Grass Wood Turning Co., 222 Vine St.,
 Philadelphia
 J. T. Hammond & Sons, Inc., 4534 Hedge St.,
 Frankford, Philadelphia
 Kassel & Co., 309 Montrose St., Philadelphia
 John Klett, 1305 N. 27th St., Philadelphia
 Thomas Ott & Co., 1124 Washington Ave.,
 Philadelphia
 L. Silverstone & Co., 1126 N. Orianna, Phila-
 delphia
 Geo. H. Lancaster, South Sterling
 W. S. Wilcox, Turnersville, Jamestown P. O.
 Blasdel Novelty Mfg. Co., Towanda
 Patterson Bros. Co., Wellsboro
 H. W. White, Whites Valley
 F. B. Sherman, Williamsburg
 W. John Stevens, Inc., Wyncote
 Keystone Farm Machine Co., York

MISCELLANEOUS.

Pennsylvania Match Co., Bellefonte, Matches
 Fred Fear Match Co., Bloomsburg, Matches
 Coraopolis Mfg. Co., Coraopolis, Signs and
 Supplies
 Penna. Hub & Veneer Co., Laquin, Brewers'
 Chips
 Bernard McCurdy, Philadelphia, Flag and Tent
 Poles

Heilprin Mfg. Co., Philadelphia, Firearms
 John Grass Wood Turning Co., Philadelphia,
 Bungs and Faucets
 A. H. Fox Gun Co., Philadelphia, Firearms
 Geo. H. Lancaster, South Sterling, Flag Poles
 and Staffs
 F. B. Sherman, Williamsburg, Firearms

APPENDIX



ROUGH FOREST PRODUCTS.

It was pointed out on a preceding page that this study does not include the rough lumber produced by the Pennsylvania sawmills, nor the State's output of shingles, lath, cooperage, wood distillation, veneer, pulpwood, etc. The Bureau of the Census, co-operating with the Forest Service, yearly collects statistics for these commodities and in order to make this report complete in all phases of wood consumption, the census figures have been copied from the latest bulletins, 1911-12, in so far as they relate to Pennsylvania, and are presented in tabular form in the following paragraphs.

LUMBER.

In the production of chestnut lumber, Pennsylvania is second among the states, and third in the cut of hemlock, maple, and beech. The following table shows 22 woods cut in the State in 1912, arranged according to quantity, together with the average price per M feet at the mill and the total cost.

Table a.—Production of Rough Lumber.

Kind of Wood.	Quantity cut—Ft. b. m.	Average price per 1,000 ft.*	Total price.
Hemlock,	386,188,000	\$15 41	\$5,951,157
Oak,	209,473,000	19 52	4,088,913
Chestnut,	93,294,000	16 29	1,519,769
Maple,	81,617,000	16 19	1,321,379
White pine,	71,870,000	21 33	1,532,987
Beech,	40,688,000	15 64	628,031
Yellow pine,	21,647,000	13 87	300,244
Birch,	17,666,000	16 72	295,376
Yellow poplar,	14,413,000	22 75	327,896
Basswood,	10,925,000	18 67	203,970
Ash,	10,336,000	20 55	201,924
Hickory,	9,826,000	21 86	225,946
Elm,	2,994,000	16 67	49,910
Walnut,	2,268,000	21 47	48,694
Red gum,	1,454,000	12 47	18,131
Cedar,	892,000	14 40	12,845
Sycamore,	575,000	13 87	7,975
Spruce,	342,000	17 30	5,917
Balsam fir,	141,000	13 42	1,892
Tupelo,	100,000	13 90	1,390
Larch,	76,000	13 29	1,010
Cottonwood,	46,000	18 12	834
All others,	6,351,000	18 50	117,494
Total,	992,180,000	\$17 00	\$16,863,673

*Prices supplied from information in files of the Forest Service for prices f. o. b. mill.

LATHS.

Many of the plastering laths produced in Pennsylvania are produced from sawmill waste. Large quantities are also manufactured by portable lath mills that follow the sawmill onto cut-over tracts and clear up the remaining small softwood and the soft hardwood trees, as well as utilize the cutoffs, crooked logs, tops, and other material the lumbermen left in the woods. Hemlock and white pine are the principal lath woods in Pennsylvania, although spruce, yellow poplar, cucumber, and aspen were also reported.

SHINGLES.

Chestnut, because it is a durable wood outside and cheap, is the principal shingle material in Pennsylvania. White pine, hemlock, and a few hardwoods in small amounts were the other woods to contribute to the output. In the production of shingles Pennsylvania is not one of the principal states, but compared with the quantity of wood used by the various wood-using industries of the State and especially with the home-grown material reported, it is of considerable importance. Shingles made in Pennsylvania are both split and sawed, the sawed shingle is more salable and therefore, the kind generally manufactured.

Table b.—Production of Laths and Shingles.

Products.	Quantity.	Equivalent b. m. total feet
Laths,	78,758,000	15,752,000
Shingles,	26,957,000	2,696,000

COOPERAGE.

Table "c" reports the quantity and cost of material used in Pennsylvania for the manufacture of barrel stock, staves, and heading. Raw material for both stave and heading is usually purchased in the form of bolts but considerable sawmill waste is saved by being converted into these products. The prices given were not taken from the Census bulletin as they are not comprised in these statistics. Information concerning them was collected from cooperage plants by agents when in the field in connection with the wood-using industry investigation, and an average made of them and applied to the Census figures.

The manufacture of cooperage is an industry which rightfully comes within the scope of the wood-using industry study because both staves and heading are but knocked-down barrels and should be included the same as box shooks or other manufactured material which needs only to be assembled to be finished. However, owing to the fact that one Bureau of the Federal Government gathers these statistics, the Forest Service did not deem it expedient to seek similar information from the cooperage plants twice in the same year. Had the cooperage data been included in the foregoing report,

this industry, according to quantity consumed, would have stood fourth in the list of over 51 industries in Table 3. Thirteen woods are demanded each year for staves and heading. They are shown in the order of amounts as follows:

Table c.—Production of Cooperage Stock.

Kind of Wood.	Number of staves.	Sets of heading.	Equivalent total quantity raw material required ft. b. m.	Average cost per 1,000 ft., bolt form.	Total cost .
Beech,	78,588,000	2,347,000	85,082,700	\$7 00	\$595,579
Chestnut,	46,186,000	3,545,000	71,079,252	6 00	426,476
Maple,	22,108,000	1,715,000	34,199,916	7 00	239,399
Birch,	10,367,000	231,000	10,458,756	6 50	67,982
Pine,	7,967,000	1,773,000	23,556,780	7 00	164,897
Oak,	1,972,000	.....	1,561,824	6 00	9,371
Red gum,	414,000	77,000	1,077,252	7 75	8,349
Spruce,	200,000	.....	158,400	6 50	1,030
Ash,	146,000	7,000	183,756	6 50	1,194
Elm,	105,000	3,000	112,356	7 00	786
Yellow poplar,	47,000	55,000	572,484	6 50	3,721
Basswood,	37,000	196,000	1,936,776	7 00	13,557
All others,	437,000	.....	346,104	6 15	2,129
Total,	168,564,000	9,949,000	230,326,356	\$6 66	\$1,534,470

PULPWOOD.

The quantity of wood consumed for making paper pulp in Pennsylvania, according to the 1911 Census figures, amounts to over 315,000 cords. It is procured in bolt form and is equivalent to more than 158,000,000 board measure feet that is annually taken from the forests of the State. Pennsylvania is the fifth State in the consumption of wood pulp and stands next to Maine in using large quantities of mill and woods waste in this line of manufacture.

Table d.—Pulpwood Consumption.

Kind of Wood.	Cords.	Equivalent total ft. b. m.
Spruce,	56,243	28,121,500
Pine,	51,265	25,632,500
Beech,	44,320	22,160,000
Yellow poplar,	35,120	17,560,000
Hemlock,	33,181	16,590,500
Maple,	30,874	15,437,000
All others,	10,295	5,147,500
Slab wood and other mill waste,	54,384	27,192,000
Total,	315,682	157,841,000

HARDWOOD DISTILLATION.

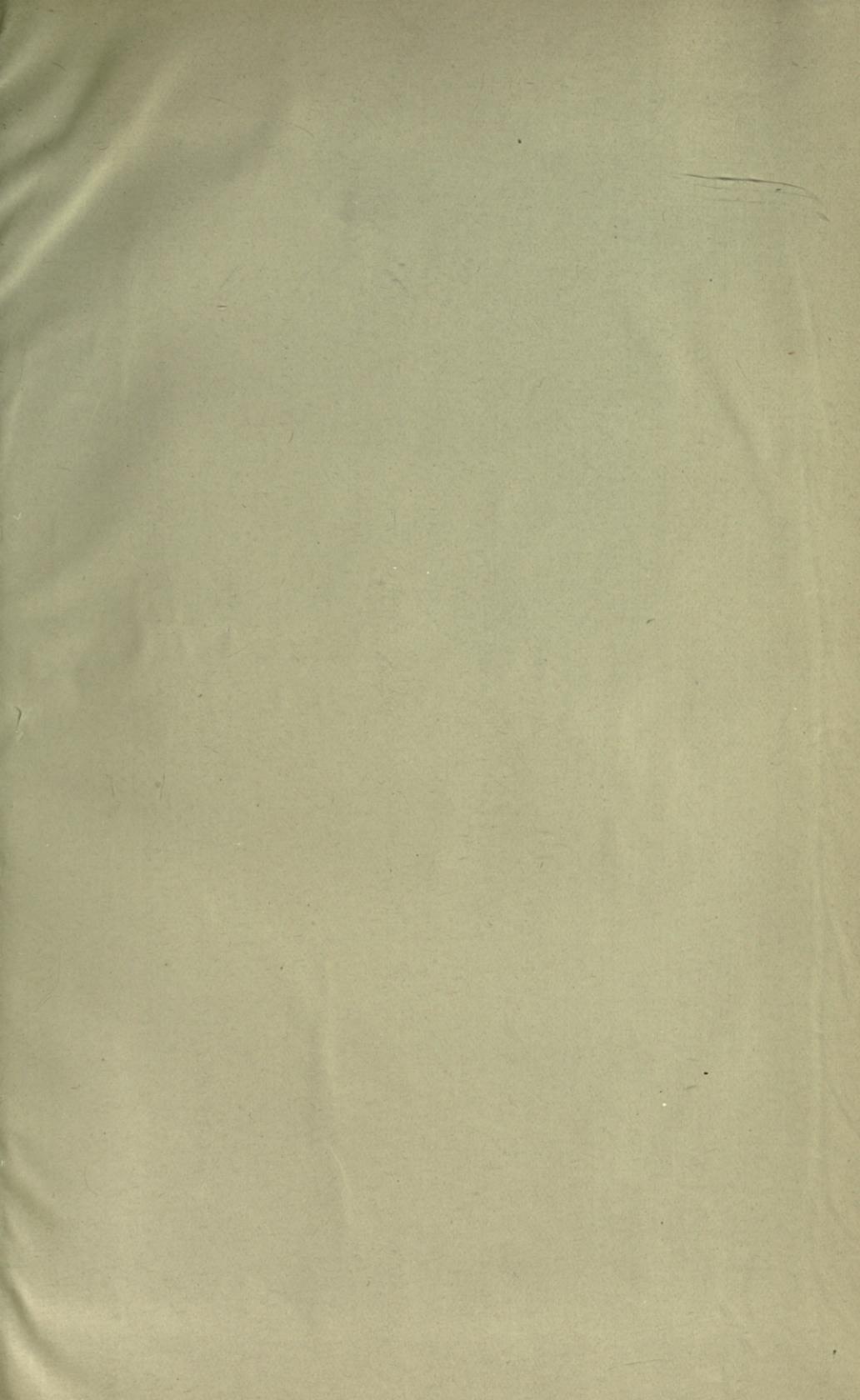
Beech, birch, and maple are the principal woods consumed in hardwood distillation. They have been separated in the following table merely to emphasize the kinds used and the quantities are not representative of the actual results but were arbitrarily divided in equal amounts for the want of more definite information. Besides the above named woods, oaks, hickory, chestnut, elm, and ashes were also consumed but in small quantities only. Pennsylvania hardwood distillation plants generally employ the destructive process. Charcoal, crude wood alcohol, and gray acetate are the principal products.

Table e.—Hardwood Distillation.

Kind of Wood.	Cords.	Equivalent total ft. b. m.
Beech,	121,513	60,756,500
Birch,	121,513	60,756,500
Maple,	121,513	60,756,500
Total,	364,539	182,269,500

VENEER.

Over 2,500,000 feet of logs in Pennsylvania were converted into veneer in 1911. These are not necessarily cut from the forests of the State as veneer logs are sought after over a wide territory and are imported from foreign countries and manufactured into veneer by mills in easy reach of important markets. In Pennsylvania maple was the principal wood consumed, followed by beech, yellow poplar, basswood, oak, birch, and cherry, in the order named. Spanish cedar was the only foreign wood.



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