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The Pruning Book

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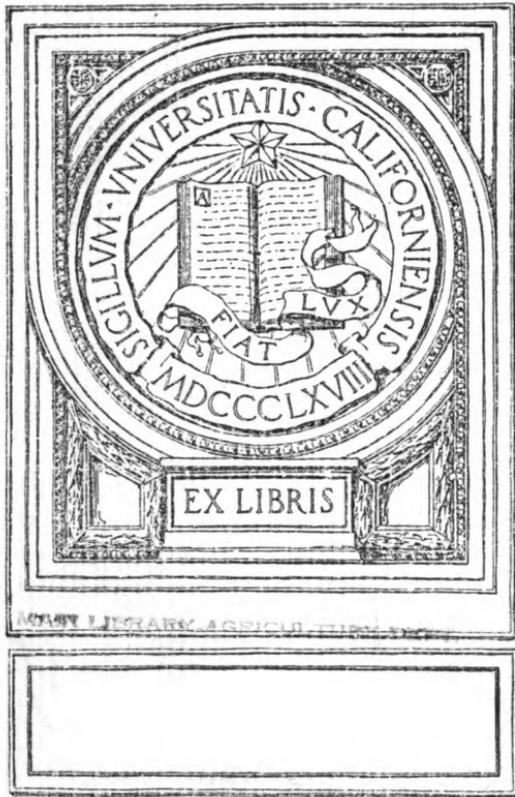
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UNIVERSITY OF
CALIFORNIA



COMMERCIAL TREES



"REAL" TREES

THE PRUNING BOOK

An illustrated statement of tested methods
of pruning and a warning against the
mistakes so commonly made.



Prepared for
HENRY DISSTON & SONS, INC.
By **ROLAND B. GILMAN**

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In Appreciation

The need for a book that would tell the story of pruning in the most universal of all languages, that of pictures, prompted the development of that plan in the following pages. With this end in view, the writer has endeavored to secure the best photographs showing the representative good and bad pruning from various sections of the United States. When these were secured, the text was built around them.

No attempt has been made to discuss relative merits of the various systems of pruning used in commercial orchards and vineyards, the aim being to illustrate those methods found to be generally adapted to the variety and section under discussion, and call attention to and warn against mistakes so commonly made in this line of work.

"The Pruning Book" is not intended as a complete work on pruning.

The writer wishes to express the thanks and appreciation of both the Company and himself to those who so generously helped by furnishing the prints and cuts so necessary to success, as follows:

The United States Department of Agriculture, Figs. 3 to 12, 26 to 29, 31-B, 32, 37 to 42, 43-A, 44 to 47, 50, 58-A and B, 60, 61-C, 62 and 78-A. Bureau of Plant Industry, United States Department of Agriculture. Figs. 65, 66, 67-B and C, 69, 72, 73, 76, 83 and 84.

The Forest Service, United States Department of Agriculture, Figs. 1, 13 to 24, 61-A and B and 64-A.

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The Nebraska Agricultural Experiment Station, Figs. 51, 68, 74 and 75.

The North Carolina Agricultural Experiment Station, Figs. 52, 55 and 57.

The West Virginia Agricultural Experiment Station, Figs. 53, 54, 58-C and 59.

The Iowa Agricultural Experiment Station, Figs. 48 and 49.

The Idaho Agricultural Experiment Station, Figs. 30, 34 and 35.

The Country Gentleman, Figs. 70, 71, 77, 78-B, 79, 80, 82-B and 85.

Mr. Harvey W. Porch, Figs. 56, 63, 67-A, 81 and 82-A.

Mr. John T. Roberts, Figs. 2 and 86-C.

Mr. L. Willard Minch, Fig. 64-B.

A large portion of thanks is also expressed for the assistance given through information and suggestions by the various State Agricultural Experiment Stations, and for the suggestions of Mr. Frank K. Phillips.

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Foreword

This "Pruning Book" answers most of the everyday questions regarding pruning and was planned to cover as broad a field as possible in a book of its size. It is hoped that the reader will be so interested in the proper care of his trees and shrubs that additional information will be desired. A vast quantity of such information is available, much of which is contained in the free publications of the United States Department of Agriculture and of the various State Agricultural Experiment Stations.

Those desiring information on pruning should address the United States Department of Agriculture, Bureau of Publications, Washington, D. C., asking for available information on the subject in question.

At times, detailed information regarding peculiar local conditions is best obtained from the Agricultural Experiment Station of the State in which such conditions exist.

The State Experiment Stations are generally in a position to give advice as to market requirements, proper spraying, cultivation, and other local factors which affect the pruning work.

Many books have been published on the subject. The best known are possibly "Bailey's Pruning Book," by Prof. L. H. Bailey, Macmillan Co., New York City; "Principles and Practice of Pruning," by M. G. Kains, Orange Judd, New York City, and "Citrus Fruits," by J. E. Coit, Macmillan Co.

History and Development of Pruning

THE "Modern Horticulturists" are apt to look upon our knowledge of the principles of pruning as being part of a very modern system of fruit growing. The surprising fact is that vineyards were spoken of in Bible writings about 2300 B. C., "Noah began to be a husbandman and planted a vineyard." Gen. 9: 20. Mention is also made of the dressing of vines and trees by Varro, who wrote a book on agriculture about the year 600 of the Roman Era. He quotes more ancient writers, criticising some for not advocating the regular pruning of the olive tree. He also testifies against that ancient Eastern proverb: "Two things improve with beating—women and olive trees." He says that the custom of beating olive trees to remove

experience of 48. yeeres labour, and now the second time corrected and much enlarged, by *William Lawson.*

Whereunto is newly added the Art of propagating Plants, with the true ordering of all manner of Fruits, in their gathering, carrying home, and preservation.



Printed at London by I. H. for ROGER JACKSON, and are to be sold at his shop neere Fleet-street Conduit. 1623.

FIGURE 3

the fruit destroyed many of the young shoots and fruit buds, reducing the next crop.

The writers of the seventeenth century quoted the Bible, Ovid, Virgil, and other ancient authors profusely. These men thought things through and arrived at conclusions surprisingly like those we hold to be true today. Their knowledge of plant disease and insects was not great, owing to the lack of proper scientific instruments needed in their study.

William Lawson, an English gardener, wrote a book on the "Ordering of all manner of fruits." (Fig. 3.) The following extract gives his idea of how a standard fruit tree should be pruned, and why:

"A fruit tree so standing, that there need none other end of dressing but fruit (not ornaments for walks, nor delight to such as would please their eye only, and yet the best form cannot but both adorn and delight), must be parted from within two foot (or thereabouts) of the earth, so high to give liberty to dresse his root and no higher, for drinking up the sap that should feed his fruit, for the boale will be first, and best served and fed, because he is next the root, and of greatest waxe and substance, and that makes him longest of life, unto two, three, or foure armes, as your stocke or grafes yeeld twigs, and every arme into two or more branches, and every branch into his severall cyons. Still spreading by equal degrees, so that his lowest spray be hardly without the reach of a mans hand and his highest be not 2 yards higher, rarely (especially in the middest) that no one twig touch his fellow. Let him spread as far as he list without any master-bough, or top equally. And when any bough doth grow sadder and fall lower, than his fellows (as they will with weight of fruit) ease him the next spring of his superfluous twigs, and he will rise: when any bough or spray shall amount above the rest, either snub his top with a nip betwixt your finger and your thumb, or with a sharp knife, and take him clean away, and so you may use any cyon you would reform, and as your tree shall grow in stature and strength, so let him rise with his tops, but equally, and in bredth also, and follow him upward with lopping his under growth and water-boughs, keeping the same distance of two yards but not above three in any wise, betwixt the lowest and highest twigs.

"1. Thus shall you have well liking, cleane skinde, beautifull, great and long-lasting trees.

"2. Thus shall your tree grow low, and safe from winds, for his top will be great, broad and weighty.

"3. Thus growing broad, shall your trees beare much fruit (I dare say) one as much as sixe of your common trees, and good without shadowing, drooping and fretting: for his boughs, branches and twigs shall be many, and those are they (not the boale) which beare the fruit.

"4. Thus shall your boale being little (not small but low) by reason of his shortness take little, and yield much sap to the fruit.

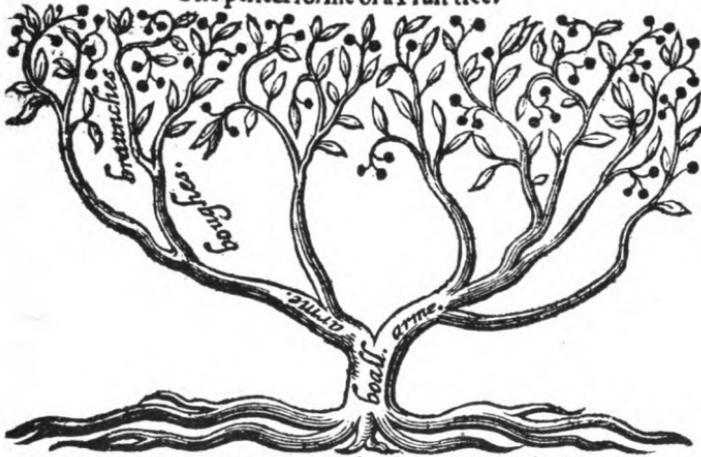
"5. Thus your trees by reason of strength in time of setting shall put forth more blossoms, and more fruit, being free from taints, for strength is a great help to bring forth much and safely, whereas weakness fails in setting tho the season be calme."

Chap. 11.

An Orchard.

Dressing. 37

The perfect forme of a Fruit tree.



If any thinke a tree cannot well be brought to this forme :
Experto crede Roberto. I can shew diuers of them vnder twenty
yeares of age.

The fittest time of the Moone for poyning is as of grafting, Time
when the sap is ready to stirre (not poudly stirring) and so to best for
cover the wound, and of the yeare, a month before (or at least proi-
when) you graffe. Dresse Peares, Appicoks, Peaches, Cher-
ries, and Bullys sooner. And old trees before young plants, ning.
you may dresse at any time betwixt Lease and Lease. And
note, that where you take any thing away, the sap the next sum-
mer will be putting : be sure thercoze when he puts a bud in
any place where you would not haue him, rub it off with your
finger.

And heere you must remember the common homely Wo- Dresse
uerbe : Soone crookes the tree that good Camrell must bee. betime.
Beginne betime with trées, and doe what you list : but if
you let them grow great and stubbozne, you must doe as the
trées list. They will not bend but bzeake, noz be wound with-
out danger. A small bzanch will become a bough, and a bough
an arme in bignesse. When if you cut him, his wound will fe-
ster, and hardly, without god skil, reconer : thercoze, obsta

FIGURE 4

William Lawson says: "Imagine that the paper makes but one side of the tree to appeare, the whole round compasse will give leave for many more armes, boughs, branches and cyons."

Lawson had the same idea with regard to the shape and general structure of the tree that is held by many present-day orchardists.

He makes a mistake when he says that "the boale will be first and best served and fed because he is next the root." Modern research has shown us that the sap as it comes from the roots is in a crude form and must pass through the sap wood of the trunk and branches to the leaves where it is digested, after which it is carried through the inner bark to the growing twigs, fruit, branches or roots as needed. (See Fig. 5-A, page 10.) Modern practice seems to disagree with his advice to remove the lower limbs. Compare Fig. 42-A, page 52, where this has been done, with Fig. 32-B, page 41, and you can readily see the value of the lower limbs, provided they get air and light.

Samuel Hartlib, in 1653 A. D., wrote: "A designe for plentie by a universal planting of fruit trees." He suggests legislation intended to compel land owners and overseers to plant and care for fruit trees.

R. A. Austin in the same year gives us "Arguments of the dignity of fruit trees and the art of planting." This book is largely quotations from ancient writers, and gives long lists of kings and great men who were interested in fruit culture. Some of these lived in ancient Babylon and China.

The knowledge of these old-time writers does not seem to have been made use of by the larger part of the farmers and fruit growers.

The writers many times give the general lack of knowledge and good practice as their reason for writing the book. These efforts of the early authors were largely annulled by the lack of general education of the public and the relatively high cost of the printed book.

The development of transportation and markets during the last half century has resulted in a vast amount of research and experimenting in connection with fruit growing. In spite of this, very little has been added to our knowledge of the principles of pruning. The details of practice have been varied to suit the peculiar demands of climate, soil, and variety of fruit, and the mystery which surrounded plant growth and diseases has been somewhat clarified.

General Principles

The work of tree pruning may be divided into two general classes: that of training and that of repair or tree surgery.

In all of this work a few fundamental principles must be observed if good results are to be realized. There are many persons who feel that great mystery surrounds the work of the "tree doctor" or specialist in this work. There are some few unprincipled men who encourage this idea. The truth is that any person may undertake this work who has a general knowledge of the tree's structure and growth, of how insects and disease affect the tree; and who can use the shears, saw, mallet, gouge, and brush with patience and care.

A cross section of a tree trunk is shown in Fig. 5-A, page 10. The dark portion (a) is the heart wood, and is practically dead tissue. Its chief value to the tree is to give rigidity to the trunk and branches. The lighter section (b) next to the bark is the sap wood. Through the minute sap tubes of this portion of the tree the crude sap passes from the fine feeding roots to the leaves and twigs. There the tree uses it to manufacture food. The action of sunlight is necessary to this digestive process and explains why trees strive to reach the sunlight when shaded, and dwindle and die when they fail. When thus digested, the food is carried from the leaves in solution through tubes in the inner bark (d) to those parts of the tree where it is needed for growth, or to be stored for future use. The food is transformed in the cambium (c) to wood or bark tissue. No growth takes place in the tree except in the cambium, the inner bark, the tips of the twigs and roots, and the leaves. The oldest bark is on the surface of the trunk and limbs, and usually consists of dead corky tissues (e).

Plant diseases and organisms which cause decay seldom gain entrance to the wood tissues if the bark and cambium remain uninjured. Where such injury takes place some substitute should be provided, such as lead paint, tar, or asphalt. Where the bark becomes broken, or a limb is removed, exposing the heart, or the sap wood, there is an opportunity for disease and decay to gain a foothold.

Fig. 5-B, page 10, shows a scar left by the removal of a large limb. Notice that the scar is healing more rapidly at the sides than at the top or bottom. No provision has been made in this case for the protection of the heart and sap wood against decay. The lack of protection has also permitted the heart wood to become dry and to crack, or check.

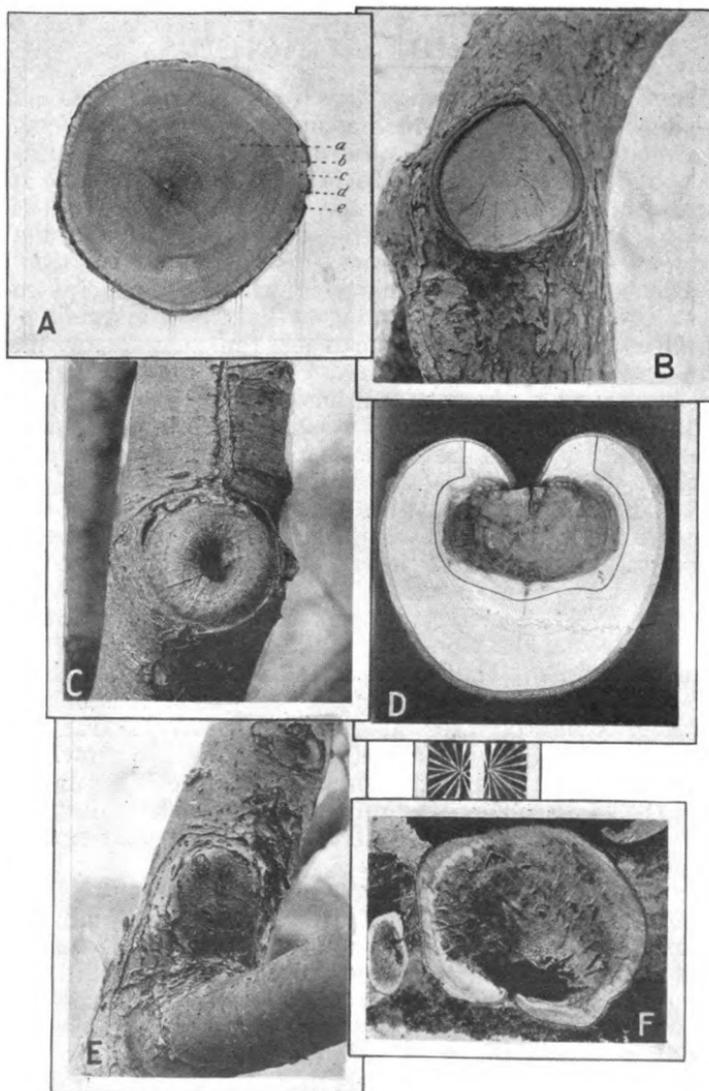


FIGURE 5

Fig. 5-C is a scar about three-fourths healed over.

Fig. 5-D shows decay resulting from an axe cut or blaze. The heart is nearly all destroyed, though the wound is almost healed over.

The line indicates the proper shape of the cavity if this had been excavated.

The scar in Fig. 5-E is entirely healed over. If decay has commenced, it will continue, even though the wound is healed.

Fig. 5-F shows a very small opening into a large area of decay; only a thin shell of sound wood remains. Many times, there are very large cavities that escape detection until a storm breaks a limb, or blows the tree down, exposing the decay. The treating of such cavities is seldom practical, except where expense is not a factor. The decay shown in Fig. 5-D and 5-F could have been prevented if the injuries had received proper treatment in the first place. The old adage: an ounce of prevention is worth a pound of cure, is doubly true in the case of pruning and tree surgery. Careful work is always well repaid in the results obtained. The use of poor or dull tools will greatly handicap the workman, not only delaying the work, but causing very poor results.

Climbing spurs and double-edged saws should never be used, since they cause a great amount of unnecessary damage.

When it is necessary to remove a limb of any kind, the workman should never hesitate to do all the work needed to make a complete job. Neglect of any kind will exact full toll, both in trouble and expense, in the future. The fact must never be lost sight of that the removal of a limb of any size exposes the wood tissue to infection until the wound is covered again by paint or new growth. Should a limb be permitted to split, as shown in Fig. 6-A, page 12, the resulting crack will afford an excellent breeding place for rot-producing fungi, and, even though protected by paint, the wound will be much longer in healing than would be the case were the work properly done.

The proper method of removing large limbs is one item that should be thoroughly understood before much pruning work is undertaken.

One should go very slowly in making the decision to cut large limbs, since replacement is usually impossible, even after many years. Also, the large wound resulting will require a long time to heal. The workman must realize that the cut surface must be protected against decay for a long period where the wound is large. One method of protecting a large cut would be to cover it with tin to within one-half inch of the edge of the cut surface. The tin must be in one piece, or if more than one piece is required, the joint should be soldered. After smoothing the cut surface and giving the usual treatment of disinfectant,

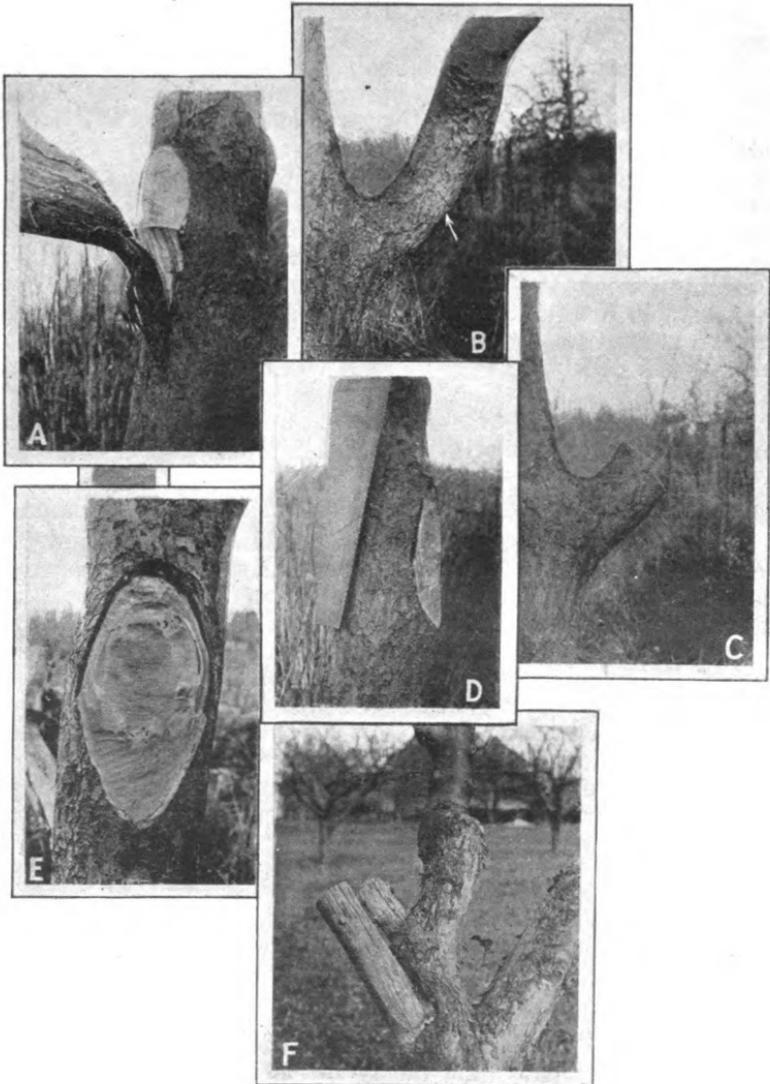


FIGURE 6

shellac, and tar or paint, the tin should be tacked on so that the edges are tight against the surface. The tin should be tarred or painted on both sides.

Fig. 6-A, page 12, is a heavy limb improperly cut, allowing it to strip as it falls. The saw-cut in the under side of the limb, shown in Fig. 6-B, is the first step in the proper removal of a large limb. This is to prevent stripping when the limb falls. The second cut is made just beyond the first and from the top, as in Fig. 6-C. The third cut is shown in Fig. 6-D, and should always be made close to and parallel with the trunk or main limb. This will leave an oval scar, as shown in Fig. 6-E, which also shows how the scar is dressed smooth with a gouge or chisel.

Fig. 6-F shows the reason why stubs should not be left.

The bark of these stubs died, mainly as a result of removing all the food-producing organs above. Decay has entered the trunk from these stubs.

Fig. 7-A, page 14, shows cavities in two trees excavated through several openings. The scars would heal better if the openings were oval and pointed at top and bottom.

A bad case of neglected horse bite is shown in Fig. 7-B. Another view is given in Fig. 7-C. Note how the decay has affected the roots. It is possible, though hardly practicable, owing to the great expense, to try to save a tree in this condition.

The treatment of cavities can be regarded as comprising three essential operations: (a) removing all diseased and decayed matter, (b) sterilizing and waterproofing all cut surfaces, and (c) filling the cavity in a manner that will favor rapid healing and exclude all rot-producing organisms.

Fig. 8-A, page 15, is a cross-section of a young tree trunk, showing how the new wood and bark grow into an unfilled cavity from the margin. If the original injury had been given proper treatment the trunk would now be sound and the scar entirely healed over. The line indicates the amount of excavating needed before filling the cavity.

Fig. 8-B shows the cross section of a cavity braced with a bolt and with nails placed to hold cement filling. The cross section in Fig. 8-C shows the manner of using two bolts in a long, deep cavity. Fig. 8-D gives the proper method of countersinking the oval washer on the bolt. If round washers are used, the countersunk area should be pointed at the top and bottom to facilitate healing. Fig. 8-E shows a cross section of the tree shown in Fig. 8-B after filling with cement. The surface of the cement conforms with the general shape of the woody portion of the trunk and does not extend beyond the cambium.

Cavities less than two feet long do not ordinarily need bolting. If the cavity is very long, the bolts should be placed

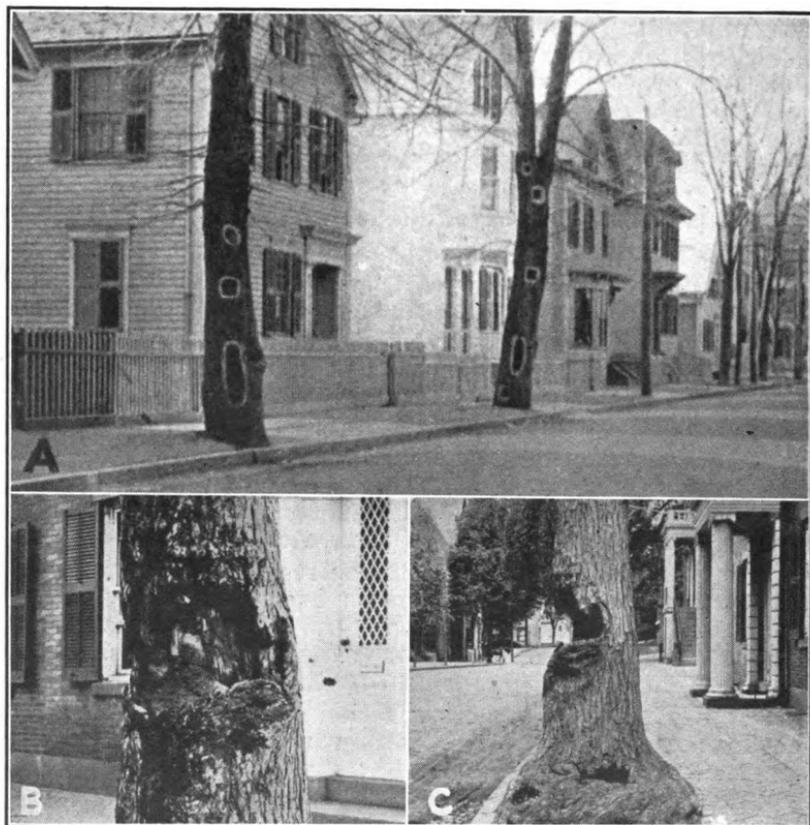


FIGURE 7

about every two feet. All split cavities and crotches must be securely bolted and protected after all diseased wood is removed.

The best material to use on the edges of the sap wood and bark is shellac. Creosote appears to be one of the best materials to use as a sterilizer on all cut surfaces, except the cambium and bark. This should be followed with asphalt or tar. The treatment of all cut surfaces to prevent decay is one of the most important steps in the filling of a cavity. If this is neglected, the filling of the cavity will not prevent further decay, and all the work will be worse than lost, since the cement filling will hide any further decay and prevent treatment.

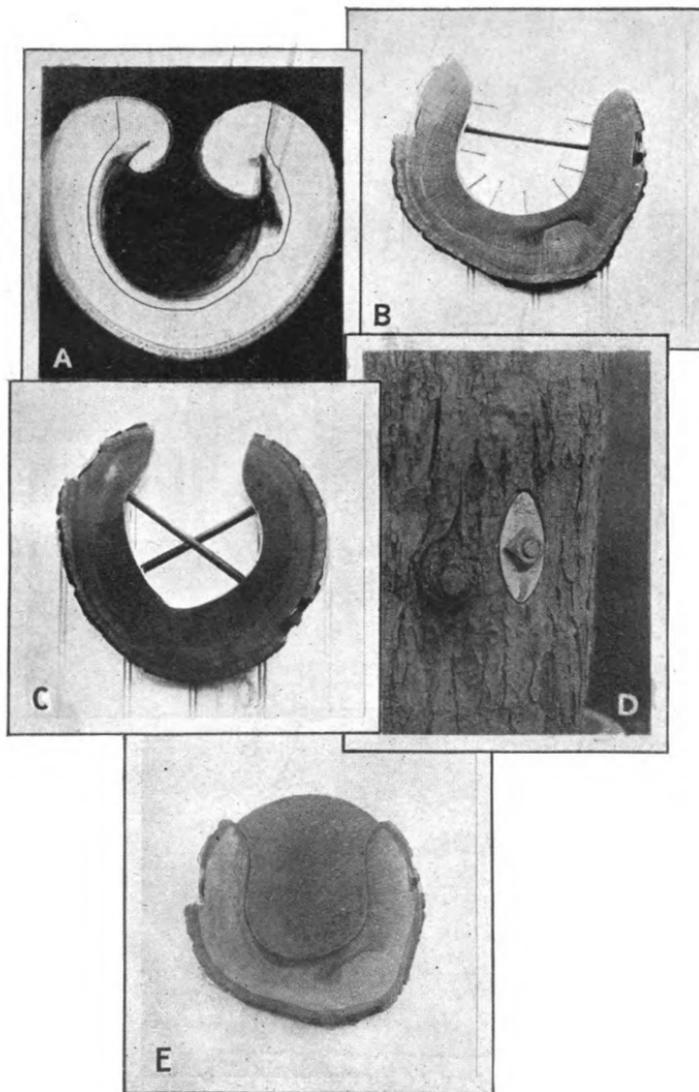


FIGURE 8

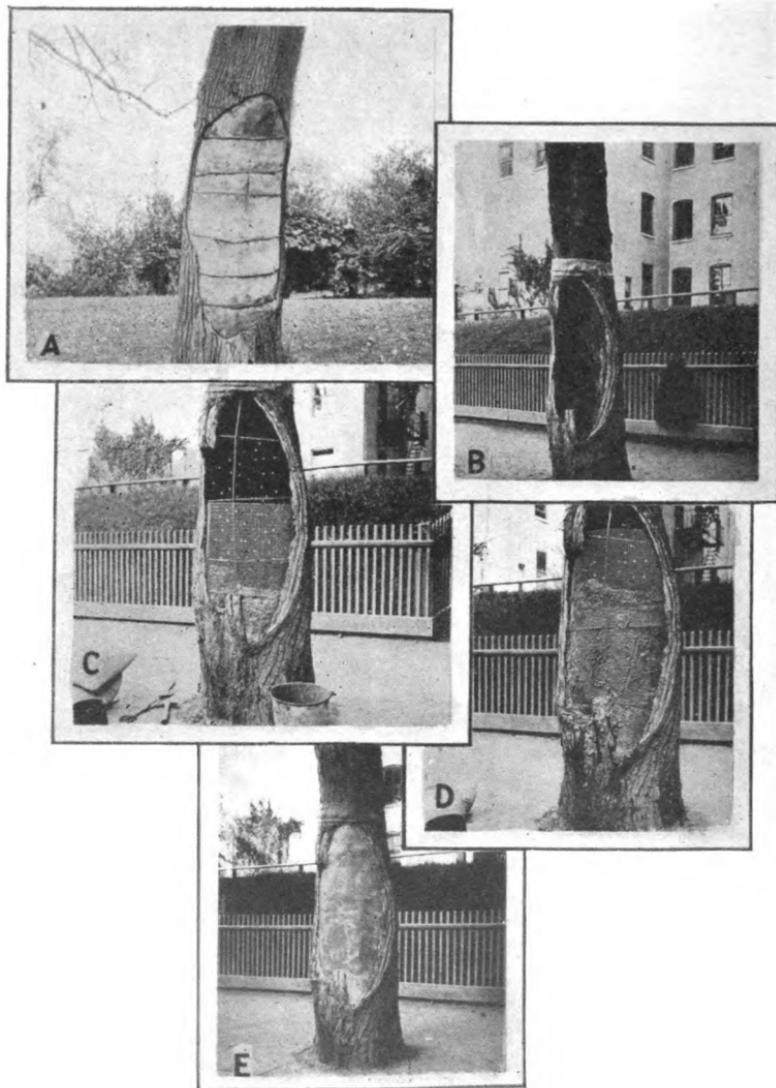


FIGURE 9

Fig. 9-A, above, shows a cavity in a large elm filled with cement with strips of tar felt between the layers. This felt allows the cement to expand or contract, or the tree to sway without

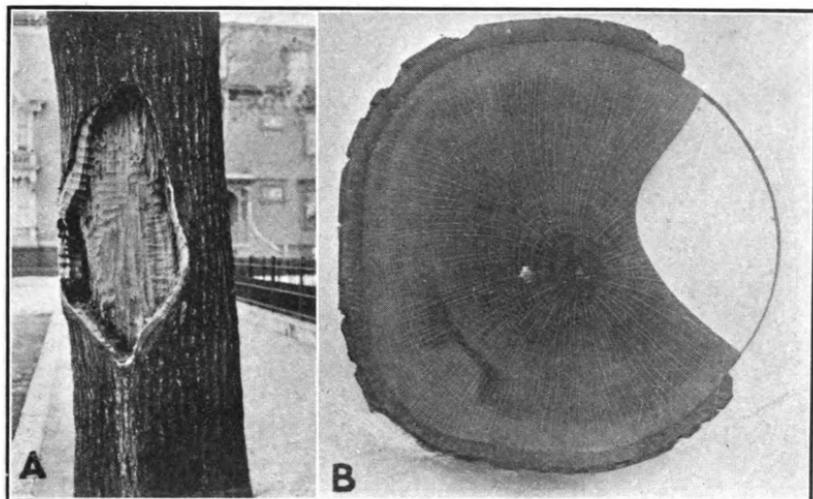


FIGURE 10

cracking the cement. The details of another method of filling are shown in Fig. 9-B-C-D-E. The rods are used to reinforce the filling, while the wire screen is only used as a dam to hold the wet cement in place until it has set. The wire netting is then removed and the cement smoothed with a trowel. Care should be taken that the surface of the filling does not extend beyond the cambium. If the bark or cambium is covered with the cement, growth is apt to continue under the filling. This will force the filling out or crack it.

Good cement and clean sand should be used in the proportion of one part cement to two and one-half parts sand. For very large cavities a mixture of one part cement, two parts sand, and three parts clean gravel or broken stone can be used. A wet mixture will make a better filling than a dryer one, but requires a better means of holding it in place. Strips of burlap wrapped around the tree across the cavity make a very efficient dam. This should not be removed until the cement is thoroughly set. The cement should be kept moist for a few days to prevent too rapid drying out, which is apt to result in the forming of fine cracks.

The cement filling is not waterproof, so a coating of asphalt or tar should be applied as soon as it is dry.

Fig. 10-A illustrates an open, shallow cavity ready for creosote and tar. Shallow cavities of this type are seldom filled.

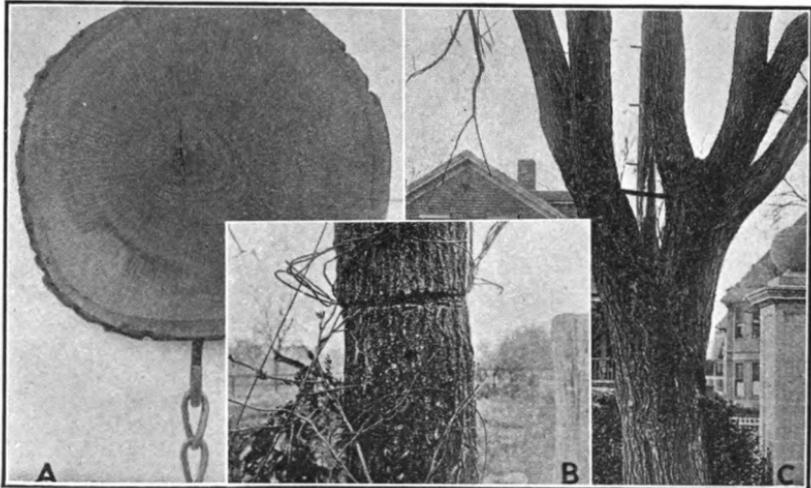


FIGURE 11

Fig. 10-B, page 17, shows the method of covering cavities with sheet metal. Excavate and treat as if for cement, except that bark and cambium should be cut back about one-half inch from the edge of the opening to permit nailing of the sheet metal, which should be painted on both sides. Be sure that



FIGURE 12

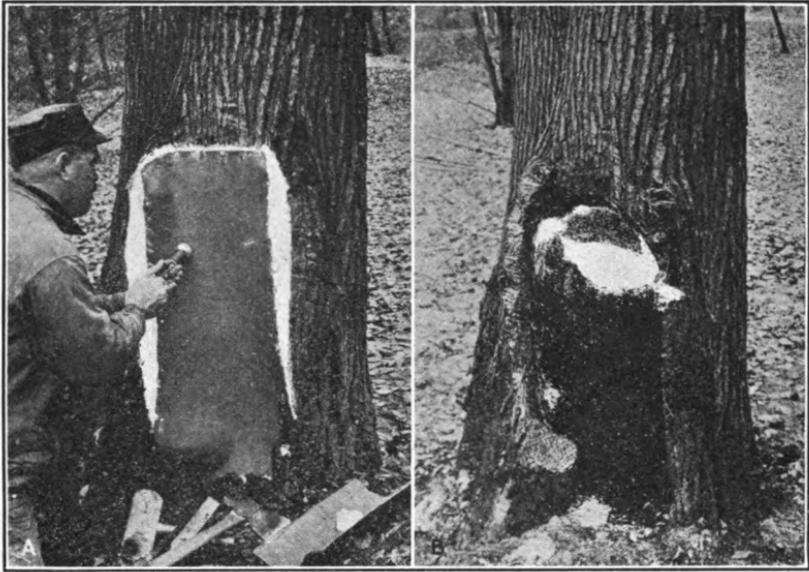


FIGURE 13

the cavity is sterilized and waterproofed before covering. Nail the cover tightly and cover with a coat of tar or asphalt.

Fig. 11-A, page 18, shows a method of attaching a guy chain by means of a hook bolt. The tupelo tree in Fig. 11-B is nearly strangled by the wires wrapped around the trunk. Wire or rope should never be attached to a tree in this way.

The split crotch in Fig. 11-C has been guyed by means of a long bolt about eighteen inches above the crotch. The limbs should receive additional support, as shown in Fig. 12, page 18. The limbs of this elm have been guyed by several independent chains, about fifteen feet above the crotches. This is the best method of preventing split crotches.

In Fig. 13-A the cavity has been excavated and the opening is closed tightly with tar paper ready for the charge of carbon disulphide that is being injected. The fumes of this liquid will penetrate the insect tunnels and destroy the insects. The covering should not be removed for several hours, or the fumes may not reach every insect. Fig. 13-B is the same cavity after filling with cement and coating with tar. The tar prevents the cement from absorbing moisture and forming fine surface cracks, which in time will spread, destroying the filling.



FIGURE 14

Fig. 14-A shows the result of poor work. The cement was put on over the edge of the growing bark. Growth under the cement has cracked it and forced it off. The cavity was not

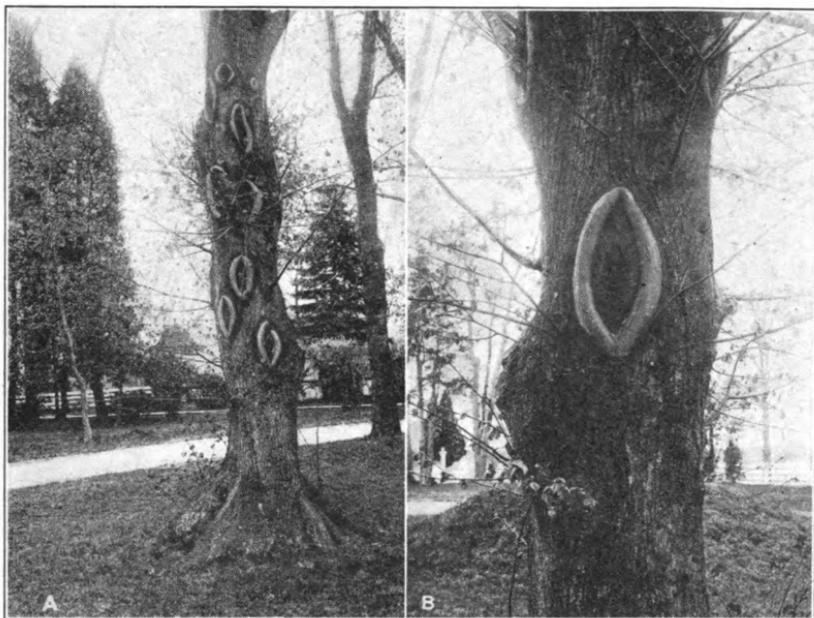


FIGURE 15

properly treated and is badly decayed. Another poor job is shown in Fig. 14-B. The cement covers the bark at the sides and in time will be broken away by the growth of the cambium beneath. The cement shows many fine cracks, which will spread, admitting moisture and disease to the heart of the tree.

The applying of tar or lead paint to wounds as shown in Fig. 14-C-D, would eliminate most of the cavity filling in the future. Care should be exercised to prevent the tar or paint from covering the edge of the bark, as it is apt to retard the healing process. The edge of the bark, as well as the cambium and sap wood, should be protected with a coat of shellac. If this protection is not given, the bark will dry out and shrink away from the edge, leaving a much larger area to be healed over. The paint or tar may cover the whole wound if a previous coat of shellac has been applied to the sap wood and edge of the bark.

The linden in Fig. 15-A has had a large number of limbs removed, so as to open up the view. A black paint has been used on the cuts. The same tree is shown in Fig. 15-B which shows how the scar is covered from the sides by the tree's efforts to form more direct sap passages across the scar.



FIGURE 16

A good example of Nature's pruning is given by Fig. 16. The lower limbs have died because of lack of light. Close planting of city street trees will lead to a similar loss of lower limbs.



FIGURE 17

Forest and Shade Trees

One of our greatest natural assets is our timber land. Its care and utilization have received a vast amount of study in the United States during the past few years.

The pruning needed in forest work consists for the most part in removing dead branches and a careful thinning of the stand of trees. Any tree that is declining in vigor through crowding or from insects and disease should be removed. The removal of undesirable trees would permit the better development of the more valuable trees.

Fig. 17 shows the result of such a thinning and pruning. The brush should always be piled and carefully burned. This will destroy many insects and greatly lessen the fire risk.

Insects and diseases are more apt to attack weak and dying



FIGURE 18

trees; if such are removed, the trees remaining will be better able to resist these attacks and make a better growth.

The stubs shown in Fig. 18-A were left to prevent bleeding where live limbs were removed from the pines. These stubs will be cut close two or three years later. This method also prevents cracked and loose knots in conifers.

Fig. 18-B shows a white pine and Scotch pine plantation properly pruned. Only dead limbs were removed. Note the straight trunks of the white pine.

Many mixed stands of hardwoods will be found to contain

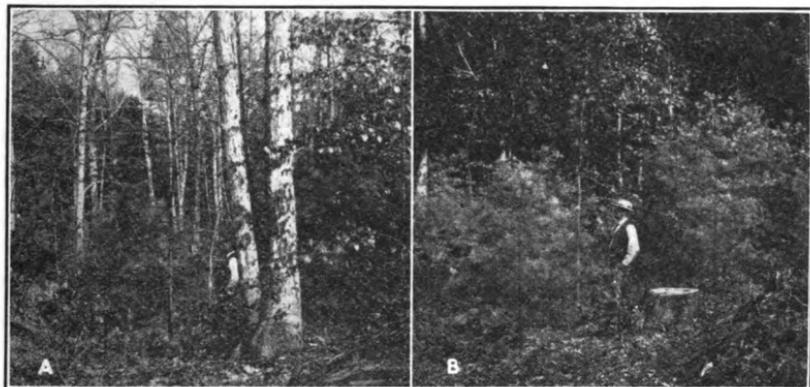


FIGURE 19

good stands of softwoods. Careful harvesting of the hardwoods will result in the harvesting of a second growth of timber at a much earlier date than would be the case otherwise. Fig. 19-A and B shows a stand of this type and the result of a careful harvesting of the hardwoods. The pines are about eight feet tall and will now make rapid growth.

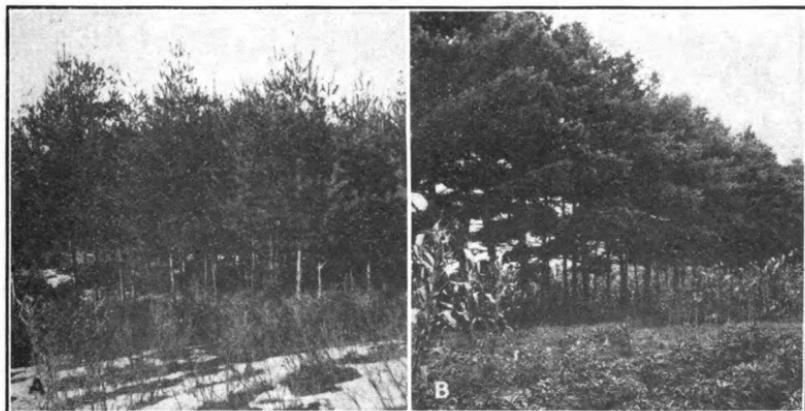


FIGURE 20

The stand of young pines in Fig. 20-A have been pruned too young, as they should be permitted to form as dense a canopy as possible. The white pines in Fig. 20-B have been slightly pruned to produce clean trunks and give air drainage to the crops. Where live wood must be removed, as in this case, the work should be done as shown in Fig. 18-A, page 24.



FIGURE 21

The catalpa plantation shown in Fig. 21 has been pruned to form clean, straight trunks for posts and poles. Care should be used to leave enough limbs to produce abundant leaf surface for maximum growth.

The practice of cutting the tops off at the ground after each year's growth for the first two or three years is often resorted to in order to obtain straight trunks.

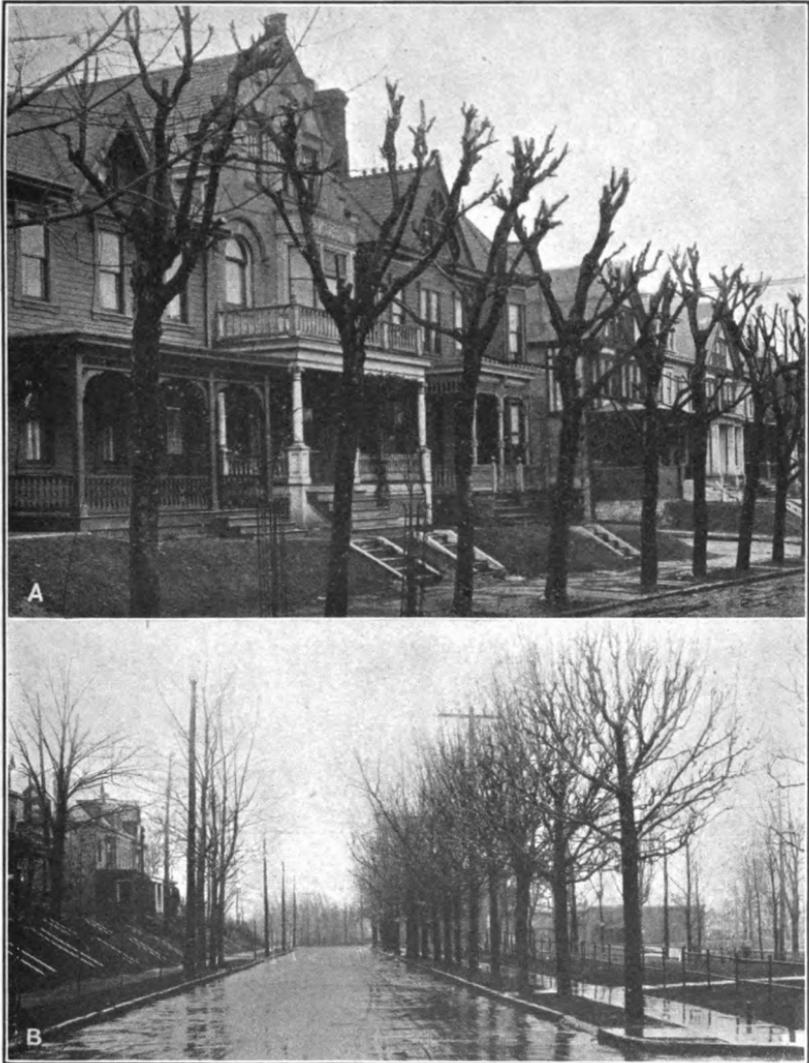


FIGURE 22

When it is necessary to remove large limbs, the wounds must be sterilized and painted, as the catalpa is subject to attacks of a fungus that causes decay in the heartwood of the live trees.



FIGURE 23

Fig. 22-A and B, page 27, shows the effect of continued annual heading back of poplars. (A) After heading back in the spring. (B) Similar trees after a year's growth. Beauty has been destroyed. In time the tree will be filled with a mass of decayed stubs.

The trees in Fig. 23 have been butchered. Judging from the location, the owner wanted small trees. He has made the mistake of planting Oriental Plane trees, which are naturally a strong-growing tree. The mistake is made worse by cutting the trees back in the dormant season, which leaves fewer buds for the roots to feed when growth starts. This will result in a stronger growth. Better results would be obtained by pruning in the growing season. This will check the growth, though the tree would never have a natural form by either method.



FIGURE 24

The trees shown in Fig. 24-A are old soft maples that have been planted too closely and permitted to form long, slender, main limbs, which were apt to be broken by storms. The tops have been removed without regard to form or future growth. No protection was provided for the scars and the trees have been allowed to resume their former faulty habits of growth. In a few years the limbs will be just as tall and straggly as before, with the added danger of cavities at the base of the limbs. Just such a cavity caused the damage shown in Fig. 24-B. Prompt attention to wounds would have prevented decay and the consequent damage to the tree and house.

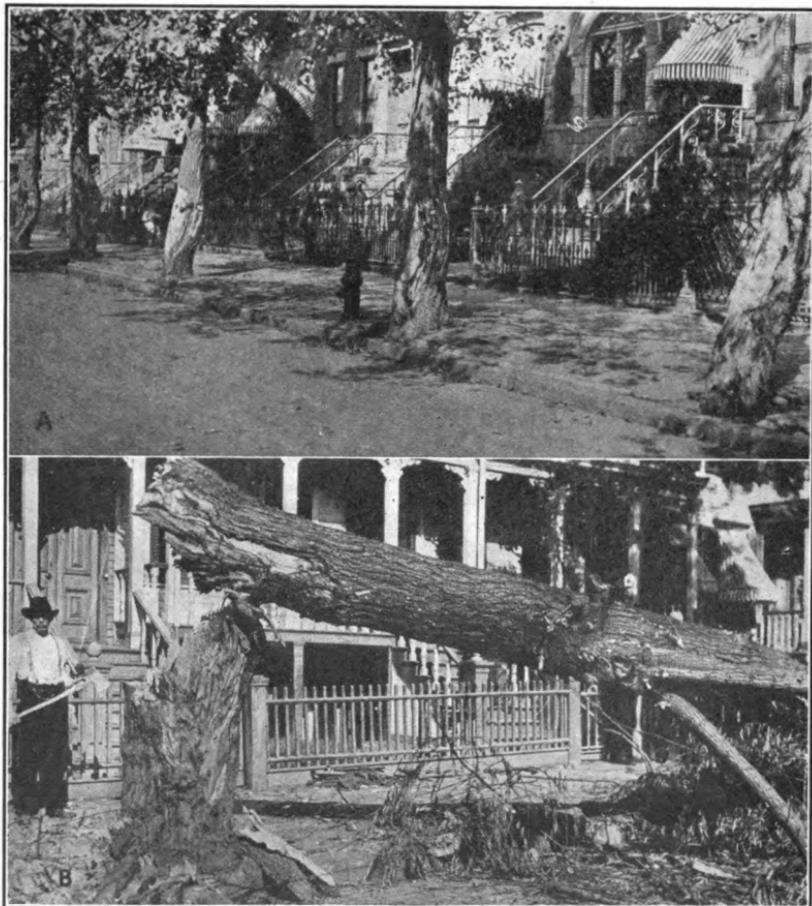


FIGURE 25

The poplars in Fig. 25-A have been damaged by horses that have chewed the bark. This destruction of the bark leaves the wood tissues exposed to decay. This would weaken the trunk and make possible the loss of the tree as in Fig. 25-B.

This damage would have been prevented if proper guards had been placed around the trees. Where such cavities exist and the tree is worth the expense, the proper treatment would be to excavate and treat the cavity as described in the preceding pages. Where cavities are large enough to make the tree dangerously weak, the top should be headed back somewhat.

Nut Trees

Nut trees should be pruned in such a manner as to produce a strong frame and maximum bearing surface. Spraying and harvesting need not be considered, though a tree of too great height is not desirable; such trees are liable to be damaged by wind.

A tree of medium height and natural form with strong, well placed frame, is the most desirable.

The trees should not receive any more pruning than is needed to produce a strong, well balanced head free from diseased or broken limbs.

Large limbs should not be removed except when absolutely necessary and all cuts should be sterilized, and those over one inch in diameter should be painted. Most of the nut trees are subject to fungus diseases.

The Pecans and Persian walnuts are subject to rapid decay unless all wounds are protected until healed.

The same general principles apply in pruning nut trees as in pruning shade trees so far as the framework is concerned.

The Persian walnut should not be pruned in late winter or early spring, since much damage may result from "bleeding."

Care should be exercised in making all cuts, and stubs should never be left in any part of the tree, since decay and possibly the loss of the tree are almost sure to follow.

Proper attention to the formation of a strong framework while the tree is young will well repay all the cost during later years. A careful study of the pruning of young fruit trees as described on the following pages will be of much assistance in this work.

Tree Planting

Many failures in orchard or shade tree growing are directly due to neglect of proper precautions at planting time. Most trees are in good condition when received from the nursery and when received should be placed in proper storage until planting time. One of the best methods is to "heel" the trees in a trench so that the tree roots are protected from the drying effect of sun and wind. The soil should be well packed about the roots and in case the roots have become dried through exposure, a soaking with water will be a great help. The preparation of the soil for planting should be thorough, but will depend largely on the type of soil and the purpose and extent of planting. The time of planting will depend on local weather conditions, though the usual time is as soon as the soil can be properly worked in the spring.

If the trees to be planted are large shade trees, the excavation should be made large enough to receive the roots without cramping, and deep enough to permit the tree to stand from two to six inches deeper than it stood in the nursery row, depending on the size of the tree.

If the trees are small, such as are planted in fruit orchards, the usual method is to plow a deep furrow where a row of trees is to stand and use a spade to deepen the furrow at the points where trees are to be placed.

The trees should not be taken from the trench until there are places prepared to plant them. The trees should be examined before planting and all diseased and stunted ones rejected. Bulletins of the United States Department of Agriculture and the State Experiment Stations, describing the various diseases, should be studied, and all trees showing the symptoms of the disease described should be discarded. A diseased tree cannot develop properly and may infect the whole orchard.

If the tree is a good one the top and roots should be pruned as described later and the tree set so that the roots spread naturally and the soil should be well packed around and between the roots. Good top soil should be used for this and no stable or strawy manure should be used in the excavation. A handful of bone-meal scattered through the soil packed about the roots will help give the tree a good start, but too much decaying vegetable matter in contact with the cut roots may cause trouble.

Great care should be exercised in filling the excavation to insure a thorough packing of the soil about the roots.

Orchard trees should be leaned slightly in the direction from which the prevailing winds come, and after the orchard is set, two or three light furrows should be turned toward the rows of trees. This will help to hold them in place and prevent switching by the wind, which is apt to damage the tender new roots that are forming.

Large trees should be supported by stakes set at planting time.

Shade and ornamental trees may need constant watching during the first summer season, since the greatly diminished root surface is seldom able to secure moisture enough in dry weather to support the top.

The same general principles apply to all the tree growth, and must be taken into account if good results are desired. Vertical growth is more rapid than horizontal, though with less tendency to bear fruit. Pruning during the dormant period is followed by increased growth if not carried to excess, while any pruning during the growing season tends to check the growth. Anything which checks the growth of a tree induces a more abundant production of fruit buds for the following season. Lack of water or nitrates, the loss of branches by storms or pruning, loss of roots or the loss of foliage will all help produce this result, though if carried to extreme will result in the weakening and loss of the tree.

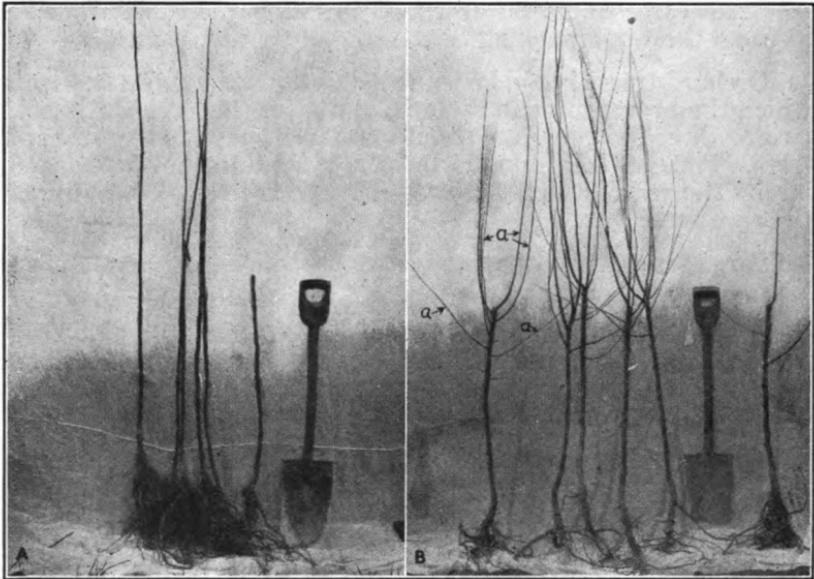


FIGURE 26

Fruit Trees

The first four or five years of the tree's life should be devoted to root and top growth in order that good crops or a good form may be obtained, depending on the results desired. If the tree is for shade or ornament, a well-supported top of pleasing form with a maximum of healthy foliage is the chief consideration. If the production of fruit is the aim, then a very different set of conditions must be considered.

The first few years of a tree's life is a very critical period so far as the pruning is concerned, since a mistake made then becomes more difficult to correct with each succeeding year. The framework formed at this period retains its character and position during the life of the tree, unless there is a loss of limbs through accident or pruning.

The work of pruning should commence at the time the tree is planted. Fig. 26-A shows six typical one-year-old apple trees as received from the nursery. They have made a good, straight growth, free from branches. The pruning of these

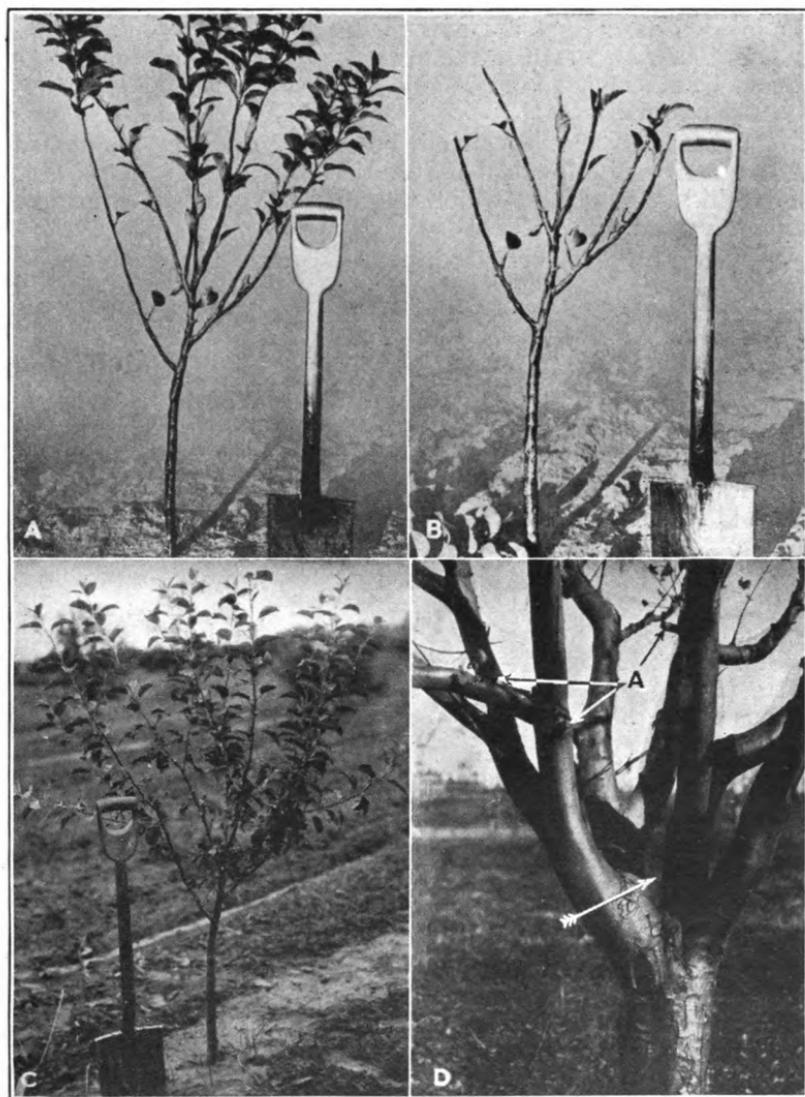


FIGURE 27

trees will be very simple. The roots should be attended to before setting the tree. Any broken or badly bruised roots should have the injured parts removed, and the larger roots should have the ends cut smooth to aid in the healing process. Very long roots should be cut back to correspond somewhat with the length of the other roots.

After setting, the top should be cut off to a point about two or two and one-half feet above the surface of the ground. This determines the point at which the head or crotches of the tree will be formed.

When two-year-old trees are used, such as are shown in Fig. 26-B, page 34, the height of the tree's head has usually been determined by the pruning done in the nursery at the end of the first year's growth.

The laterals (a) grew during the second year. They usually develop better in the open field or orchard than in the nursery row, and this, combined with the lower price, makes the one-year-old tree the best for commercial planting.

After the two-year-old tree is set, three or four of the laterals should be selected as evenly spaced around the tree as possible.

These should be about four to six inches apart in a vertical direction, and should be shortened as shown by the tree at the right. The trees will seldom grow in such a manner as to make this ideal of pruning possible, so the workman should study the habits of growth of each variety of tree he comes in contact with, paying particular attention to the type of crotches or unions made between the trunk and branches. Fig. 27-A-B, page 35, is an apple tree after one year's growth, before and after pruning. The same tree is shown in Fig. 27-C after the second season's growth and pruning. This tree has a tendency to very upright growth, and while the usual framework or scaffold branches have been selected, others have been permitted to remain for a few seasons, so that the permanent branches will make a more spreading growth.

Fig. 27-D shows many stubs (A) and has too many main limbs, which prevent the proper development of fruit spurs inside the tree. As the limbs increase in diameter, they will come in contact at the point indicated by the arrows, which will tend to split the crotch as the pressure increases.

The tree in Fig. 28-A-B has been pruned so as to leave two sets of main limbs, one above the other. The upper set will soon become the dominant one, and unless suppressed by pruning will soon shade the lower limbs, causing them to weaken and die.

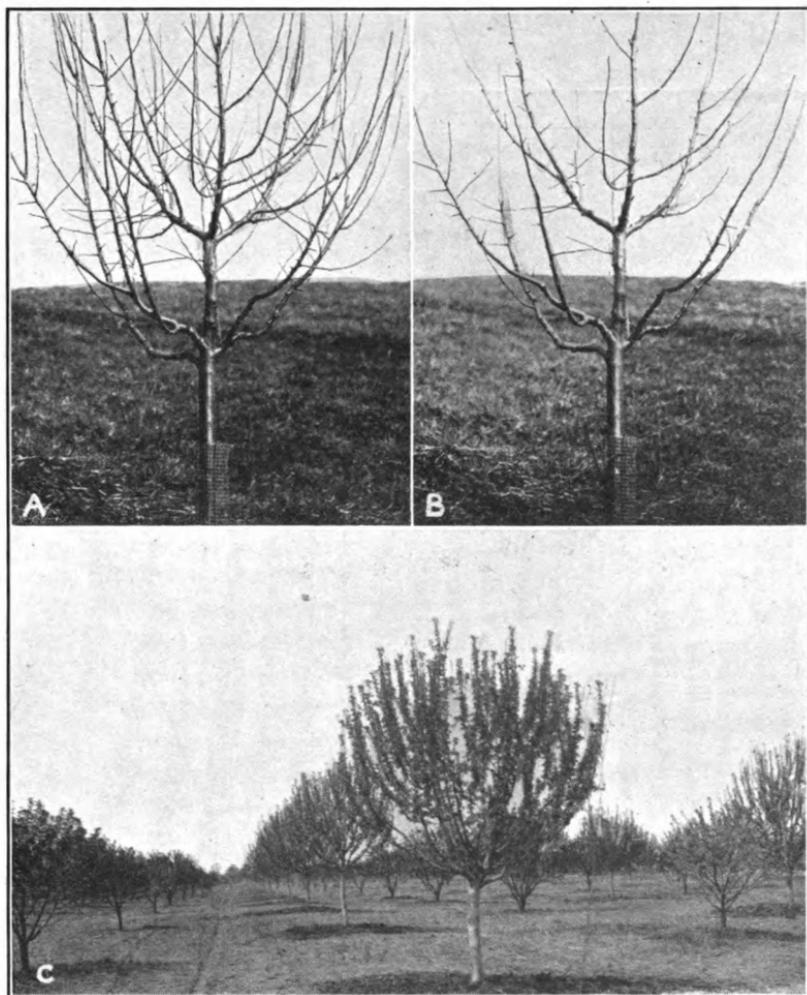


FIGURE 28

Most of the trees in the orchard shown in Fig. 28-C have too many limbs starting at or near the same point. This will not leave enough room for them all to develop and will result in the growth of slender branches.

The four-year-old Rome Beauty apple trees in Fig. 29-A, page 38, show a very decided tendency to upright growth.

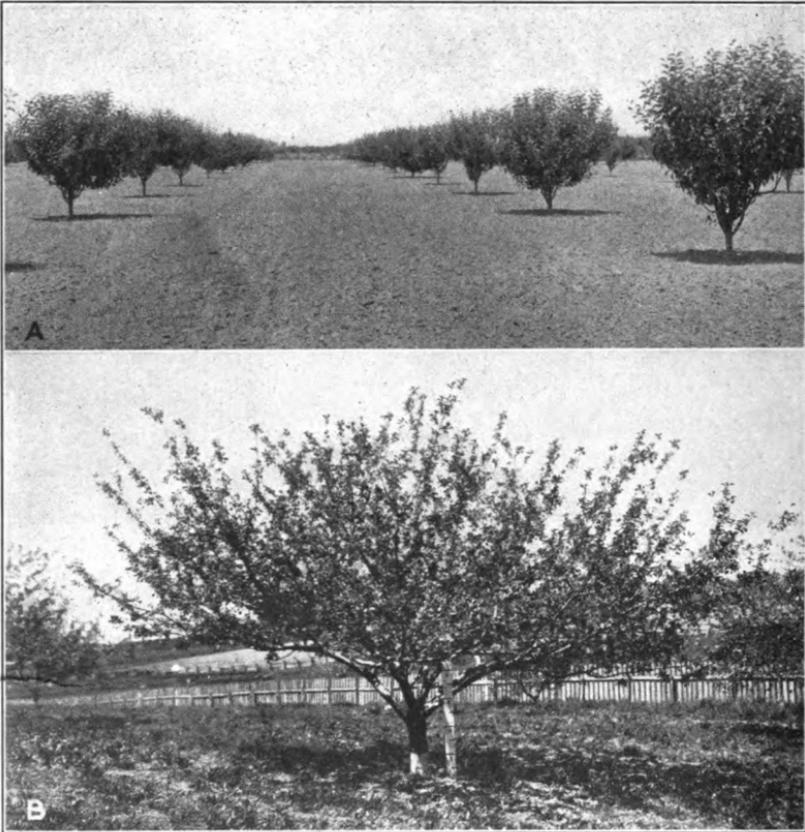


FIGURE 29

One or two good crops of apples will cause the limbs to spread and leave the center of the tree more open. The tendency of this type of tree is to develop a fruiting area outside and under the axis of the main limb, causing the limb to bend away from the center of the tree. Study the tree in Fig. 29-B and note the horizontal development of the main limbs, and the fact that the most of the load of fruit will be above the axis of the limb which will have a tendency to twist. The limbs are also more apt to be injured by teams and tools.

The tree in Fig. 30-A-B, page 39, has a good form, but is making too strong a wood growth to need such severe dormant pruning. The tree would come into profitable bearing much sooner

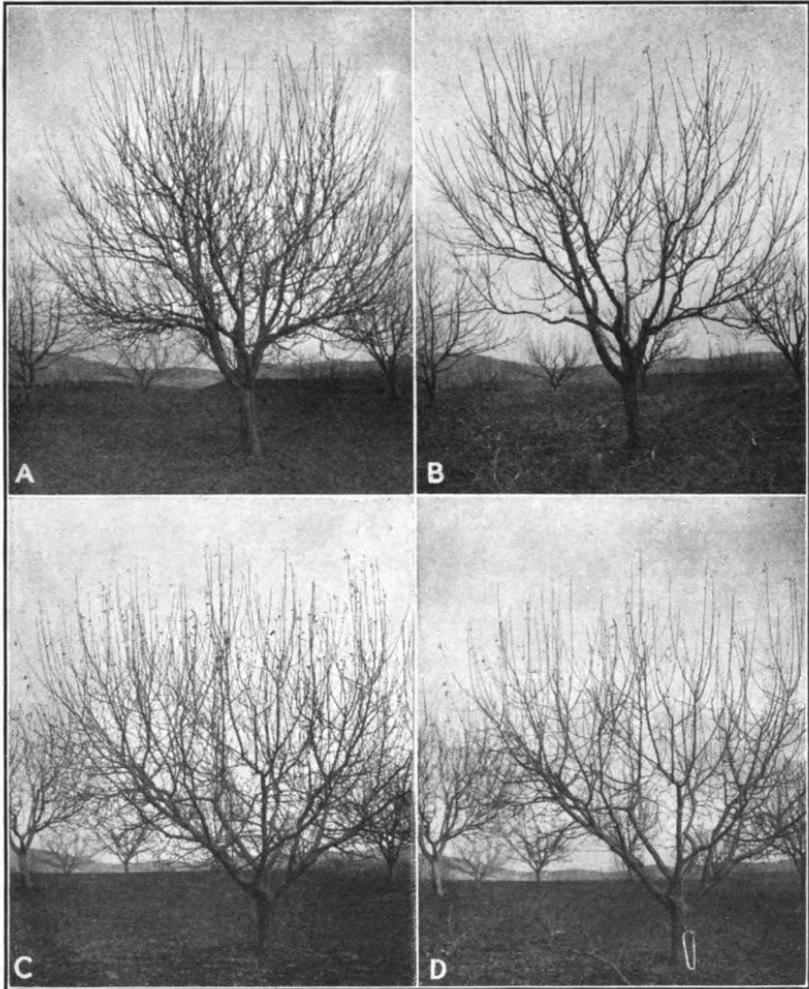


FIGURE 30

if some of this pruning were done during the growing season, which would check wood growth and favor the development of fruit buds. Too many of the twigs have been removed from the lower part of the tree, leaving long, bare branches.

The tree in Fig. 30-C and D has developed its main branches at an angle of about forty-five degrees, which is about as wide an angle as is desirable.



FIGURE 31

The orchard shown in Fig. 31-A is a very good example of what can be done by intelligent work in a commercial orchard. Note that the main limbs have been given plenty of room to develop lateral branches.

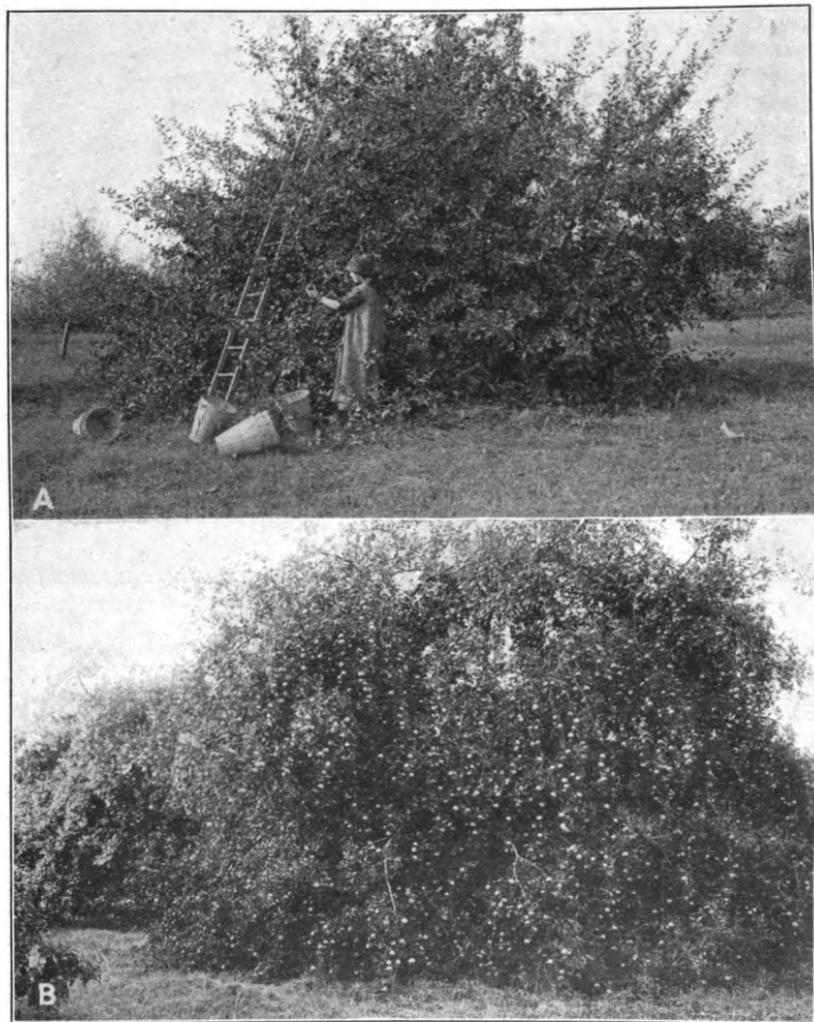


FIGURE 32

Fig. 31-B, page 40, shows a row of Jonathan apple trees. These trees are about fifteen years old, and are well branched and open enough to admit the sunlight so much needed by this variety to give it color.

The apple usually produces its fruit on spurs or twigs that are one or more years old, and these twigs should not be pruned

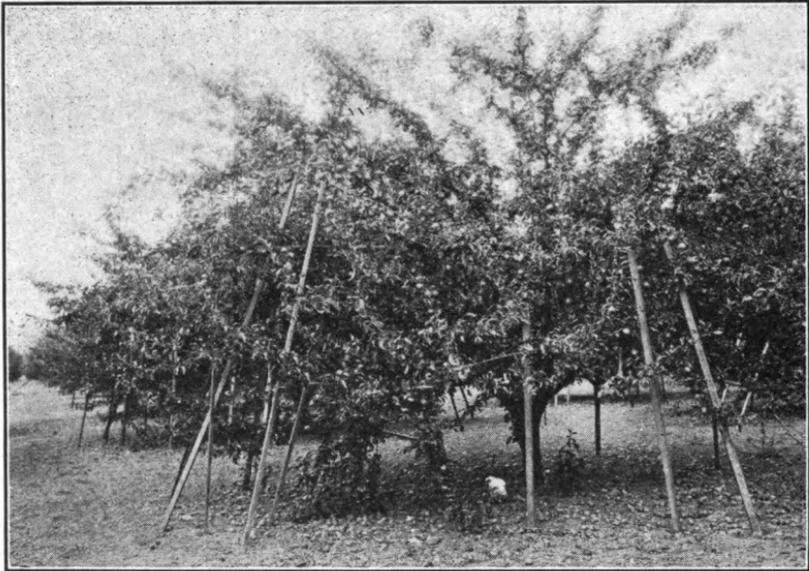


FIGURE 33

off, even though they appear on the larger limbs. Fruit spurs on the larger limbs should be encouraged by keeping the top of the tree thin enough to admit sunlight to the center of the tree.

The trees in Fig. 32-A and B, page 41, are two excellent arguments in favor of low-headed trees. The leaves have been stripped from the tree in Fig. 32-B to show the even distribution of fruit.

The fruit from such trees can be gathered with comparative ease, as most of it can be reached from the ground or short step-ladders. Since the harvesting of the fruit is one of the largest single items in the cost of production, it would be wise to consider it at pruning time and so shape the tree as to bring the bulk of the bearing surface as near the ground as practical. Objection is made by some to such low limbs, claiming that they make cultivation difficult. This can hardly be termed a serious objection, since any cultivation that might be done near the trunk of trees of this size would probably do more damage to the large roots than it could do good to the tree as a whole, and extension disc-harrows and smoothing-harrows would reach a considerable distance under the low limbs without doing damage to any part of the tree.

Note that the tree has been so trained that the load of fruit is carried outside of and under the axis of the main limbs.

The twelve-year-old *Esopus* apple tree in Fig. 33, page 42, could be made self-supporting by shortening the branches, but this would also reduce the fruiting area of the tree. The props are a good solution of the problem where the required labor and material is available.

EXPERIMENTS IN SUMMER PRUNING

The summer pruning of the apple tree has received very little attention in most of the commercial orchards, though there are some fruit growers both in the East and the West that are getting good results in improved color and quality through careful summer pruning. The following quotations from Bulletin 98, of the University of Idaho Agricultural Experiment Station, give the results of careful experiments with summer pruning covering a period of three years:

"The primary object of the experiment was the determination of the effect of winter *vs.* summer pruning upon the yield and color of the fruit. In order to study the problem, the orchard was divided into two blocks. The trees of one block were pruned in the winter time and those of the other were pruned in the summer.

"The trees have been so developed that they will produce a good quality of fruit and at the same time ample wood to bear good crops without the aid of artificial supports. All the trees were pruned to the open or vase-shaped type.

"Approximately the same amount of wood was removed in each case.

"The summer pruning was done after the terminal buds had set.

"The work was performed at this time because the trees have practically finished their growth for the year.

"If the summer pruning is done before the trees have ceased growing, adventitious buds will push out below the cuts, which results in a growth of shoots. On the other hand, if pruned too late in the season, no opportunity is given the buds to swell into fruit buds, which is one of the objects sought by summer pruning.

"1. The data presented in this bulletin on winter *versus* summer pruning of apple trees, shows the results secured under the two methods for a period of eleven years. The object of the experimental work was to test the value of winter pruning compared with summer pruning as measured by yield and color of fruit. There were four varieties—Jonathan, Rome, Grimes and Wagener, and seventy-four trees under observation.

"2. The nature of the pruning and the amount of wood removed each year from both blocks were practically the same.

"3. The average terminal growth in the summer-pruned block in 1916 was 15.4 inches; in the winter-pruned block 14.02 inches; a difference in favor of summer pruning of 1.38 inches.

"4. The measurement of the height and width of all trees in both blocks at the close of the season's growth in 1916, shows that summer pruning, with most varieties, checked the wood growth slightly.

"5. Taking the diameter of the tree trunks as a basis for judging vigor, we find that the trees are somewhat larger in the winter-pruned block. The difference, however, is practically insignificant.

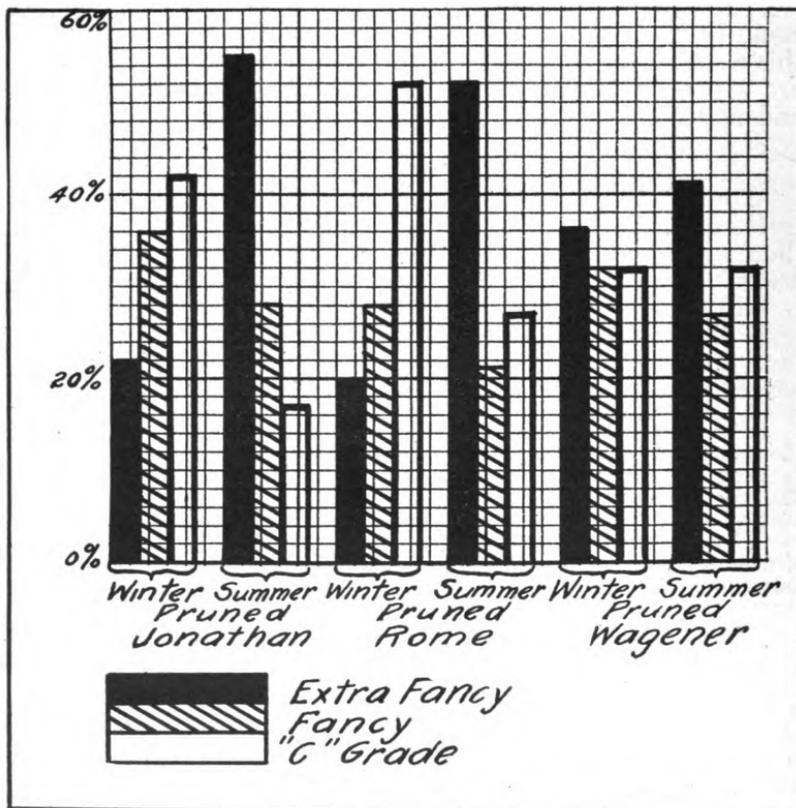


FIGURE 35

"6. With some varieties, summer pruning has hastened the bearing of young trees and increased crop production.

"7. The evidence shows that thinning has a direct relation to pruning and crop production.

"8. On the basis of the total production for the first seven crops, summer pruning has produced the greater yield in all varieties. The average annual increase per tree for each variety was as follows: Jonathan, 5.17 pounds; Rome, 8.37 pounds; Grimes, 7.22 pounds, and Wagener, 40.98 pounds.

"9. With all red varieties of apples under experimentation the color was intensified as a direct result of summer pruning.

"10. The crop value per acre as determined by both color and yield shows an average gain in the three summer-pruned plats over winter pruning as follows: Jonathan, \$52.33; Rome, \$53.64, and Wagener, \$30.69."

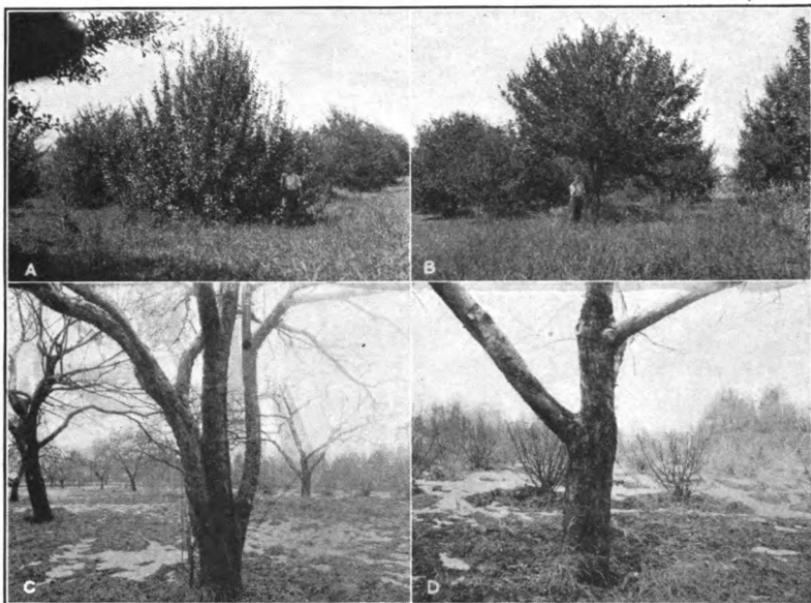


FIGURE 36

The trees in Fig. 36-A and B are examples of very low and very high headed trees. These trees are about the same age, and the tops are about the same size. The low-headed tree is forming a second series of branches in the center of the top, which should be removed before it becomes too dominant. The high-headed tree is a badly formed tree in many ways. It has a high head that is expensive to prune, spray, or from which to harvest. It also has a very bad formation of the main branches. This type of tree will later develop into just such a tree as is shown in Fig. 36-C, with its weak crotches and long, bare limbs.

The older trees are our best sources of information on many things. Early mistakes are emphasized and the value of good care in the early life of the tree is clearly shown.

Fig. 36-D shows some very good crotch formation. The greatest fault this tree has is the lack of low limbs. This is an expensive type of tree to harvest fruit from, since most of the crop must be reached by the use of ladders.



FIGURE 37

Fig. 37 shows trees that are typical of most of the neglected orchards. The younger trees (Fig. 37-A) are still vigorous, but are too high and dense and are beginning to interfere with each other. The lower limbs will die and decay, with results similar to those shown in the older trees, Fig. 37-B.

The trees in Fig. 38-A have been well pruned, though in some sections with less sunlight they would need to be thinned a little to admit more air and light. This orchard is in Indiana.



FIGURE 38

A very fine tree is shown in Fig. 38-B. This tree has had all the room it has needed for its development. The trees in the background are too close, and as a consequence are forming high and unprofitable tops, while the more valuable bearing wood near the ground is becoming shaded and weak.

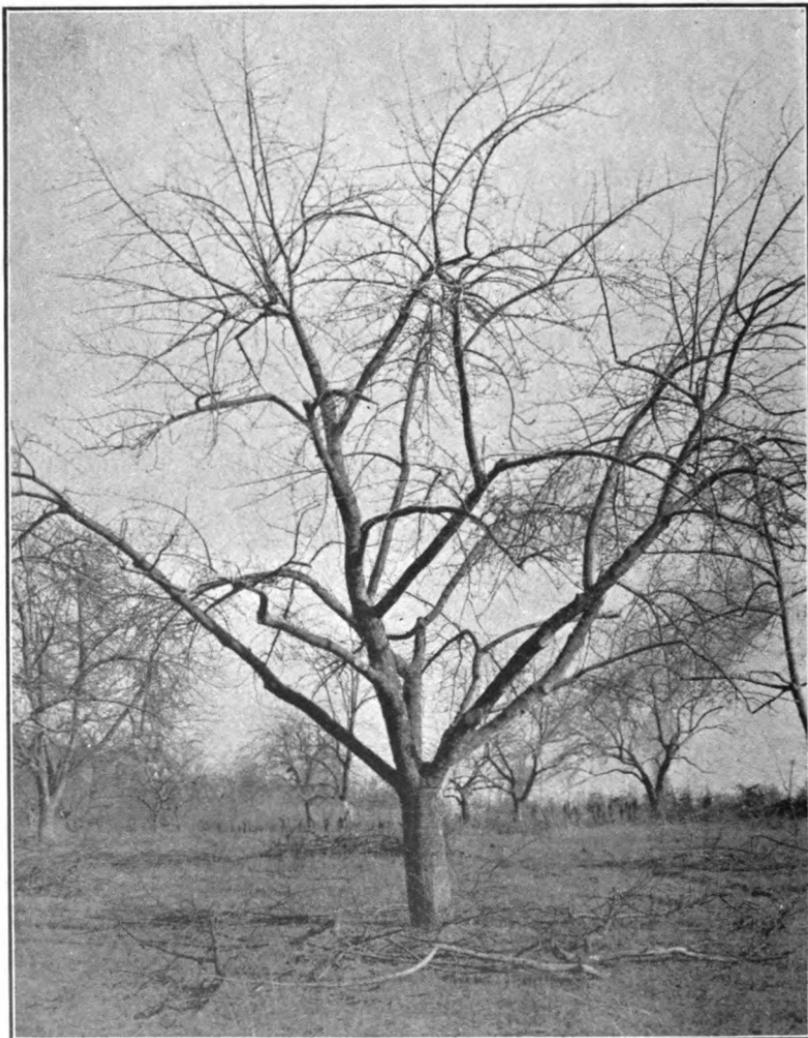


FIGURE 39

The first step in renovating a neglected tree is shown in Fig. 39. All of the dead wood has been removed and some of the live branches have been thinned out. The wounds should be treated to prevent decay and induce early healing. There are a few stubs in the upper part of the tree that should be removed, since they will either die back, causing a larger wound,



FIGURE 40

or they will send out a number of sprouts that will grow at the expense of the more valuable parts of the limb. If the thinning out of the live limbs calls for the removal of very much live wood, the heading in or lowering of the upper limbs should be deferred till the next year.

The heading in or dehorning of trees that have developed limbs above the point where harvesting can be done with profit is a problem that faces many in the pruning of old orchards.



FIGURE 41

Very good and very poor jobs of this type are shown in Fig. 40-A and B. In the first case, the cutting has been done in such a way that the general form of the tree has been preserved and there is abundant bearing wood to produce a crop the next season. All the cutting has been done just above laterals, thus leaving wounds that will heal quickly. The second job is just plain tree butchery.

The tree in Fig. 41-A-B needs some of the upper limbs removed, but owing to its vigorous condition and the large



FIGURE 42

amount of live wood removed in the thinning process, any further cutting should be deferred until the next pruning season.

Fig. 41-C, page 50, shows the result of too close planting. The lower limbs are being weakened by lack of air and sunlight.

The orchard in Fig. 42-A has been ruined by the removal of the more valuable lower limbs. These lower limbs can never be replaced.

Fig. 42-B illustrates the unsanitary condition of many farm orchards. Such neglect helps the spread of insects and disease,



FIGURE 43

prevents proper cultivation, and makes the other orchard work both unsatisfactory and dangerous.

The chief function of a fruit tree is to produce crops of fruit. This demands a strong frame, in order that maximum crops may be borne without injury to the tree. Careless pruning is practically certain to lead to the formation of cavities at vital points in the tree, as shown in Figs. 43-A and 43-B. These cavities form very soon in apple trees, therefore every step should be taken in the proper treatment of all wounds.

The scar shown in Fig. 43-C is properly made and protected. If it is kept protected, the new growth will soon cover it and prevent infection in the future.

Three forms of tree guards are shown in Fig. 44-A, B, and C., page 53. These are useful in sections where trees are subject to

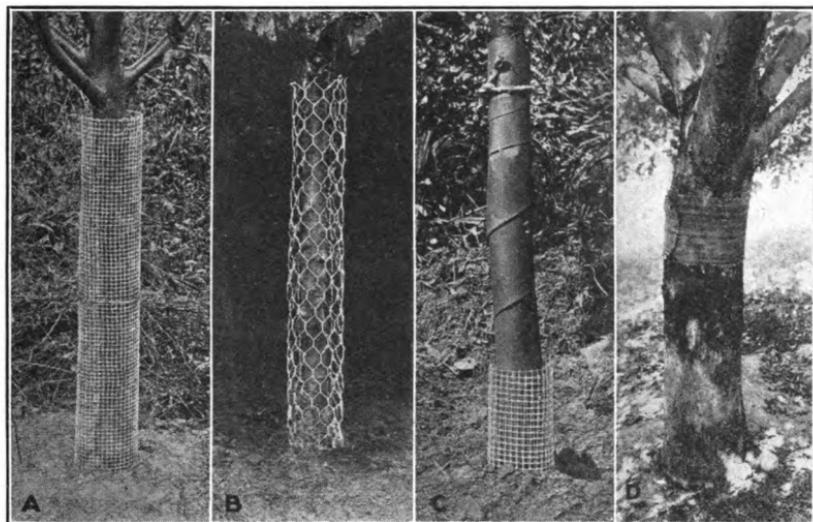


FIGURE 44

attacks by rabbits. Fig. 44-D shows a band under which codling moth larva may hibernate, making it a little easier to find and destroy them. The most efficient method of combating this

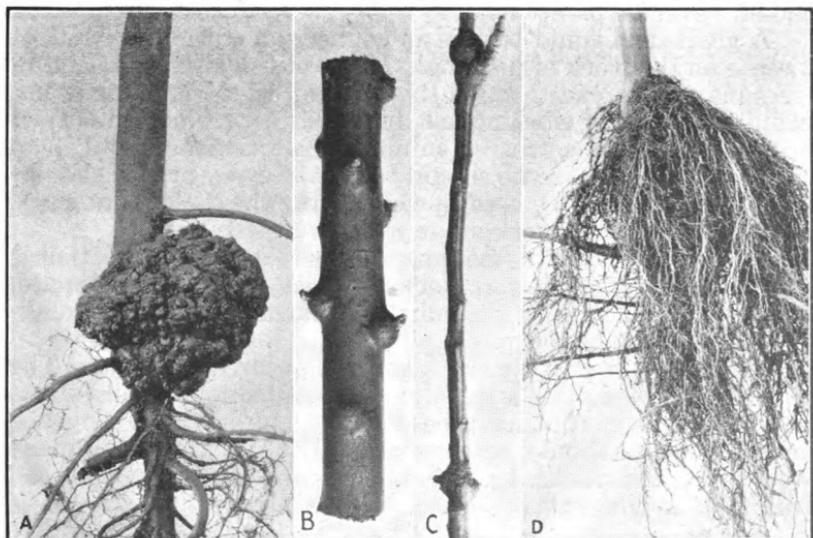


FIGURE 45

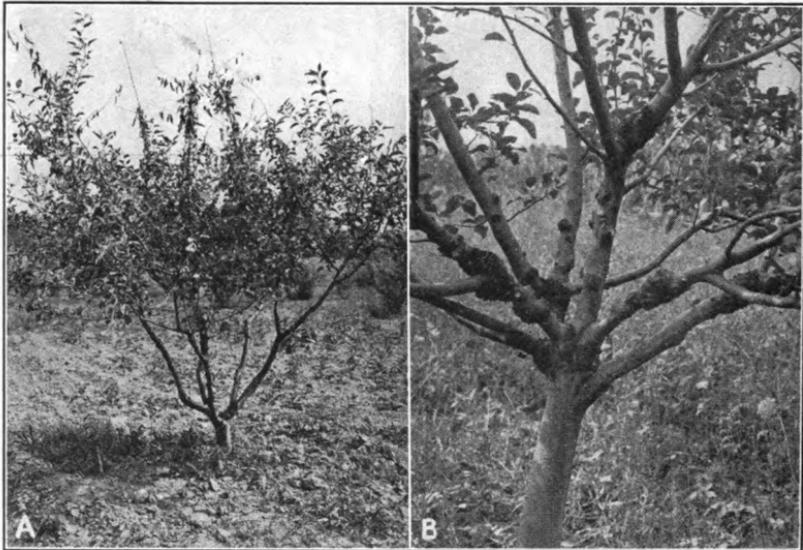


FIGURE 46

pest is proper spraying of the tree. Fig. 45-A, B, C, and D shows various forms of hairy root of the apple. Such trees should never be planted.

A great deal could be said in connection with the effects of disease on the work of pruning. Many of the diseases affecting trees may be spread through the orchard by the careless use of pruning tools after working in a diseased tree. A large-mouthed bottle containing corrosive sublimate solution of about 1 to 1000 strength and a swab should be part of every pruning equipment. This should be used in disinfecting the tools at intervals and especially after working on a diseased tree.

Trees vary in their resistance to disease. This variation is influenced by many factors, such as variety of fruit, the climate, soil, density of the foliage, cultural treatment, weather conditions, and insect attacks.

The tree shown in Fig. 46-A has been injured by blight. The progress of the disease is rapid, and the infection usually starts in growing twigs that have been injured by insects. Any diseased branches should be removed. The cut should be made well below the diseased portion. This disease may be spread from tree to tree unless the tools are disinfected.

Fig. 46-B shows the injury caused by the woolly aphid. The tree will outgrow this defect if the insect is controlled, otherwise

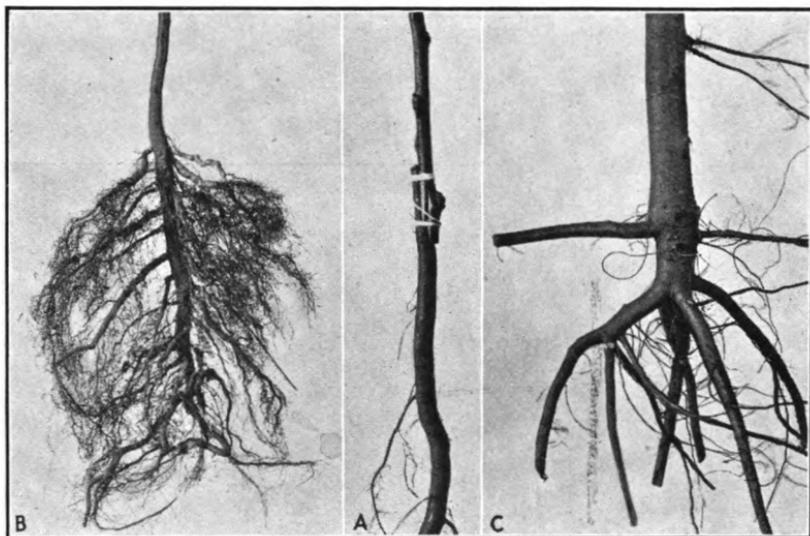


FIGURE 47

the limbs will become weak and unable to produce good fruit. The commercial fruit tree of today is produced by one of two methods: the grafting of a scion from a tree of the desired variety on a hardy seedling, or by inserting a bud, taken from the proper variety, in a slit made in the bark of the stock. After the bud starts growth, the portion of the stock above the bud is removed, permitting the new shoot to form the top of the tree. Fig. 47-A is an apple scion grafted on a seedling root. The scion has been tied in place and is ready to be waxed and planted. The wax is applied to the joint, and prevents the tissues becoming dry, which would prevent growth.

Fig. 47-B shows a similar tree after one year's growth. This is the ideal tree to plant under most conditions, since there is a better chance for the top to develop in the field than in the nursery row.

The tree shown in Fig. 47-C has grown for two years in the nursery since being grafted. Most of the roots were left in the ground when the tree was dug. This calls for a correspondingly heavy pruning of the top at planting time.

Any shoots or suckers that start from below the point where the tree was grafted should be removed at once. If the tree is not planted deep enough to prevent these sprouts from forming, there will be constant trouble. All trees should be set four to six inches deeper than they were in the nursery row.

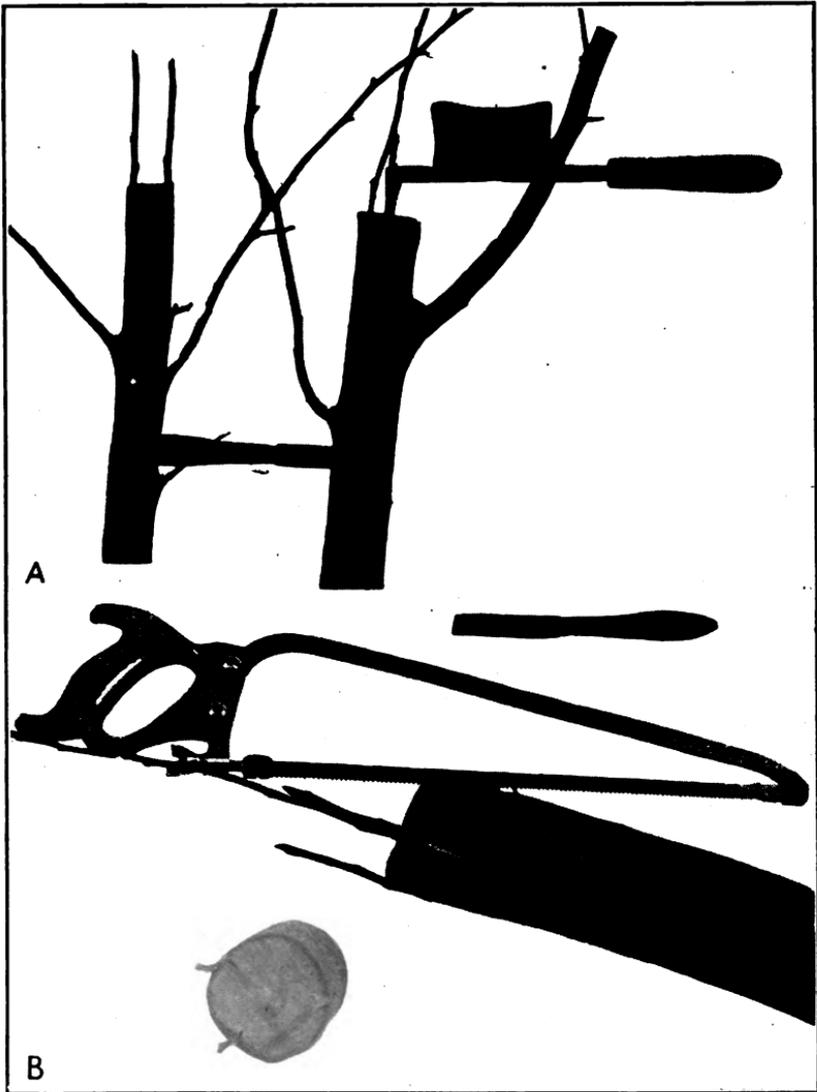


FIGURE 48

Apple trees that bear undesirable varieties of fruit may be top grafted to any variety wanted, provided the tree is in a healthy growing condition. The work should be extended over

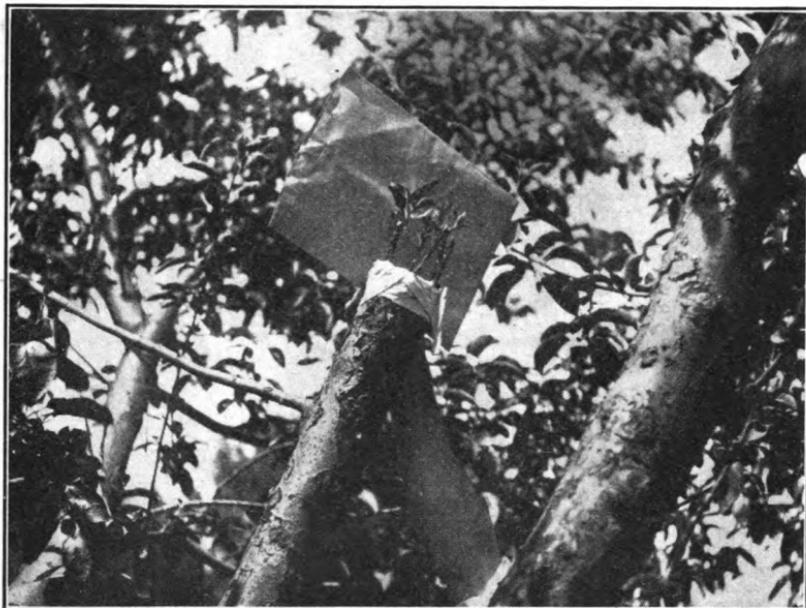


FIGURE 49

a period of two or three years, since the tree would be too severely checked if all of its leaf surface were to be removed at one time.

Two methods of doing this work are shown in Fig. 48-A and B, page 56. The cleft graft method shown in the upper illustration is good if the branches are small. The limb should be cut off with a saw at the point where the grafts are to be inserted. The grafting tool is then used to split the limb and the wedge is used to open the cleft enough to receive the scion, which should be cut in the form of a wedge and inserted so that the cambium of the scion comes in contact with the cambium of the limb as much as possible. The second scion should be inserted in the opposite side of the cleft in the same manner, and the cut surfaces and the stub should be covered with grafting wax and wrapped with strips of cloth to prevent drying of the tissues until healing commences. Kerf grafting differs only in the way the limb is prepared to receive the scion, a saw being used to cut a notch instead of splitting the limb. This offers less chance for decay to enter.

Fig. 49 shows the scions after growth has started, as well as the way in which the wrappings should be applied.



FIGURE 50

Fig. 50 shows a large apple tree before top working and after half of the branches have been grafted. The other branches may be grafted the next year.

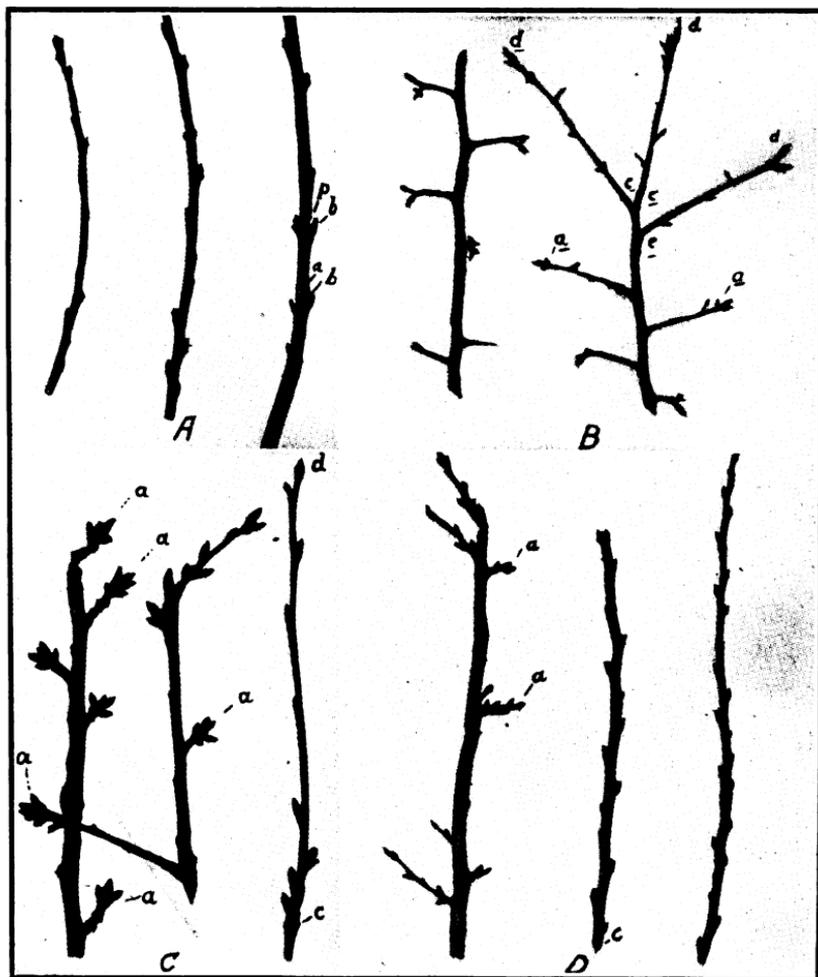


FIGURE 51

Fig. 51-A shows the fruit buds of the peach which are formed on either side of the leaf buds on wood of the current year's growth. Fig. 51-B shows the fruiting habit of the plum, while that of the cherry and apricot are shown by Figs. 51-C and 51-D. These fruits set fruit buds on both the current year's wood and on fruit spurs. It is important that this be remembered at pruning time.

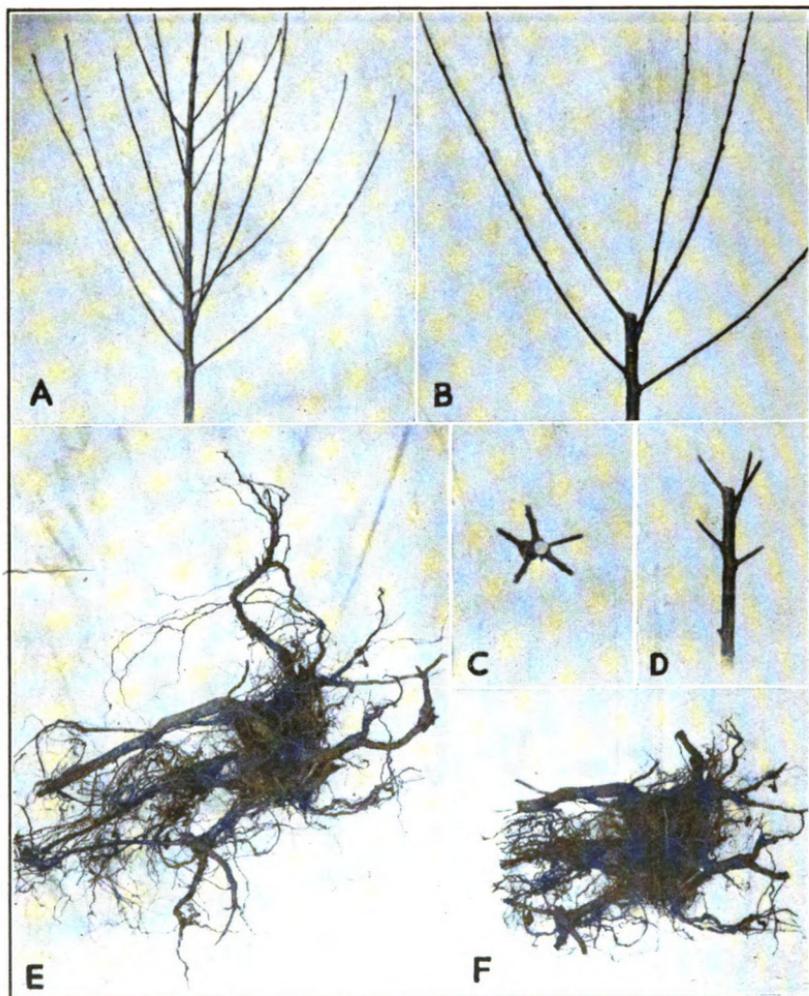


FIGURE 52

The peach tree, like the apple, should be carefully pruned at planting time. Only one-year-old trees should be planted. Fig. 52 shows the various steps in the pruning of a typical peach tree. The head should be formed about eighteen inches above the ground. Where possible, several nicely placed laterals should be left as shown in Fig. 52-B; these should be cut short, as in Fig. 52-C-D. The roots need attention, as

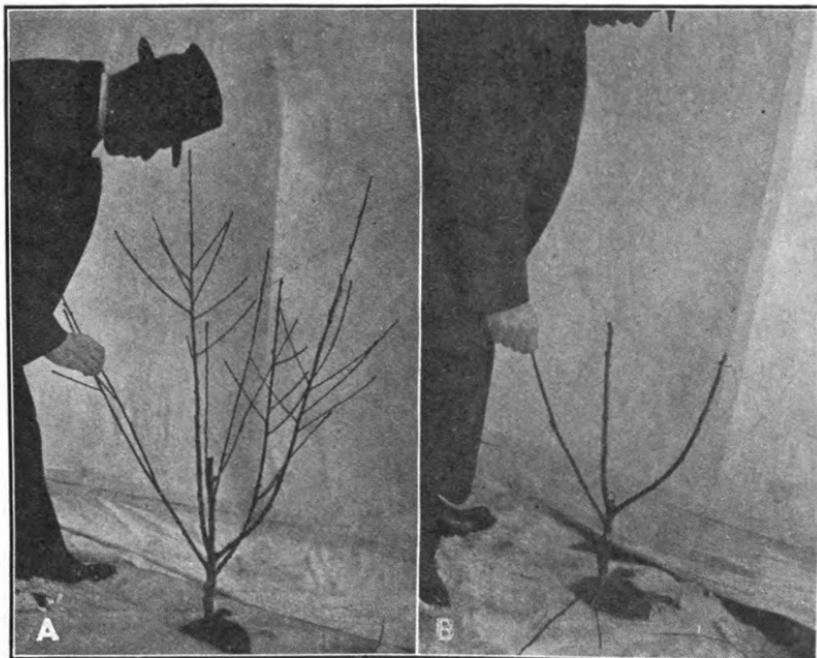


FIGURE 53

indicated in Fig. 52-E and F, page 60. Borers should be looked for just above the roots. Their presence is usually indicated by the presence of gum or sap on the surface of the bark. If any are found, they must be dug out to prevent further damage.

The tree should be watched during the first season, and any undesirable sprouts rubbed off, permitting the more desirable shoots to develop unhindered. Aside from this, the tree should not be pruned during the first growing season.

Fig. 53 shows the pruning of a one-year-old peach tree. This tree was pruned to a straight stalk or whip when planted, and seven branches have started from it at various points. It may be noted that the lowest branches have made the strongest growth. This is generally true of all peach trees, therefore, if it is desired that the head be formed at a certain point, all branches starting below that point should be removed as soon as possible.

The average tree under ordinary culture may be pruned as severely as the one in Fig. 53, and should make a strong, healthy growth the following season. Trees that are apt to make very



FIGURE 54

strong growth because of cultural conditions or variety should be pruned like the tree shown in Fig. 54. The branches have been left somewhat longer, and some of the lateral twigs have been retained, so that the next season's growth will be more widely distributed.

These lateral twigs should always be tipped; that is, a few inches of the tip should be removed, which eliminates the weak buds and permits the more mature buds to continue the growth in the spring. It may be noted in Fig. 54 that the branches did not start from the top of the tree, but from a much lower point. The stub should always be removed close to the top lateral as shown, so that the wound may heal properly.

Fig. 55-A, page 63, shows a peach tree after the second season's growth. This tree has been making good growth, and should produce a good crop of fruit the next season. Enough of the small branches or laterals having fruit buds on them are left to carry this crop. Care should be taken to have these laterals well distributed, so that air and light may have free access to all parts of the tree.

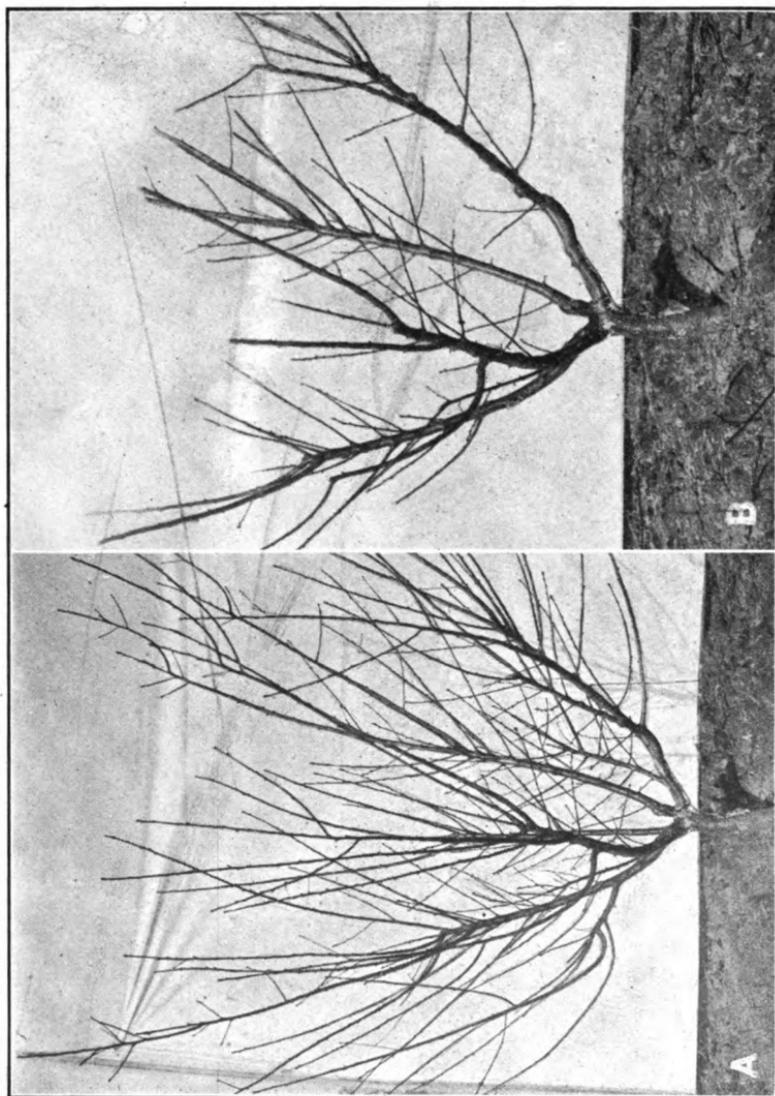


FIGURE 55

This tree was too severely cut back, but not thinned out enough after the first season's growth. If only three instead of six branches had been retained, and the three been pruned as shown in Fig. 54-B, a much better type of growth would have been secured.

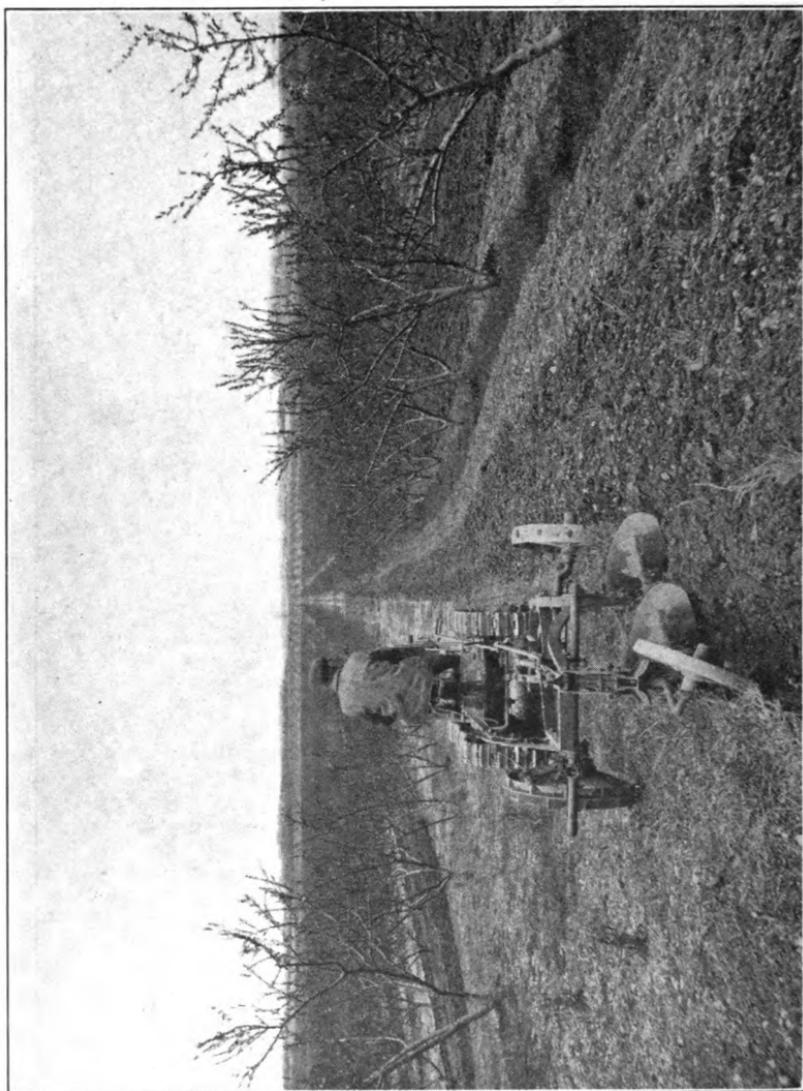


FIGURE 56

Fig. 56 shows a typical commercial orchard at the beginning of the fifth year's growing season.

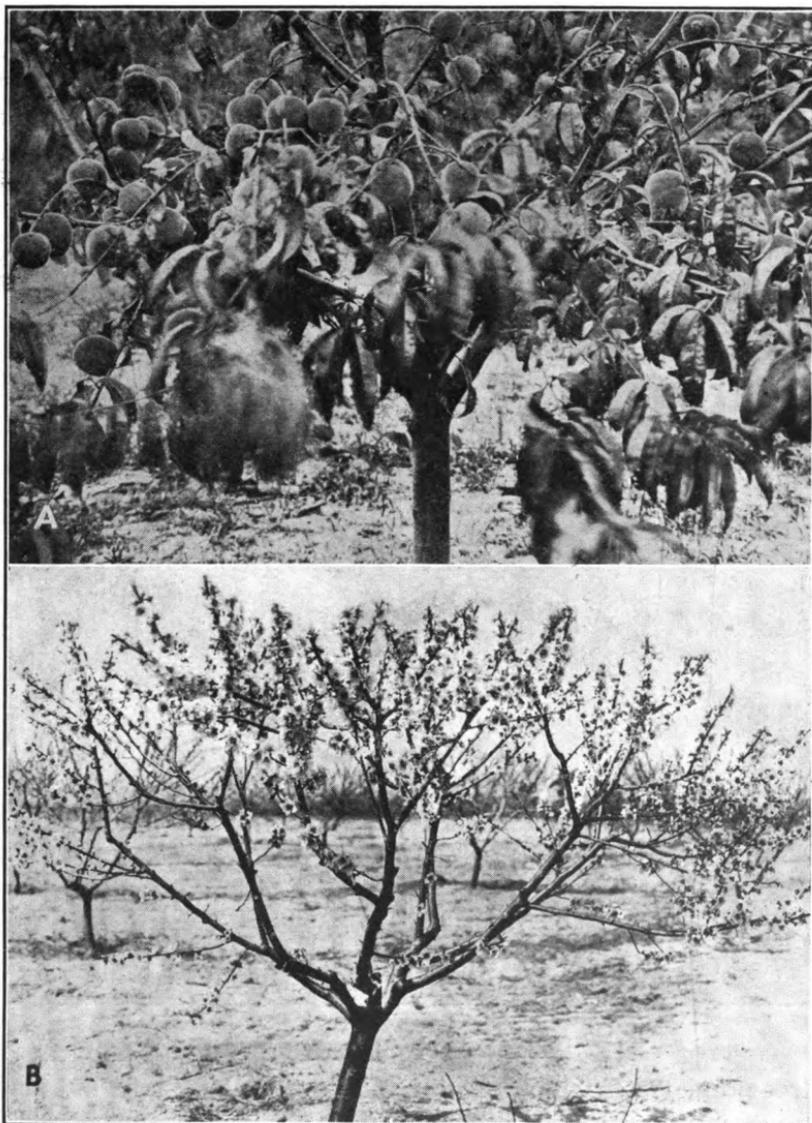


FIGURE 57

The tree in Fig. 57-A has had the leaves stripped to show the good set of fruit in the lower part of tree. This low-bearing wood has been lost through faulty pruning in the trees shown in Fig. 57-B.

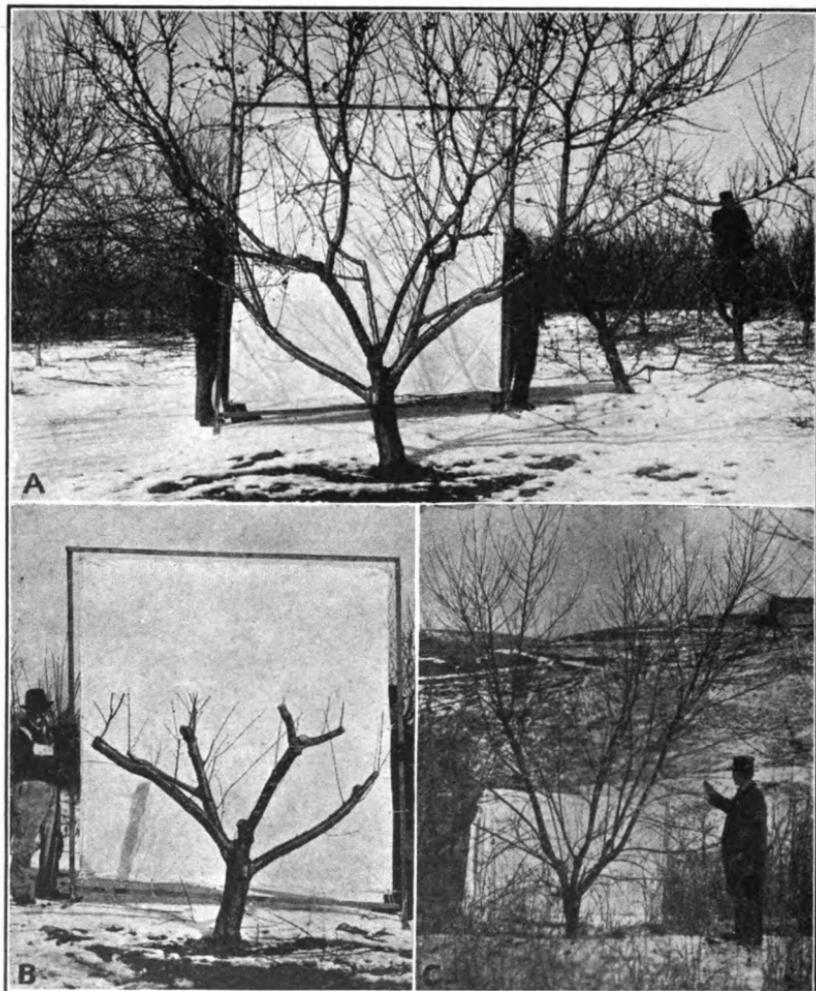


FIGURE 58

Fig. 58-A shows an advanced stage in the development of a tree pruned as in Fig. 57-B, page 65; that is, headed in but *not* properly thinned out in the top to provide for the multiplying of the branches. The tree has lost nearly all of its low-bearing wood through being shaded by the dense growth above. A proper thinning of the upper part of the tree would have permitted enough sunlight to reach the lower growth for the proper devel-

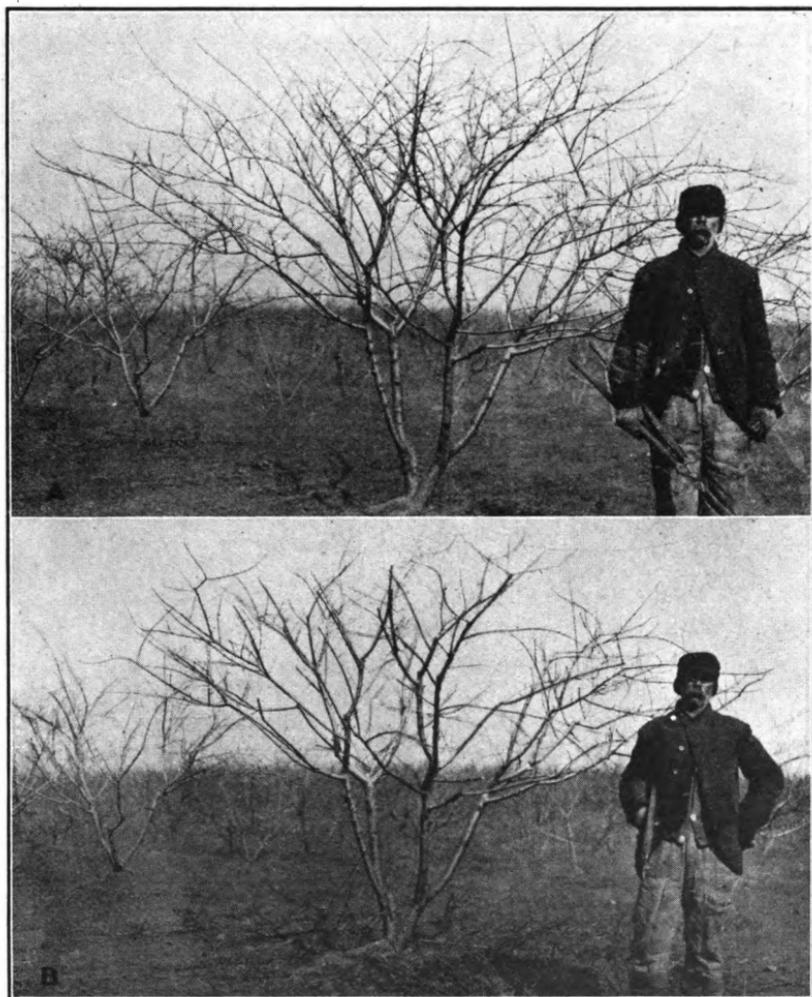


FIGURE 59

opment of good fruit. The severe pruning shown in Fig. 58-B, page 66, was given in order that a new low head might be secured. Such treatment is also given after winter injury, but otherwise need never be called for if the earlier pruning is properly done.

The tree in Fig. 58-C was pruned after the first season's growth and then permitted to make three year's growth without further pruning.



FIGURE 60

The tree in Fig. 59 has been well pruned, though it is in need of more thinning unless it is growing in a very sunny locality.

The advantage of an open, low head is quite apparent at harvest time. The trees in Fig. 60 are easy to cultivate or spray, and the fruit may be reached easily from the ground or from short ladders. The sunlight is able to reach all parts of the tree, insuring a better development of the foliage, and fruit having finer flavor and color than could be expected from trees as dense as those shown in Fig. 61-A and B, page 69. Sunlight is essential to the development of good flavor and color in fruit of any kind, and the admission of sunlight to all parts of the tree should be kept in mind when pruning a fruit tree.

The trees shown in Fig. 61-A and B are growing in Eddy County, New Mexico, and have retained their vigor in spite of their dense tops because of the good soil and abundant sunlight. They were ten years old when photographed. Most of the bearing wood is in the top of the tree, which makes harvesting difficult.

The forming of a low head does not insure a low top, as may be seen in Fig. 61-C. This tree has a low head, but the main branches have been stripped of their low laterals, leaving the bearing surface of the tree very high.



FIGURE 61

The pruning of all the stone fruits does not vary much from the treatment called for by the peach. They all should be so pruned that the tree will make a healthy growth each year without becoming too dense, or too large. This will mean a systematic cutting back and thinning of the growth each year,



FIGURE 62

With the exception of the cherry, which is the largest of the stone fruit trees, a large size is seldom attained before the tops show signs of decline and the tree attempts to send out new growth near the trunk.

The plum is very apt to set more fruit than it can properly mature, and small fruit, weakened trees, and increased decay are the result unless the fruit is thinned when about half grown. Fig. 62 shows a well-pruned Burbank plum tree. The fruit is being thinned.



FIGURE 63

The plum trees in Fig: 63 have very well placed limbs, though the tops are too thick for the best development of the fruit.

Apricots and prunes need the same general treatment as the peach and plum.

The cherry needs careful pruning every year. The open head is the best form for most sections, since the fruit requires an abundance of air and sunlight for the best development and freedom from disease.

A sweet cherry tree will form long, slender branches unless careful heading back is practiced during the early life of the tree. Most sweet cherries are upright in their growth, and care should be taken to prevent them from becoming too high. Both sweet and sour cherries will bear good crops on their lower limbs if the tops of the trees are kept open and low. It should be remembered that the harvesting of the cherry crop is a tedious and expensive operation, and that broad, low heads will bear the most profitable crops.

The sour cherry is more spreading in its growth than the sweet cherry, and is apt to form a dense top. Unless the top is kept open, the lower limbs soon become weak and die.

Pear trees are upright in their habit of growth, and have a



FIGURE 64

tendency to form a top that is too thick. Some growers have tried to overcome the upright growth by heading back the vertical shoots, as has been done for several years in the case shown in Fig. 64-A, with the result of forming very stiff, upright branches that become so crowded that fruit will not develop properly.

The trees in Fig. 64-B have been headed in closely the first two years and then allowed to grow without cutting back, except to keep the tree in good form, the chief attention being given to thinning out the branches so that they would have abundant room for development. These branches will be bent outward with the heavy crops of pears, and will need attention during the growing season or they will become overloaded and break. After harvest the branches will be apt to retain their horizontal position. This will check their growth and induce them to set heavy crops of fruit. If too many pears are set on a limb, the leaves will not be able to supply enough food and the fruit will be small and of poor quality.

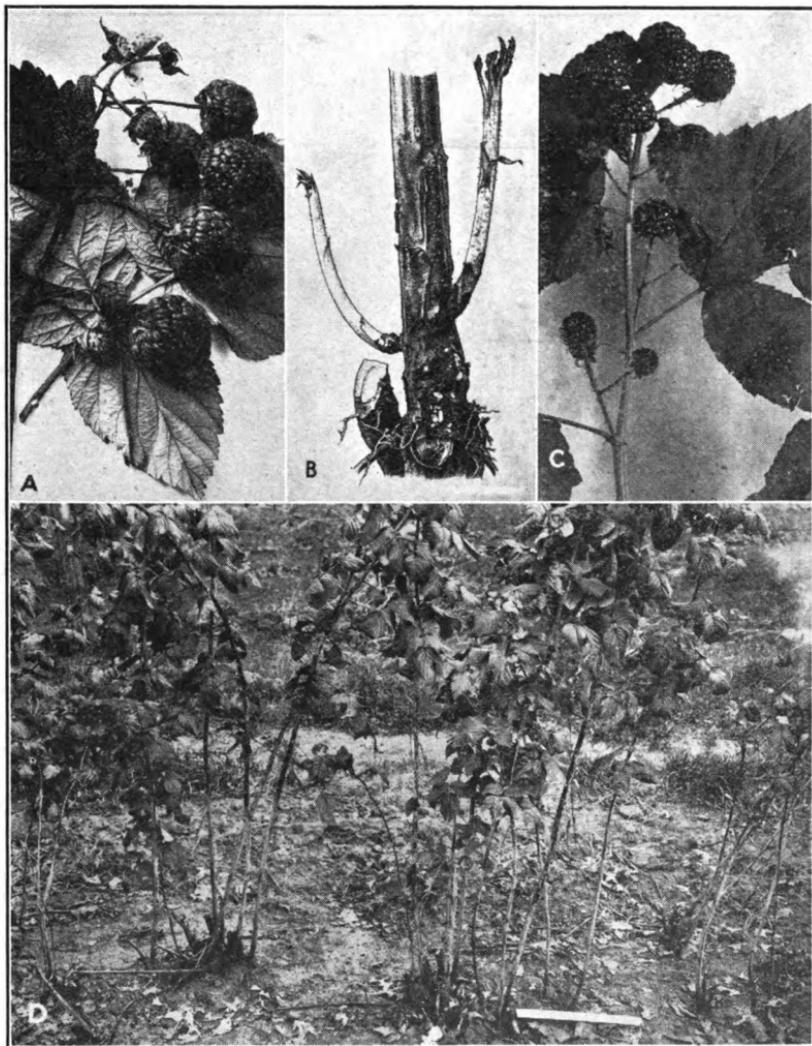


FIGURE 65

The pruning of the raspberry is a very simple though tedious operation. The plants send out new shoots each year from the base of the plant, as shown in Fig. 65-B. These shoots bear fruit the following season. The fruit is borne on the end of short laterals, as shown in Fig. 65-A and C, which grow from

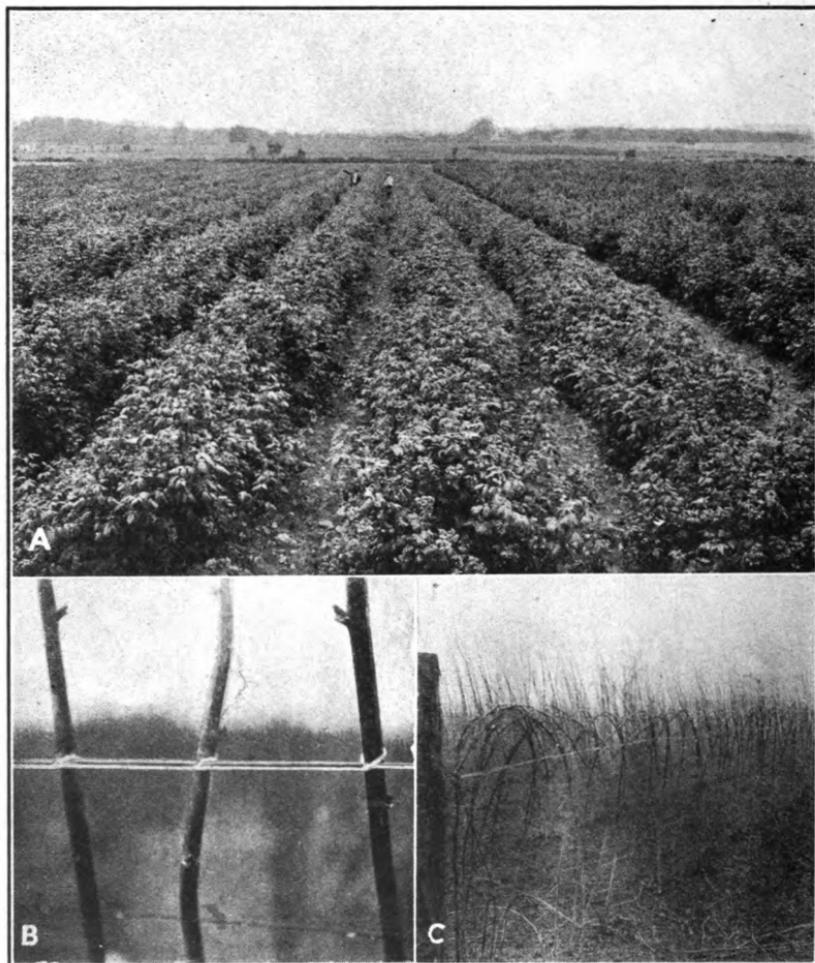


FIGURE 66

buds on the one-year-old canes. These canes die after one season's fruiting, and should be removed immediately after harvest.

Fig. 65-D, page 73, shows raspberry plants with the old fruited canes removed and the new canes which will bear the next season.

The raspberries shown in Fig. 66-A are being grown under the hedge system. The canes are not given any artificial sup-

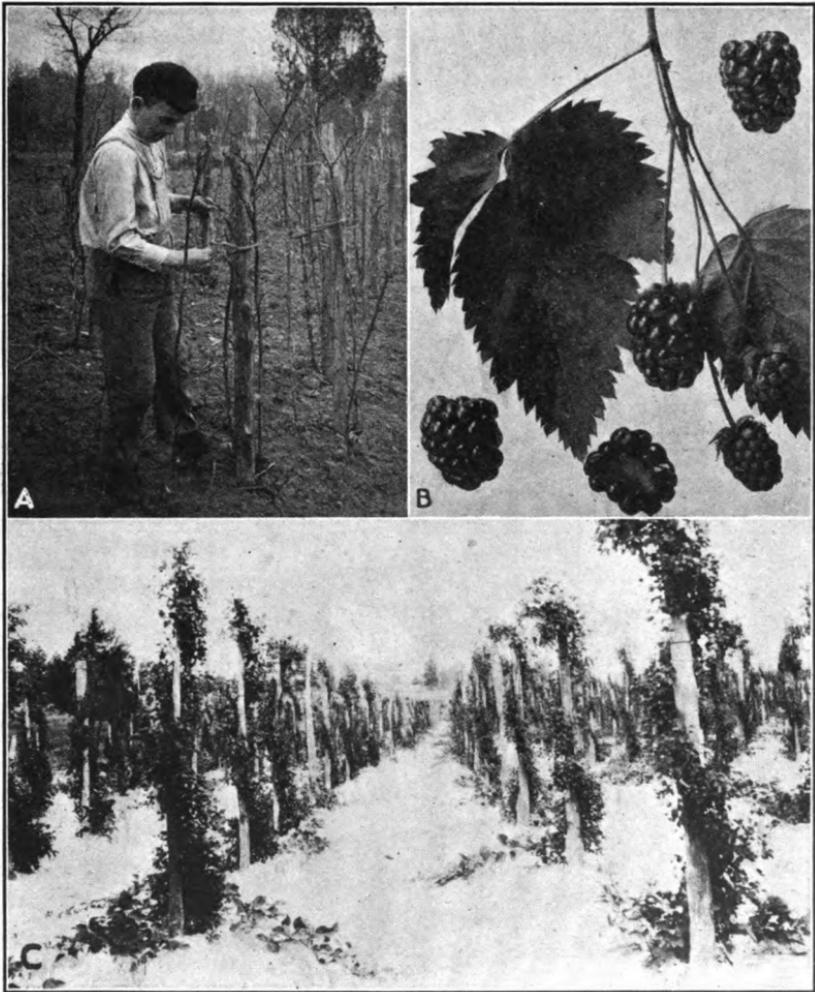


FIGURE 67

port. This is not advisable where the canes make over four feet of growth.

Two methods of supporting the canes are shown in Fig. 66-B and C, page 74.

The old canes that are removed after fruiting in the summer should be burned.

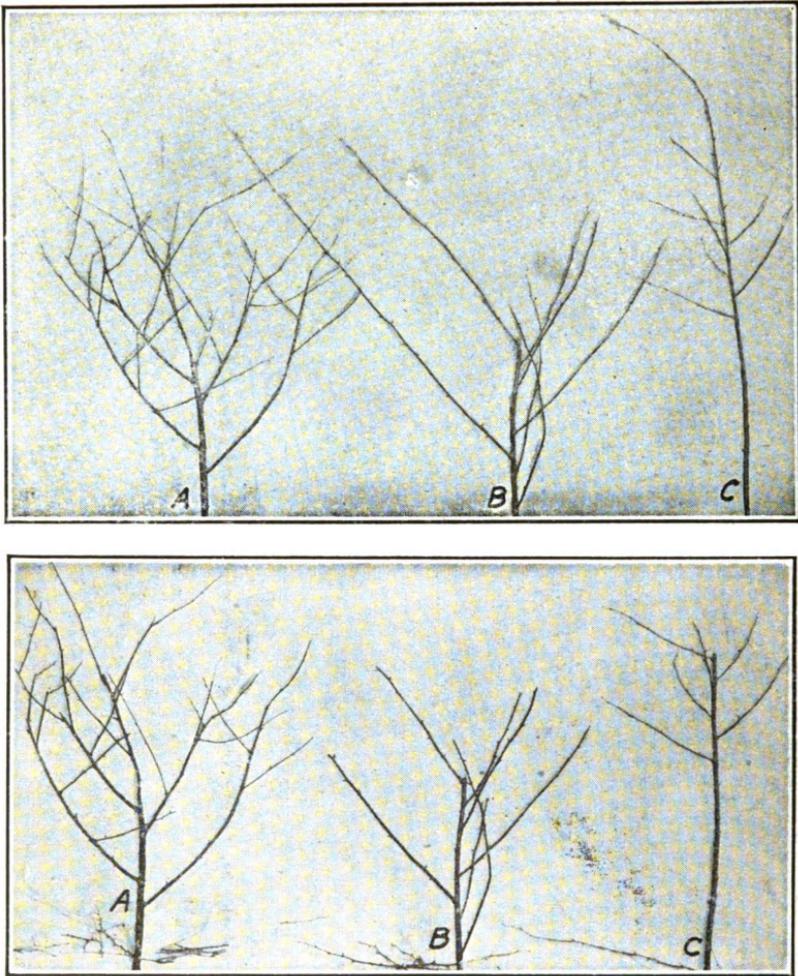


FIGURE 68

The canes should be cut back to healthy wood in the spring, and all weak or diseased canes removed. The canes may be tied in place at this time and will need no further pruning until after fruiting.

Fig. 67-A, page 75, illustrates the supporting of the canes with stakes. A fruit spray of the dewberry is shown in Fig. 67-B and



FIGURE 69

the method of supporting the fruiting canes in Fig. 67-C. The new canes for next year's crop may be seen trailing on the ground.

The dewberry may be tied to wires, but since the canes are so small, and easily bent and broken, the stakes make the best support.

The pinching back or heading in of the raspberry canes

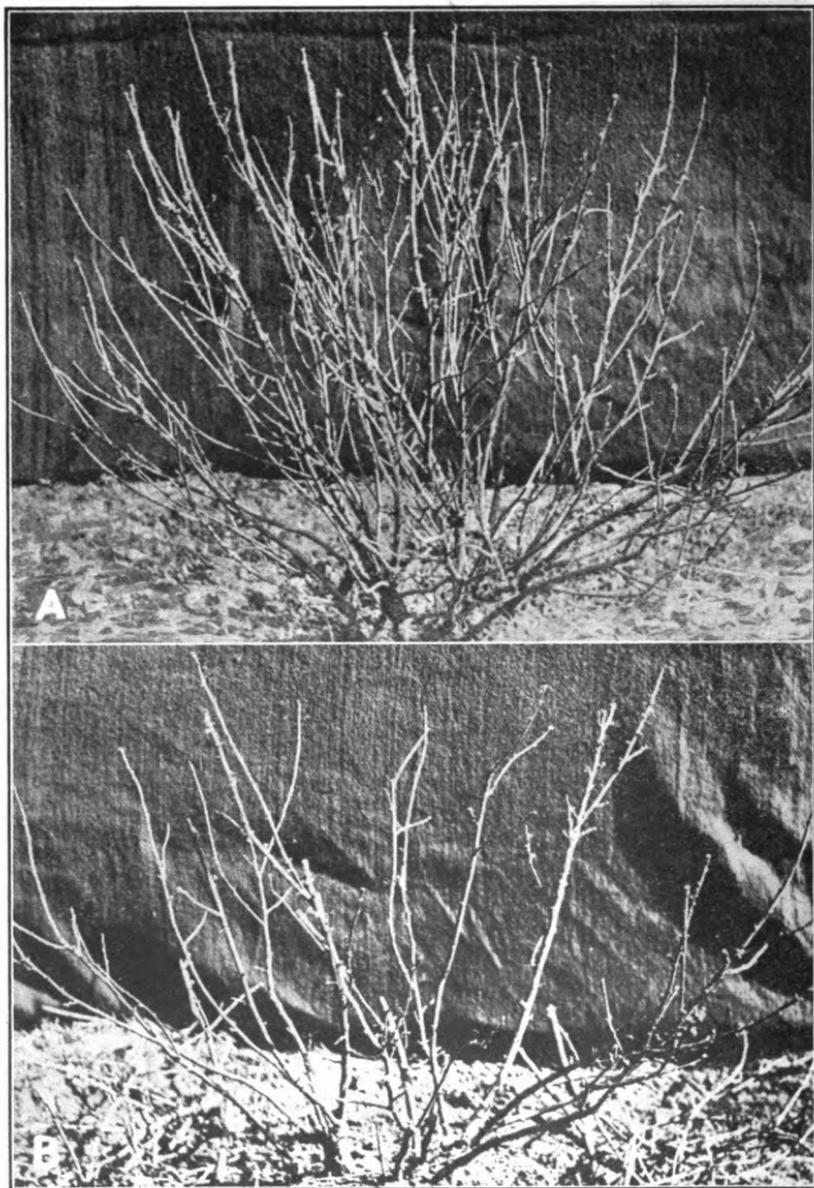


FIGURE 70

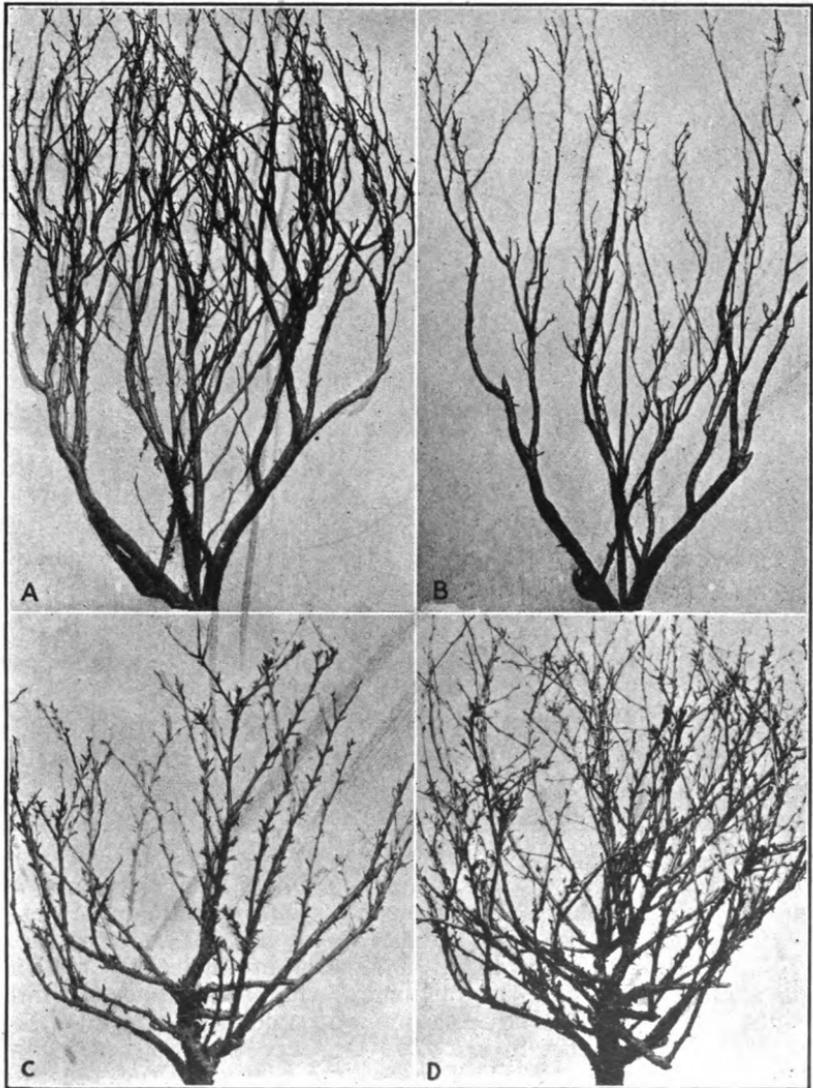


FIGURE 71

during the growing season is not advised unless no means of support can be provided. The top row of Fig. 68, page 76, shows how branching may be encouraged by this summer pruning: A, the cane and then the laterals pinched back; B, the main cane

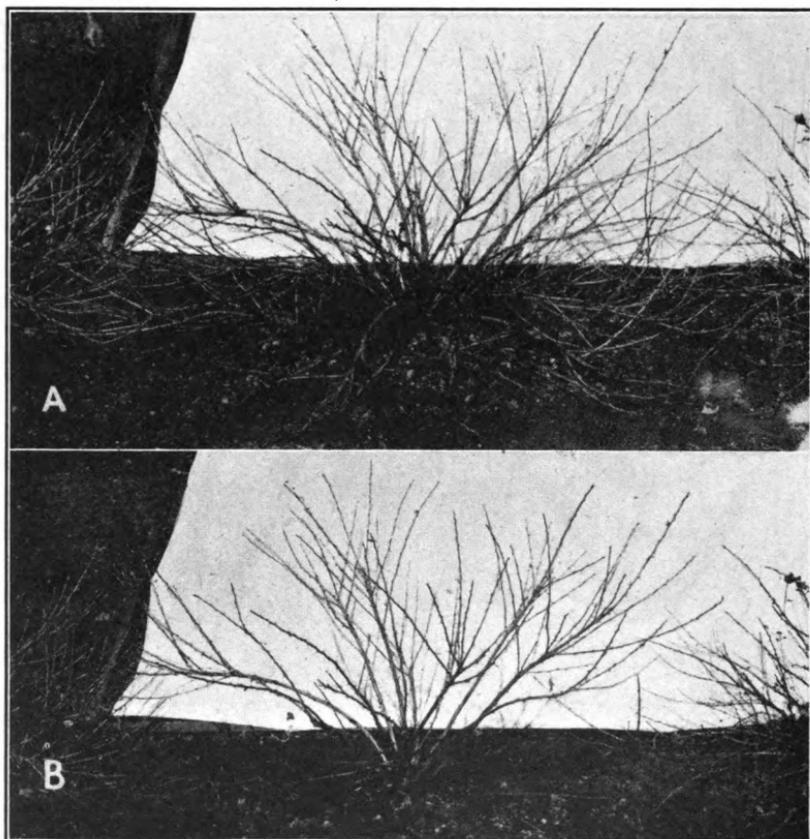


FIGURE 72

only pinched back; C, not summer pruned. The bottom row shows the same plants after the early spring pruning.

The summer pruning of the blackberry induces fruit bearing.

The blackberry and logan blackberry produce their fruit in the same way as does the raspberry; that is, on one-year-old canes that die after producing one crop, and should receive the same general treatment. Fig. 69-A, page 77, shows a logan blackberry after the fruited canes have been removed and the new canes tied in place so they can continue their development. Fig. 69-B shows the base of the same plant and the stubs left when the old canes were removed. These stubs should have been cut much shorter.

The currant produces the best fruit from buds on one and

two-year-old wood. The bush should be encouraged to send up a few new shoots from the root each year to take the place of those that have fruited three or four years.

Fig. 70, page 78, shows how a currant should be pruned to permit air and light to reach all parts of the top and to leave room for the development of new shoots.

Gooseberries and currants may be pruned to a tree form as shown by the currant in Fig. 71-A and B, page 79, and the gooseberry in Fig. 71-C and D. This is not advisable, since borers are apt to destroy the entire plant. The renewal of the bearing wood is also much more difficult.

Great care should be taken to burn all trimmings, since borers and disease are carried over winter in the small twigs. Dead or dying canes should be removed and burned as soon as detected.

The gooseberry produces the best fruit on the one-year-old wood. Care should be taken to keep the bushes well pruned so that new wood may have enough room in which to develop without interfering with the fruit. All weak and trailing canes should be removed. The best time to prune the bush fruits is during the dormant season, though some of the oldest canes may be removed after the fruit is picked, if the bushes are too dense.

Intelligent pruning of the grape calls for an understanding of the bearing habit of the vine and how pruning affects the growth of wood and the bearing of fruit.

The grape bears its fruit on shoots that grow from the lateral buds of canes that grew the previous season. When pruning the vines, enough of this one-year-old wood should be saved to produce the crop, and new canes should be permitted to grow each year to provide this fruiting wood. If the vine is closely pruned so that only a small crop of fruit is produced, the vine will have a tendency to make a strong growth, while a vine so pruned that a heavy crop of fruit is set will not be apt to make much wood growth.

The vines should be pruned when set, leaving only two or three buds with which to start growth. When the new shoots have reached a length of about three or four inches, the strongest one should be selected and all the others removed. If this is not done the vine usually will not produce a shoot long enough to reach the trellis wire. If the vine does not produce a shoot long enough the first season, it should be cut back to two buds the following winter and receive the same summer treatment that was given the first year.

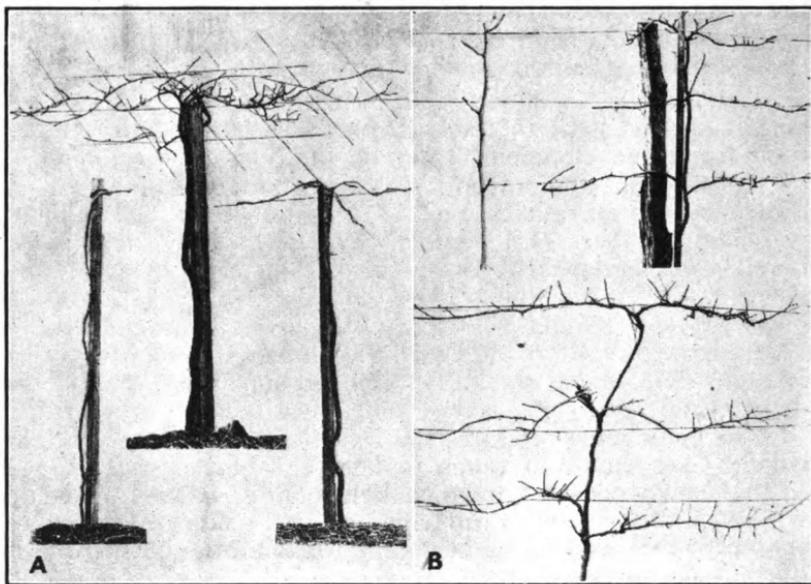


FIGURE 73

A trellis should be erected at the end of the first year and a decision made as to the system of training to be followed in the future.

Fig. 73 shows the successive steps in the development of the framework of the vine under two different systems.

Fig. 73-A shows the pruning at the end of the second, third, and fourth years in the development of a vine supported on an overhead trellis. Future renewal of bearing arms should be made from a point at or near the head of the vine, which, in this case, is near the wires at the top of the stake.

The pruning given at the end of the second, third, and fifth years to a vine trained to six horizontal arms is shown in Fig. 73-B. Both of these vines have been pruned by the spur method; that is, the previous season's growth is cut back to one or two buds during the dormant season. These buds produce the bearing shoots for the next crop. This method is not as good as the long cane renewal, since the best bearing shoots come from the buds near the middle of the cane. Fig. 74 shows the same vine that is shown in Fig. 73-B, after the fourth season's growth and before pruning. Instead of cutting all the canes back to spurs having one or two buds, a better crop

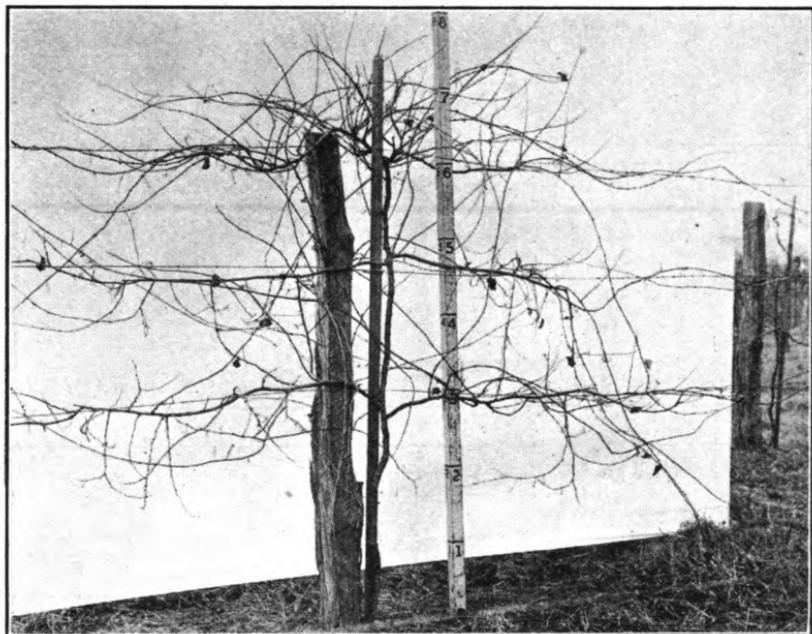


FIGURE 74

would be secured if each arm of the vine were pruned like those of the four-arm vine shown in Fig. 75-A, page 84, which was pruned by the long-cane renewal method. Instead of cutting back each cane on the arm to a spur having one or two buds, two canes are selected which grow from the arm as close to the main stem of the plant as possible, and the balance of the arm is removed and the best cane is tied in its place. This cane will produce the crop and if too long may be cut back, reducing the crop. The other cane is cut back to a spur having one or two buds, which will provide a good cane for renewal the next season. Each arm should be given the same treatment each spring.

Fig. 75-B, page 84, shows a vine pruned according to long-renewal principles. Spurs have been left at the base of each cane for the purpose of producing canes for renewal next season. The long canes may be left long or short, depending on the strength of the vine and the space to be occupied.

Fig. 75-C has been pruned according to a modification of the long-renewal system, using more canes and cutting them back to six or eight buds.

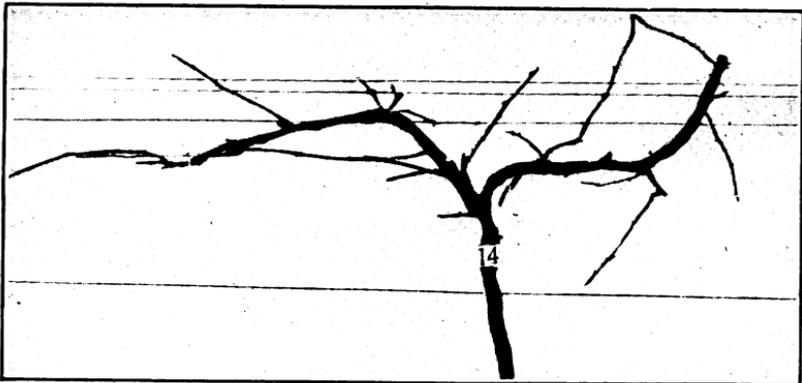
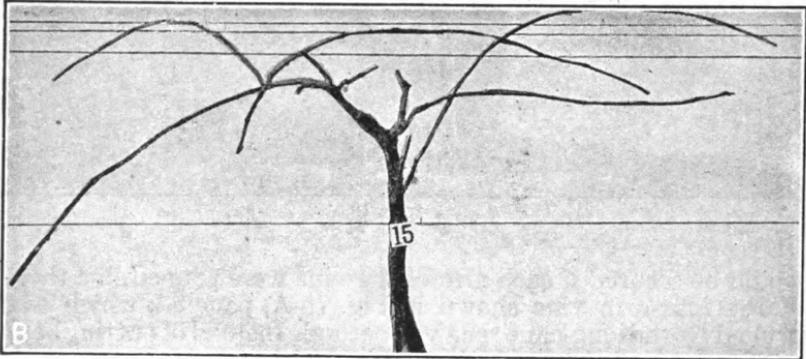
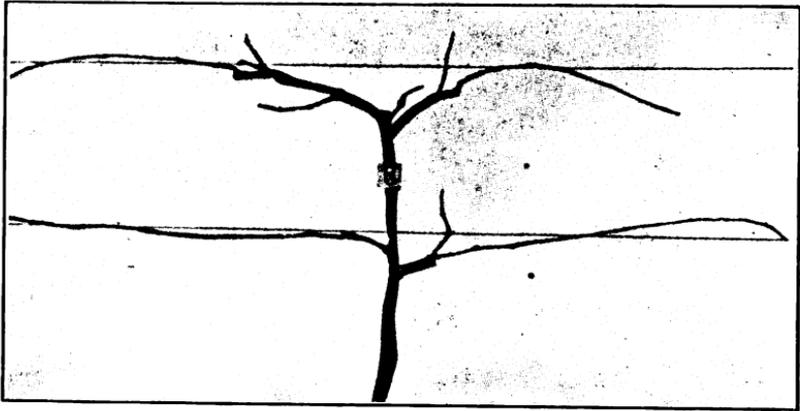


FIGURE 75

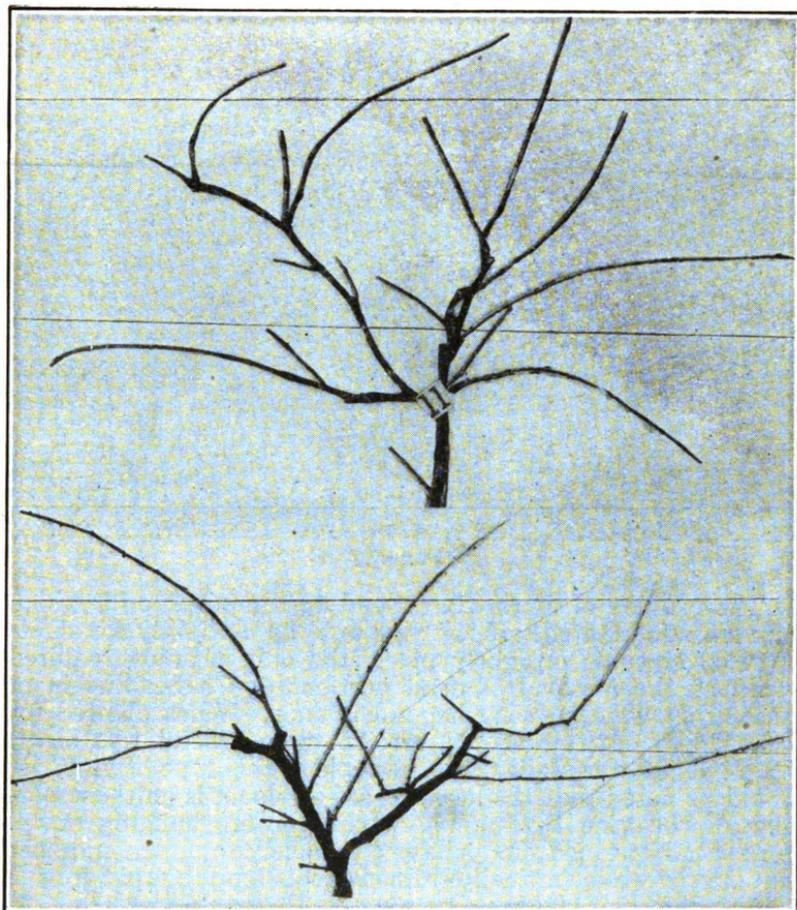


FIGURE 76

Fig. 76 shows two modifications of the fan system of training and long renewal. While the long renewal of the bearing wood is much better than spur renewal, the system of training must depend on the location, climate, variety, and type of support. This training will vary from the overhead trellis supported *Rotundifolia* to the stool or unsupported vines of the stockier varieties of *Vinifera*.

All dormant pruning of the grape should be done before the sap starts in the spring to prevent loss of strength by bleeding.

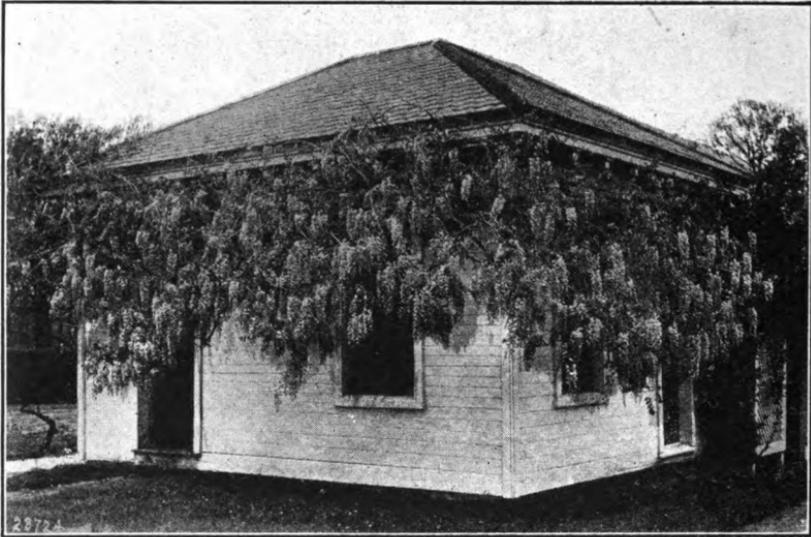


FIGURE 77

The pruning of vines will depend on the purpose for which the vine was planted. If the vine is to be used only for shade or to cover some unsightly place, the only pruning required would be the removal of dead portions and a heading in of shoots that were growing beyond bounds. Vines planted for their bloom or fruit should receive more careful treatment. Fig. 77 shows a wisteria as an example of this type of vine. It should be noted that the heaviest set of bloom is on those portions of the vine that are horizontal or are hanging down. Horizontally trained shoots have a tendency to bloom and bear fruit or seed while vertically trained shoots tend to rapid growth at the expense of bloom.

Such vines as the wisteria should not be heavily pruned during the dormant season, since much of the blooming wood will be removed at that time. Only remove dead wood and defer the main pruning until the vine has bloomed. Occasional heading in of strong growing shoots and a little thinning of dense portions of the vine will help in the production of late bloom. Great care should be exercised to prevent portions of the vine growing around or through any part of the wood work, since the future growth of the vine may destroy the wood work or make it impossible to remove the vine from the building when painting or repairs are needed.



FIGURE 78

The pruning of blooming shrubs seems to be a greatly misunderstood subject, since very few are properly pruned.



FIGURE 79

Shrubs will produce more bloom and a better appearance if permitted to retain their natural form. If a formal effect is desired, a hedge-plant such as privet or box should be used.

Fig. 78-A, page 87, shows *Forcythia* in bloom, while 78-B shows a spring flowering magnolia. These bloom from buds formed the previous season, and much of the bloom would be lost if the pruning was done in the dormant season. Such shrubs may have the broken or diseased parts removed while dormant, but the general pruning should be deferred until after the blooming period. First all dead or weak shoots should be removed, then the canes that have been growing for a number of years should be taken out to make room for the younger growth. The best bloom is borne on wood that is from one to three years old. On such shrubs as *Forcythia*, the bloom on the older wood is borne in clusters on spurs and from lateral buds in the case of the one-year-old wood.

Some spring-blooming shrubs send out short shoots terminating in a cluster of bloom. These shoots spring from the lateral buds of the previous year's growth. Like the *Forcythia*, these should be pruned immediately after blooming, so as to encourage the formation of new wood.

Fig. 79 shows the abundance of bloom obtained when the shrubs are properly thinned and pruned after blooming.

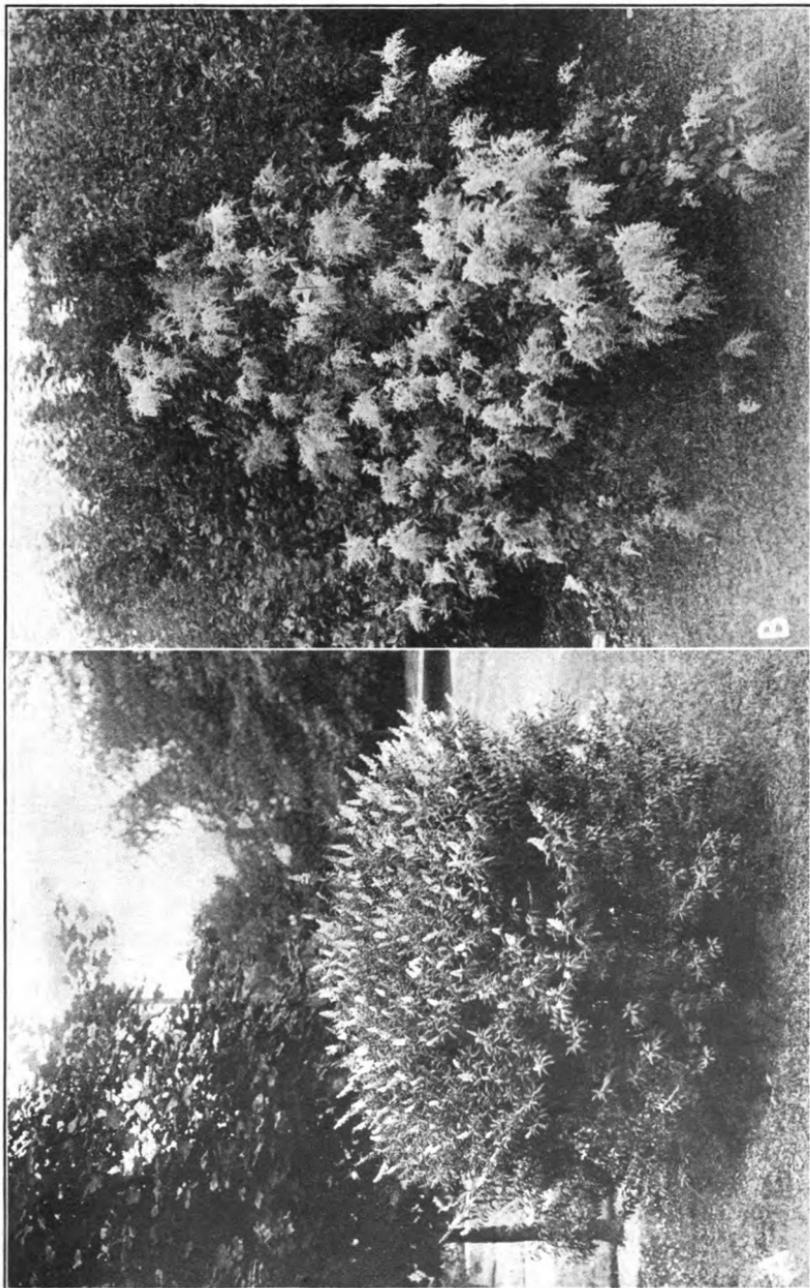


FIGURE 80

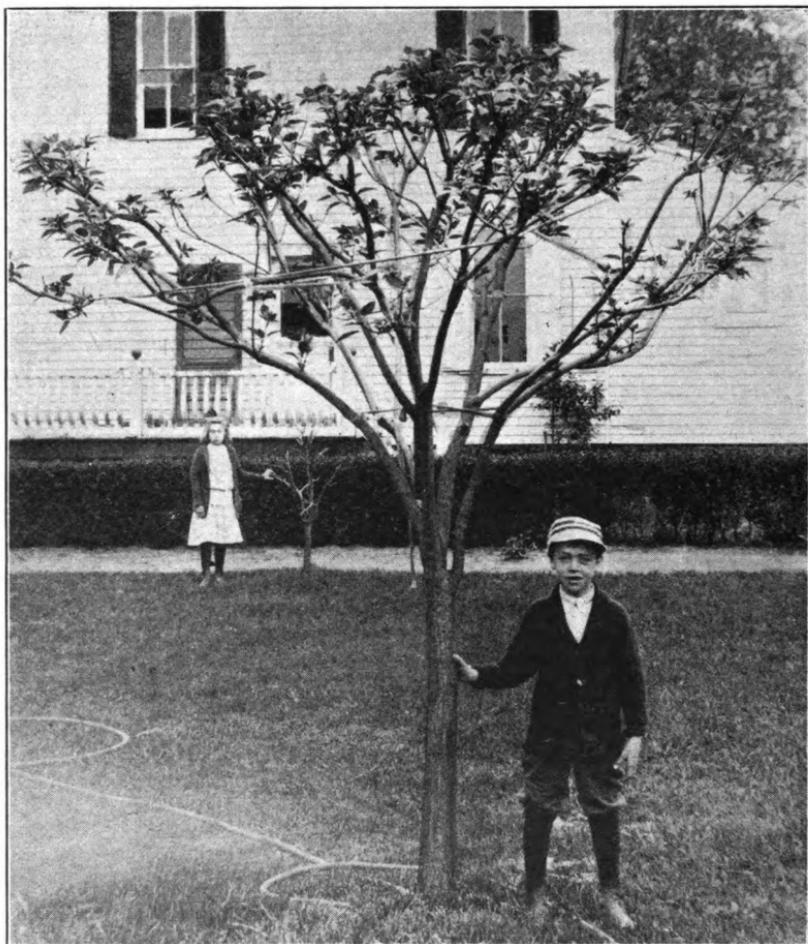


FIGURE 81

A careful shaping of the bush after blooming will produce better results than the shearing that is sometimes given in the spring in an effort to give a good form to the bush. The location should be considered when determining the form of the bush. The shrub in Fig. 80-A, page 89, has a good form for its position, but would not appear as well in a shrubbery border as the one in Fig. 80-B, which is so formed that it becomes a part of the mass of shrubbery.



FIGURE 82

The catalpa tree shown in Fig. 81, page 90, shows one way to prevent the splitting of limbs to which this tree is subject. This tree should be thoroughly thinned out each year, as shown, or the dense foliage will be injured by disease.

The pruning of a privet hedge is a very simple operation; still, a few of the principles of plant growth must be taken into consideration if a dense, well-shaped hedge is desired.

The first pruning should be given at planting time. The plants should be set in a trench as in Fig. 82-A and the soil firmly packed about the roots to within about two inches of the top of the trench. This will make watering easy, and the trench may be entirely filled the next year. After setting, the plants should be pruned to a point even with the top of the trench and then be permitted to grow the entire season without further pruning. The second spring the hedge should be cut to a uniform height of about four inches. When most of the shoots have reached a length of ten inches, the hedge should be trimmed to a height of about eight inches and the side branches pruned to give a uniform width throughout the length of the hedge. The top of the hedge should never be permitted to become greater in width than the bottom or the lower branches will become weak and possibly die.

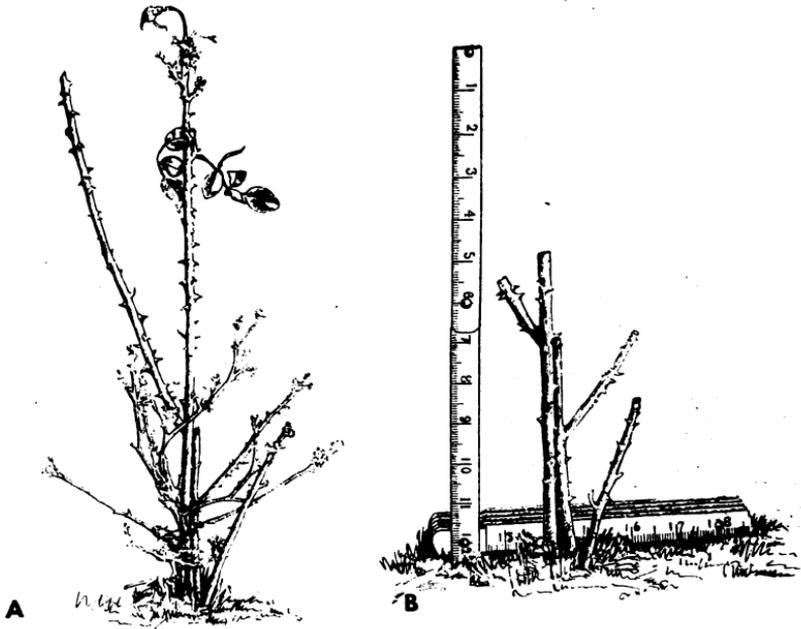


FIGURE 83

The succeeding prunings should not permit the hedge to increase more than two or three inches in height or width until the desired size is reached, after which the hedge should be pruned often enough to keep it in good form. This gradual growth in size will insure a dense hedge from the ground up. The hedge in Fig. 82-B, page 91, was not cut low enough when planted. The result is a weak hedge with little or no growth near the ground. The only remedy is to cut the hedge back as shown and start over again.

ROSES

The pruning of the rose is influenced by the variety and location as well as the purpose for which the plant is grown. If individual blooms of high quality are wanted, the bushes should be severely pruned. Where a mass of bloom is desired, remove the old and dead wood, cutting back the plants one-half.

The teas and hybrid teas should be more severely pruned than any other variety. Fig. 83 shows the pruning of a hybrid tea rose. The weak shoots were entirely removed and the three remaining shoots cut back to about one-third their former height. If the plant had not made so much growth, the pruning

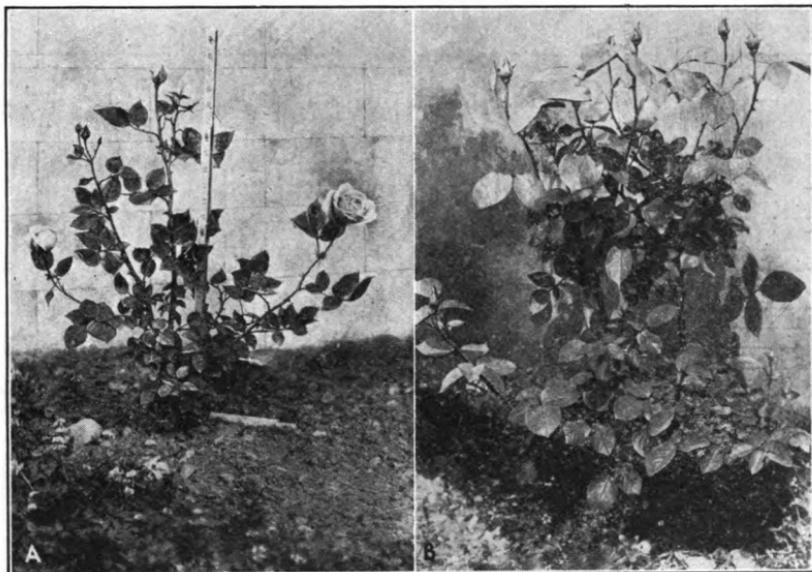


FIGURE 84

should be more severe. Fig. 84-A is the same plant at blooming time. Note the long stems and compare it with the bush in Fig. 84-B, which was not so closely pruned. The second bush was left with canes about fourteen inches long. It has produced eleven blooming shoots with stems about one-half of the length of those on the first plant. Note that the growth is not well distributed on the second bush. The unsightly stems are not hidden by the foliage, and unless closely pruned after the first blooming the plant is not apt to produce enough strong, new canes for renewal.

If not removed sooner, every bloom should be removed as soon as the petals begin to fall. The cut should be made so as to leave only one or two buds at the base of the shoot. These will start growth soon and reproduce the shoot that has been removed.

The rose shown in Fig. 85-A and B, page 94, has been very poorly pruned. It has only been headed in each year without thinning the branches. The top is too dense to permit the growth of new shoots from near the ground, or to develop a good crop of bloom. One-half of the wood shown in Fig. 85-B should be removed, leaving the youngest.

Many hybrid tea roses are budded on strong growing stocks.



FIGURE 85

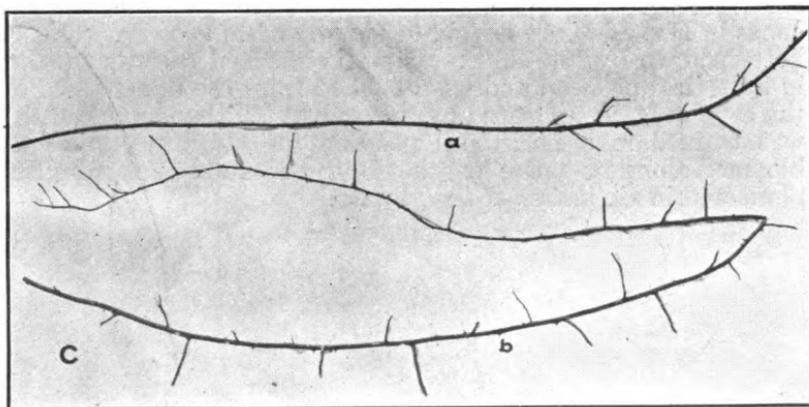
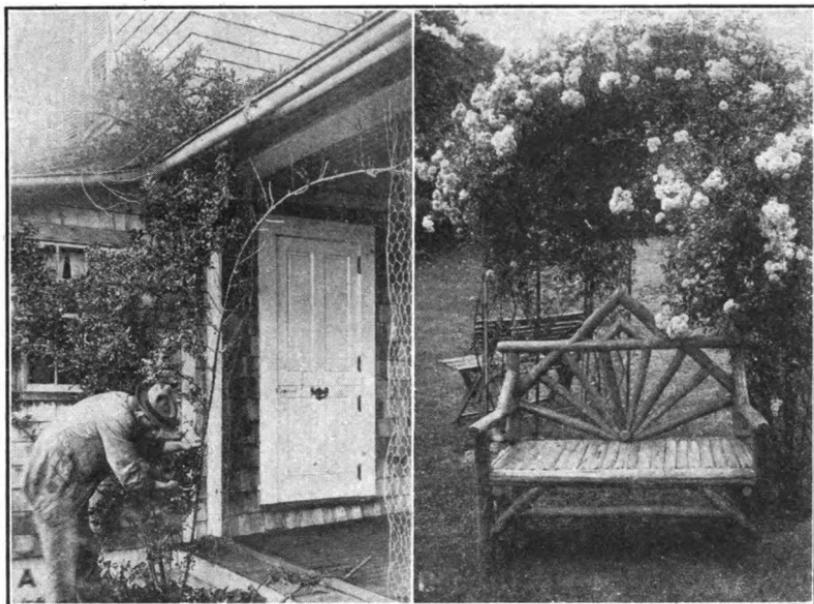


FIGURE 86

These stocks often send up suckers, which, if permitted to grow, would rob the more desirable top of proper nourishment, causing it to die. These suckers have leaves with seven leaflets, and the tea and hybrid teas have leaves with only five leaflets.

The pruning of the hybrid perpetuals for cut flowers is the

same as given the hybrid teas. All of the old wood should be removed and the new canes thinned out in the spring. These canes should be cut back to about six inches. Fig. 85-C and D, page 94, shows a rose of this type and the proper pruning to give. If a quantity of bloom is wanted, two or three of the strongest one-year-old canes should be selected and all other wood removed. These canes will produce blooming shoots along their entire length if bent over in a horizontal position and tied to stakes to keep them in place. See explanation Fig. 86-C, page 95.

Rugosa roses need only a little thinning out of the old canes each year.

The brier roses usually bloom on shoots that grow from laterals, and should not be as closely pruned as the ramblers; only removing enough of the oldest wood each spring to let light and air reach all parts of the bush.

The ramblers and climbing teas should be pruned after blooming and all wood that has bloomed removed. The best bloom is produced on the one-year-old canes. Fig. 86-A, page 95, shows a rambler that did not receive the proper treatment after blooming the previous season. The dead cane was permitted to bloom for two years and did not have strength enough to start out the third year.

The greatest bloom is obtained from climbers when the canes are trained in a horizontal position. Note that the vertical canes in Fig. 86-B are devoid of bloom or leaf growth. This is better shown by Fig. 86-C. The cane marked (a) was trained in a vertical position and has bloomed from the upper third of the cane only, as indicated by the stubs. The cane marked (b) was trained in a horizontal position for blooming, and has bloomed along its entire length. Both canes were cut from the plant within six inches of the ground.

Tools

The work of pruning demands tools that are both sharp and well constructed. A dull tool makes a poor cut and wastes the workman's patience and strength. These tools should also be well designed so that they will perform properly the work for which they were purchased. The various operations of pruning call for equipment differing widely in construction and use. These different types of tools are also modified to suit the varied tastes and demands of the individual workman.

We respectfully call attention to the wide variety and high quality of the Disston line of pruning tools.

There are many calls for a tool that will remove branches that cannot be reached with ordinary tools. "The Little Giant" and "The Orchard",—pruning hook and saw,—mounted on a pole of the required length are ideal tools for this type of work. The pruning saw and knife No. 20, the pruning saws Nos. 10, 11, and 111, are also good tools for this work.

The removal of large limbs demands a saw with a long narrow blade. Numbers 3, 7, 7½, D-24, D-26 and the York State Pruner are of this type.

The tapered pruning saws are adapted to the general work of pruning in both the orchard and the shade trees. Ten different patterns are offered.

A type of saw designed to cut when drawing the saw toward you is much used in grape pruning. These saws have curved blades and are made in seven patterns. One of these has a folding handle which permits the saw to be carried easily in the pocket.

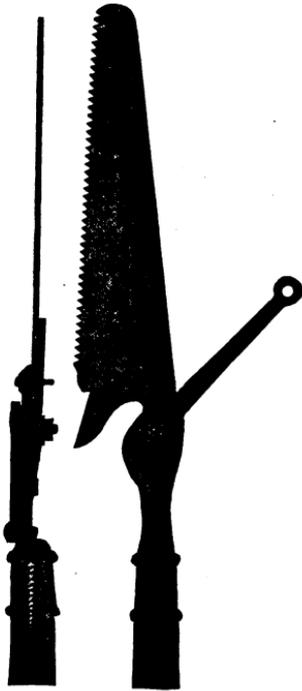
The writer does not advise the use of the double-edged pruning saw, but for those who demand such a tool, a choice of five patterns is offered. Illustrations of these saws may be found in the general catalog.

The Disston Hedge Shears are designed for the trimming of the privet and similar hedges.

The hand shear is one of the most important tools used in the work of pruning.

“LITTLE GIANT” PRUNING HOOK AND SAW

SIMPLE AND DURABLE

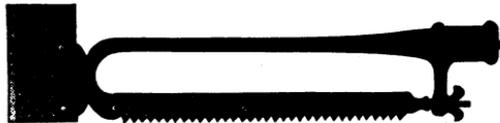


The Knife and Saw are both made of Disston Steel. The tool is strong and durable. The Saw may be detached when its use is not required for cutting large limbs.

This Pruner fills a long-felt need, as it combines two useful tools in one, without increase of cost to the user.

The Saw-blade is attached to the Hook by means of two clamp-screws, as shown in the accompanying illustrations, which also show the method of attaching a Pole or Handle. We also make a Pruning Hook of this style without the Saw Attachment.

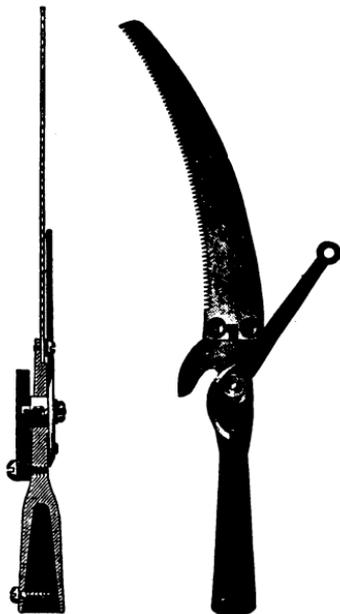
IMPROVED PRUNING SAW AND KNIFE No. 20



This Saw is designed for attachment to a pole, so that the upper branches of trees can be reached without the aid of a ladder. Either the Knife or Saw may be used as required. When desired, the Pole can be detached; the socket on the Frame forms an excellent handle.

The peculiar formation of the Tooth enables the Saw to cut both ways, causes an equal strain on the limb being cut, insures smooth and rapid cutting, and prevents the saw from becoming jammed in cutting green wood. Length of saw, 10 inches.

“THE ORCHARD” PRUNING HOOK AND SAW



This tool meets general requirements. The economy of combining two tools in one will be appreciated.

The Knife and Saw are made of Disston Steel, and can be used with or without a pole. Although possessing great strength, the tool is of light construction, with crescent shaped blade, which has long, slender teeth, so formed as to draw the saw into the wood. It is particularly adapted for sawing the smaller branches in general pruning.

The Saw Blade, which is attached to the Hook by two clamp-screws, can be removed when the Hook only is required. We can furnish this style of Pruning Hook without the Saw attachment if so desired.

Malleable iron handle, Japanned, with socket.

No. 111 PRUNING SAW



Similar in quality and style to “The Orchard,” without Pruning Hook.

Malleable iron handle, Japanned, with socket. Disston Steel, crescent-shaped blade, 10 inches in length; long, slender teeth.

The blade is fastened to handle with wing-nut and so arranged that it may be adjusted to any angle. Can be used with or without a pole.

DISSTON TABLE AND PRUNING SAW, No. 7



Disston Steel, Grained Blade, Warranted, Apple Handle, Polished Edge, Brass Screws.

BROWN'S TABLE AND PRUNING SAW, No. 3



Grained Blade, Apple Handle, Polished Edge, Brass Screws.

YORK STATE PRUNER



Beech Handle, Varnished Edges, Brass Screws, Narrow Steel Blade, Blued. Length of Blade, 20 inches; five inches wide at butt, one inch at point. Toothed seven points to the inch.

GRAPE PRUNER



Hardwood, Open Grip Handle, Brass Screws, Disston Steel Blade, 10½ inches long, 1¾ inches wide at butt, ¾ inch at point.

TAPERED PRUNING SAWS

Polished Steel Frames, Disston Steel Blades, Hardwood Handles. These are specially desirable Pruning Saws, the shape of Frame permitting their use in narrow spaces. 14-inch Blades.

POMONA, No. 8



DOUBLE SWIVEL, No. 9

Adjustable Blade.



"THE FOREST," No. 10

Without Pole. Socket Handle, Adjustable Blade.



CLIMAX, No. 12

Adjustable Blade.



PACIFIC COAST, No. 15



TAPERED PRUNING SAWS

No. 16



Flat steel back, narrow tapered point, Beech handle, two nickel-plated screws. Handle has extra large grip for use in gloved hand. Swivel stretcher. Blued steel blade, 14 inches long.

No. 17



Oval steel back, straight tapered point, Beech handle, three nickel-plated screws. Handle has extra large grip for use in gloved hand. Blued steel blade, 20 inches long.

NEW YORK PATTERN, No. 18



Flat steel back, narrow tapered point, Beech handle, three brass screws. Handle has extra large hand-hold for use in gloved hand. Blued steel blade, 18½ inches long.

No. 19



Flat steel back, narrow tapered point, Beech handle, three brass screws. Handle has extra large hand-hold for use in gloved hand. Swivel stretcher. Blued steel blade, 18 inches long.

No. 25



Flat steel frame, slightly tapered, riveted sockets, swivel stretcher. Beech handle, two nickel-plated screws. Blued steel blade. Length 14 inches centre to centre of holes.

PRUNING SAWS

CALIFORNIA, No. 50



No. 51



Curved Beech handle, 3 brass screws. Crescent-shaped Disston Steel Blade, slender teeth similar to the "Orchard" Pruner. Made with 12-inch blade only.

No. 52

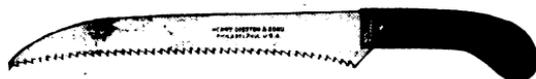


Straight Beech handle, 3 brass screws. Crescent-shaped Disston Steel Blade.

ADELAIDE, No. 60



PRUNING SAW, No. 61



Special shaped, Disston steel blade, teeth arranged to cut on the draw stroke; comfortably shaped handle; two screws. Made with 12, 14, and 16 inch blades.

PRUNING SAWS

No. 7½



Similar to the No. 7 Ship Pattern Handsaw, with the exception of extra large hand-hold for use in gloved hand, slightly heavier blade, and coarser teeth for pruning.

No. D-24



Narrow Point Disston Steel Blade, Copper Handle with Beechwood Grip.

No. D-26



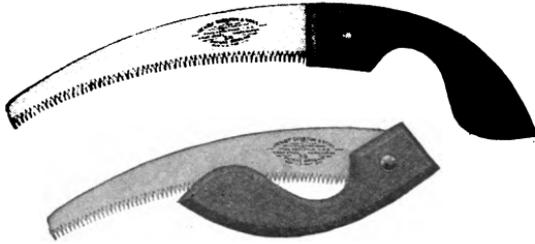
Similar to the No. D-20 Handsaw, with the exception of extra large hand-hold for use in gloved hand, slightly heavier blade, and coarser teeth for pruning. The 26-inch is fitted with five brass screws; 24-inch, and smaller, with four brass screws.

ADJUSTABLE POLE PRUNER, No. 11

Without Pole.

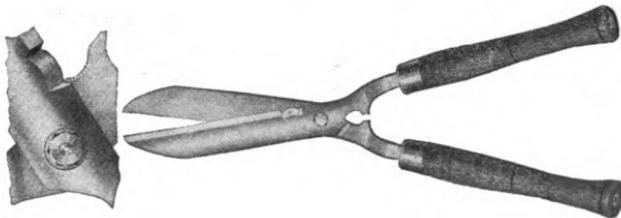
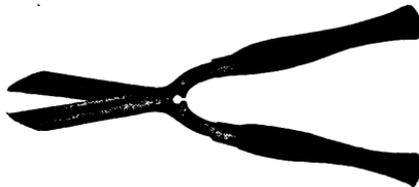


Adapted for sawing by hand or attached to a pole. The Handle is made of malleable iron, with socket, and the Blade of Disston Steel. Adjustable for sawing at different angles.

FOLDING PRUNING SAW, No. 38

Length when open, $16\frac{3}{4}$ inches. Length when folded, $12\frac{3}{4}$ inches.

This Saw is designed to meet the demand for a Pruning Saw which can be carried easily in the pocket. The crescent-shaped blade, 10 inches long, is of well-tempered Disston-made Steel. The teeth, long and slender, are specially formed to draw the saw into the wood, easily making a clean cut. The saw cuts on the draw stroke. The handle is of hardwood, shaped to give a comfortable, firm grip, with a slot near the end to accommodate blade when folded.

DISSTON HEDGE SHEARS, No. 101**LADIES' PATTERN HEDGE SHEARS, No. 1**

Blades $6\frac{1}{2}$ inches long.

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