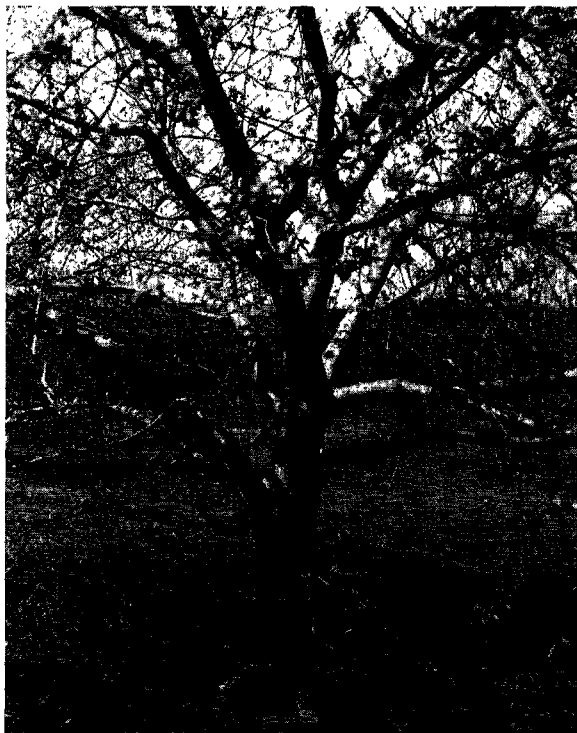


AGRICULTURAL EXPERIMENT STATION

KANSAS STATE COLLEGE OF AGRICULTURE
AND APPLIED SCIENCE

MANHATTAN, KANSAS

DEPARTMENT OF HORTICULTURE



A properly pruned tree is strong and well-balanced

PRUNING FRUIT PLANTS¹

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INTRODUCTION²

General Requirements of Modern Orchardling.—Modern orcharding involves three production operations of first rank: Spraying, pruning, and soil management. A good deal of misunderstanding is current regarding the relative importance of these three primary operations, and results are frequently credited to one or an-

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2. Table of contents appears on page 26.

other of them that cannot be so ascribed under controlled conditions. But it may be taken as a general rule that lack of care regarding any of these three will greatly reduce the value of the orchard and the crop. These three operations are closely related and demand the grower's attention, each in its proper degree and season. All being essential to the success of the undertaking, none can be placed in a dominant position over another. Good spraying and careful soil management combined with skillful pruning constitute the only sound foundation for successful fruit production.

Definition of Pruning.— Pruning may be defined as the removal of a part of a plant for the purpose of increasing the economic value of the remainder. This increase in value may be merely the greater probability of the plant's living; it may consist in the building of a larger or stronger tree or bush; fruitfulness may be increased; or it may be merely an aid to other orchard operations, as spraying and harvesting. Without exception, however, the grower does better pruning when he understands the particular purposes toward which his efforts are directed and the physiological effects which may be expected to follow whatever cutting he does.

Bearing Habits of Fruit Trees.— The grower must understand, also, something of the method of fruit bearing of the plants which he prunes. He should know apple and pear fruit spurs and realize that they are the tree's machinery for fruit production; that two or more years are required for their development; that they will be unfruitful, or even die, if overshadowed; and that when once lost on any part of the tree they can never be replaced there but must be produced further out on the tree. In contrast with this habit, that of the peach and of some of the sour cherry varieties may be mentioned. With them the principal part of the crop is borne from buds on the twig growth of the preceding summer, and so the production of twigs must be encouraged. Still another method of fruit bearing is to be found in the case of the grape, the bramble, the persimmon, and the quince. None of these plants carry separate fruit buds over winter, but all bloom and bear their fruit on shoot growth of the current season, which arises from lateral buds formed the preceding summer. An accurate conception of such facts is a necessary part of the working knowledge of one who would prune fruit plants intelligently. Some of these methods of fruit bearing are illustrated in figure 1.

Individuality of Fruit Trees.— A clear understanding of the fact that both varieties and trees within the variety have individuality and that each requires special treatment, is of great use to the pruner. A system which proves successful with the Jonathan apple might not apply in the case of an upright-growing apple tree like the Rome; so, although something resembling a system of procedure in pruning may well be adopted, the worker must keep constantly in mind the necessity of adapting his "system" to the peculiarities of varieties and even of individual trees.

Some Definitions.— In order to learn about pruning from the printed page the writer and the reader must agree regarding the meaning of terms used in describing the process. The collar of the

tree is the point of union between the root and the trunk. The trunk extends from the collar to the first subdivision of branches. The leader in a fruit tree is the central, upright-growing stem, a direct continuation of the trunk. The framework or scaffold branches are the series of branches originating directly from the leader. From



FIG. 1.—Fruit-bearing parts. (a) Apple spurs which have borne fruit. (b) Vigorous apple spurs which have not borne fruit. (c) Peach fruiting twig. (Note the fruit buds at the third and sixth nodes.) (d) Straight fruit spurs on Montmorency cherry.

these arise the secondary branches. Stems beyond the secondary branches are potential fruit-bearing wood. It may consist of terminal stems of the preceding season's growth, called twigs, or of spurs. Spurs are borne laterally on stems which are two or more years old. Leaves appear only on twigs and spurs. These parts of a fruit tree are illustrated in figures 1 and 2.

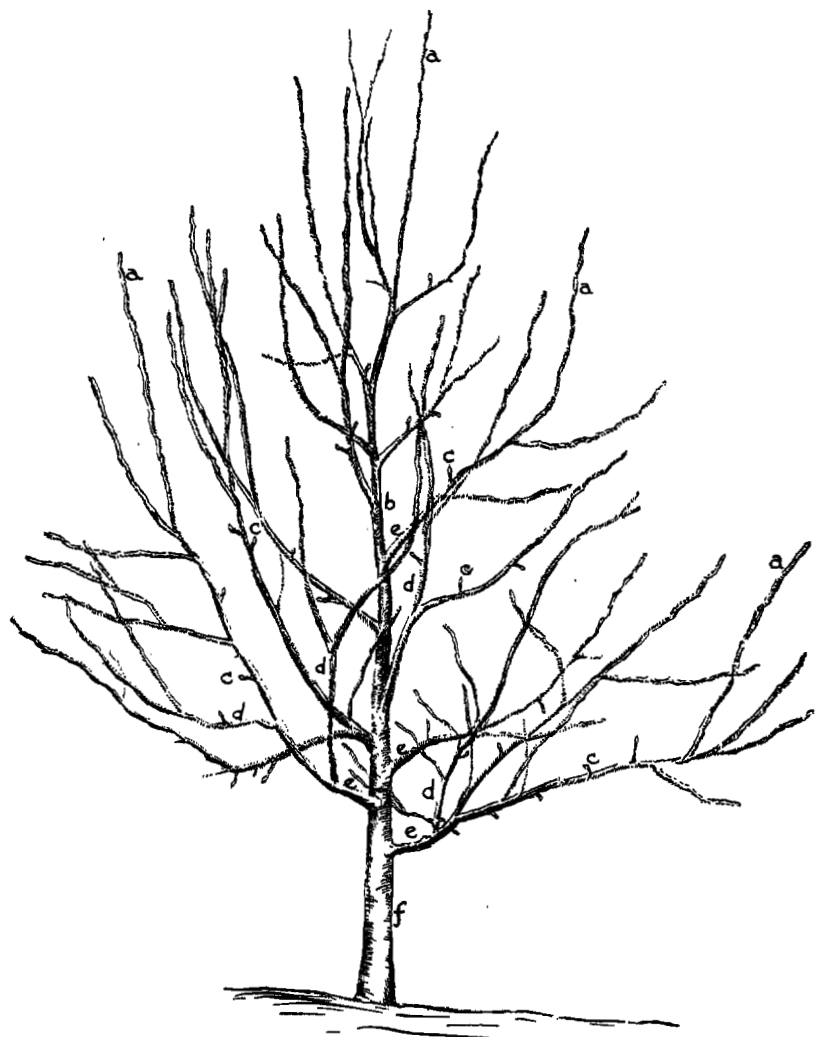


FIG. 2.—Diagrammatic sketch showing the important parts of a fruit tree. (a) Twigs. (b) Leader. (c) Fruit spurs. (d) Secondary branches. (e) Framework or scaffold limbs. (f) Trunk.

There are three principal operations connected with pruning: Heading back, thinning out, and the removal of large branches. Heading back consists of cutting off a portion of a twig or branch. It more commonly applies to twigs and is a part of the training of young trees. Thinning out refers to the removal of twigs or small branches which are growing too close together. It is practiced throughout the life of the tree. Large branches are removed when they become broken, diseased, or crowded, and in rejuvenation pruning.

Heavy pruning of fruit trees may be considered as any pruning in which wood equal to one-fourth or more of the annual twig growth is removed, while light pruning would be the removal of wood amounting to less than one-fourth of the annual twig growth. A third class, medium pruning, might be made, and would include the removal of one-eighth to one-fourth of the annual growth. These distinctions are somewhat arbitrary and the amounts named relate to trees which have had regular attention in the way of pruning and are making normal growth.

Moderation Recommended in Pruning.— Fruit growers have suffered severe losses due to using extreme methods in pruning. Too heavy pruning upsets the balance between the top of the tree and the root system and results in various ill effects, such as unduly delaying the establishment of fruit production, the dwarfing of the tree, and, usually, its earlier decline and death. Neglect of pruning and too light pruning are also injurious. They lead to overheight of trees, making picking and spraying more expensive; to undue density of top and consequent poor color of fruit; to overbearing, a cause of small fruit and of the biennial habit; and to a general dominance of the vegetative over the reproductive functions of the trees during the middle period of their lives. For these reasons the medium course in pruning is recommended.

Large trees are desirable but they must not be so large as greatly to increase the expense of orchard operations. Vigorous-growing trees are the most valuable, but they must not be so vigorous in wood growth as to defeat the object for which they are grown; that is, fruit yield. Productive, heavy-bearing trees are requisite for profit, but they should not be so fruitful that they bear themselves to death in a few years, as occasionally happens.

Moderate annual pruning is of vastly greater value than irregular, heavy pruning. The best pruning is that which is done in the light of a knowledge of its probable results; of the physiological principles which underlie the work; of the local climatic and soil influences; of kind and varietal peculiarities; and of the importance of the regular, well-planned application of this knowledge. Pruning so done assumes a value which entitles it to rank as equal in importance with spraying and soil management.

Time for Pruning Fruit Trees.—The old adage, "Prune when your knife is sharp," better fitted the day of amateur fruit growing than the commercial orchard of today. The time for pruning is now set by economic considerations and the observed effects on the pruned tree. Both of these tests indicate that nearly all pruning of fruit plants should be done while the plants are dormant, after the leaves have dropped in the fall and before the buds open in the spring. Favorable weather for this work usually occurs in Kansas during the three winter months, and the owner will then be able to do the necessary pruning in about thirty acres of young orchard.

Some exceptions to the rule of pruning during the winter months only could be cited. Pruning of fruit plants which are tender to low temperatures may be delayed until the hazard of winter injury

is past, usually in March. In some sections, pruning of peach trees may be postponed until the prospect for a crop is known. If the blossoms are killed, more wood should be removed from trees of bearing age. Some pruning of brambles must be done during the summer, but the general rule of pruning fruit plants during their dormant period is well established.

GENERAL DIRECTIONS

The art of pruning fruit trees can be comprehended best if the discussion of it, as well as the actual work, be divided into two rather definite parts. The first of these, which would include all pruning done between the time the trees are set and the time they

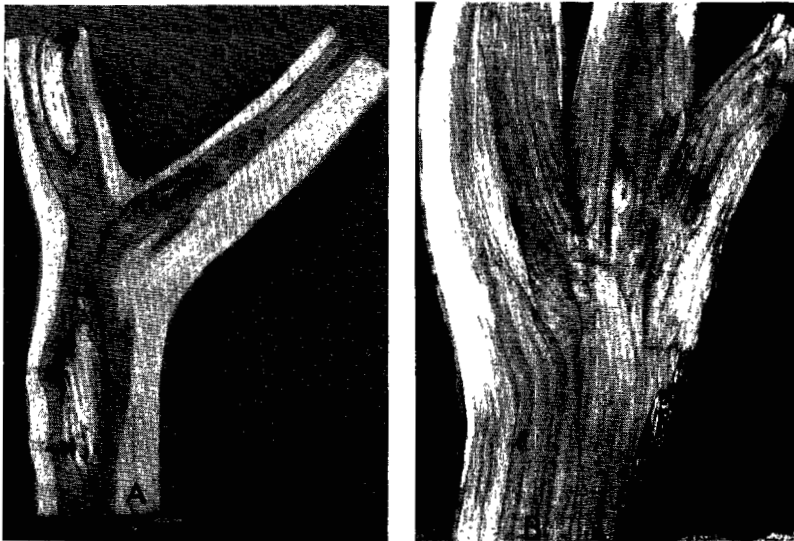


FIG. 3.—The wide-angled crotch A is much stronger than the narrow crotches B. Note the bark inclusions at points 1 and 2 which prevent a strong union.

come into bearing, may be called “Pruning for Tree Building.” This process, is, in many ways, in sharp contrast with the subsequent phase, which may be termed “Pruning for Tree Maintenance and Fruit Production.”

PRUNING FOR TREE BUILDING.

Building the Framework.— The object which should be in the mind of a grower while pruning for tree building should be the production of trees that are strong; that are large though low; and that will come into bearing at a proper age. The mechanical strength of a tree, its ability to support a heavy load of fruit, depends on two principal features: (1) The correct formation of the framework, and (2) the stockiness of the wood. The arrangement of the low

framework limbs is usually determined at the time of the second pruning following the graft. Care at this pruning to select branches that are evenly spaced around the trunk and that are distributed eight inches or more apart vertically usually will yield a tree which will not split at this point. Strong and weak crotches are illustrated in figure 3. However, the preservation of a central leader for a

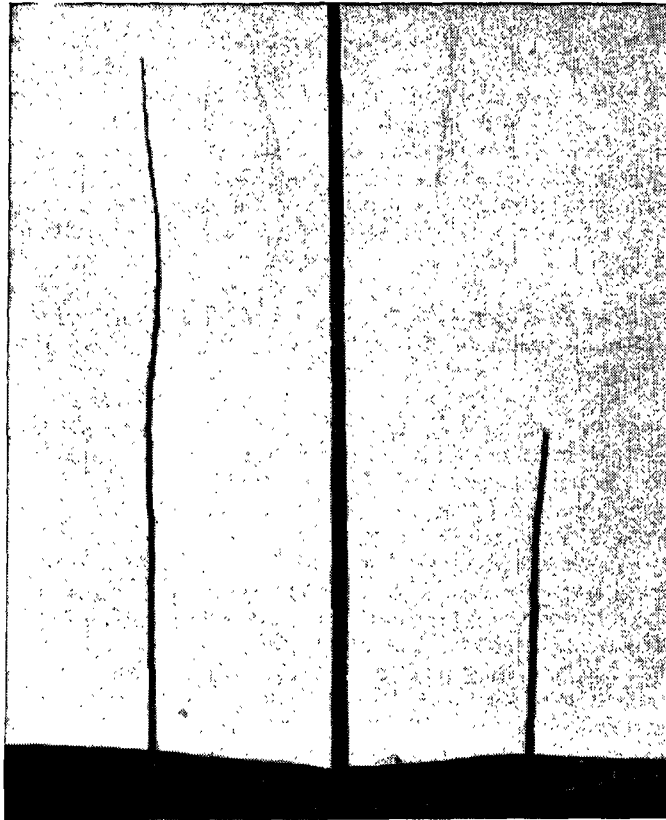


FIG. 4.—An apple tree when planted; before and after pruning. The apple whip was 54 inches tall when set; headed back to 30 inches.

number of years still further strengthens this weakest part of most fruit trees. Stockiness of branch is encouraged by heading back, combined with any treatment which will increase the vegetative activity of the tree.

Pruning for Size.—Heavy yields of fruit are obtained only from large trees. The avoidance of over pruning is the principal precaution to be observed in order to produce such trees, provided the soil is fertile. It is probable that no pruning at all would be the treatment which would result in the largest trees, but they would be de-

fective in so many ways that this practice has little else to recommend it. Persistent heavy pruning dwarfs fruit trees because it greatly reduces the total leaf area of the tree, and consequently the elaboration of plant food. Large trees must be prevented from becoming too high by judicious heading back of upright-growing branches and by encouraging, through lighter pruning, those which tend toward the horizontal.

Pruning and Fruit Bearing.— The age at which fruit trees begin to bear is largely an innate characteristic and can be influenced by pruning within only rather narrow limits. In a general way, heavy pruning delays the beginning of fruit production because it prevents storage of starch early in the growing season and diverts the activities of the tree to the production of wood to replace that removed, especially if this heavy pruning is done during the dormant season. However, light pruning, or even no pruning, seems to have but little effect in hastening fruit bearing—the kind of fruit, variety, soil, and climate probably being the principal factors governing early maturity.

The First Pruning.— In most parts of Kansas one-year-old fruit trees are more valuable for starting an orchard than are older ones. Grafted apple and pear trees of this age will usually be straight switches, but others, as the peach and cherry and budded apple and pear, will have lateral branches. The root system of the transplanted tree may need attention. Broken or badly injured roots may be cut back to sound wood, and if one or two roots are much longer than the others they should be cut back to average length.

Straight-switch trees require only heading back at the time of setting. A glance at figure 4 will make this operation plain. The cut should be made at a height of about 30 inches, thus allowing for a trunk of 18 to 24 inches and sufficient space above it for the distribution of the framework branches. The pruned switch must bear a number of good strong buds on the upper 12 inches. If these buds are weak or have been rubbed off, the tree should be thrown away.

If two-year-old trees or branched yearlings are planted, they are headed back at about the same height as unbranched trees, though the leader may be left somewhat longer if the branches arising from it are vigorous and stocky. The framework branches are then chosen and are headed back severely, to but one plump bud if the trees show any signs of weakness, and all other branches are cut away close to the main stock. Strong two-year-old trees having good root systems may be pruned in the manner described for “the second pruning,” except that the lateral branches should be more severely headed back.

The Second Pruning.— After making its first summer’s growth the young tree is again pruned during the dormant period. This is the most important pruning that the tree will undergo. It involves the choice of the first framework branches of the future tree. These should be two or three in number, of nearly equal strength, and well distributed both around and up and down the main stem. After

selecting those to be left all other twigs are cut off close to the central stem. Those preserved are then headed back to about 18 inches in length. The central one of the twigs left on the tree will be upright in its growth and will become the leader in the tree. It should be left slightly longer than the other branches at this pruning. Figure 5 illustrates this operation.

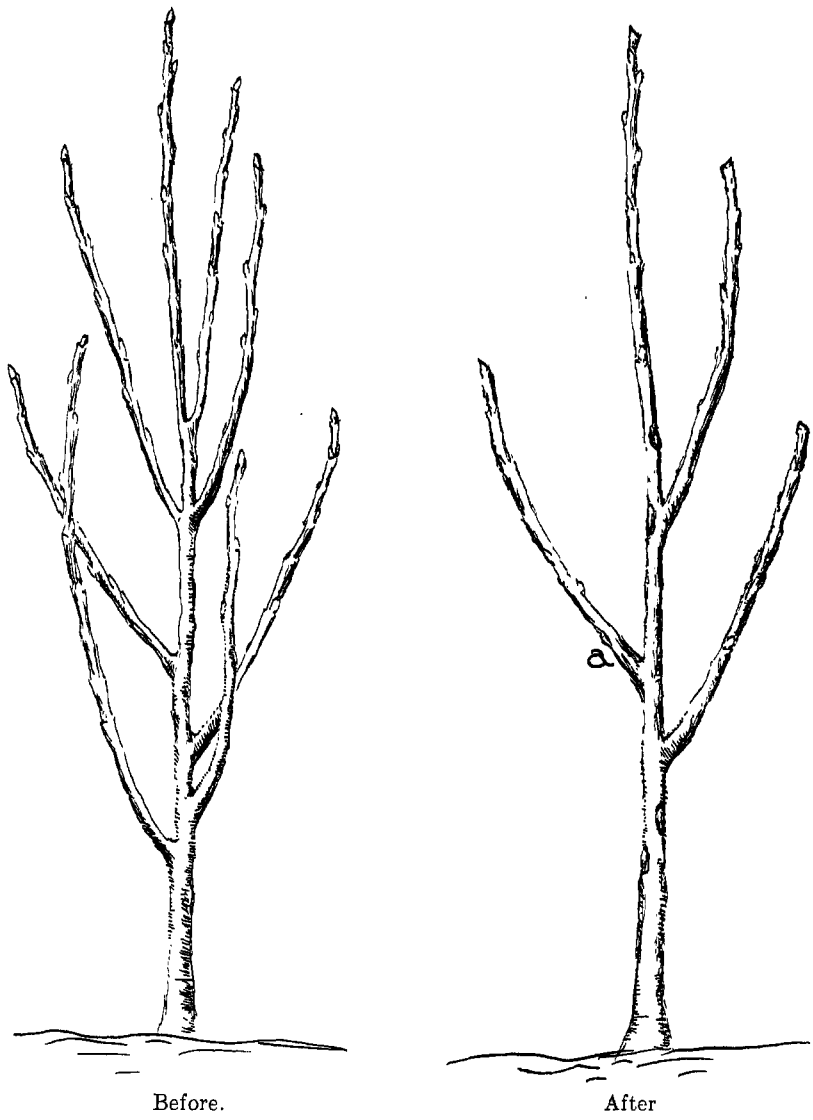


FIG. 5.—An apple tree after one year's growth in the orchard; before and after pruning. Note the vigorous branch (a) to the southwest.

The Third Pruning.— One year later the tree will receive its third pruning. This will be similar to the second and consist of both thinning out of twigs and heading back of those which remain. These latter will be about twice as numerous as the first series from which they arise, and are known as secondary branches. They should be headed back in proportion to the growth they have made. Great care must be exercised to space the branches as well apart on the scaffold limb as is possible and to head them back to unequal lengths. Many of these pairs of branches would form acute angled

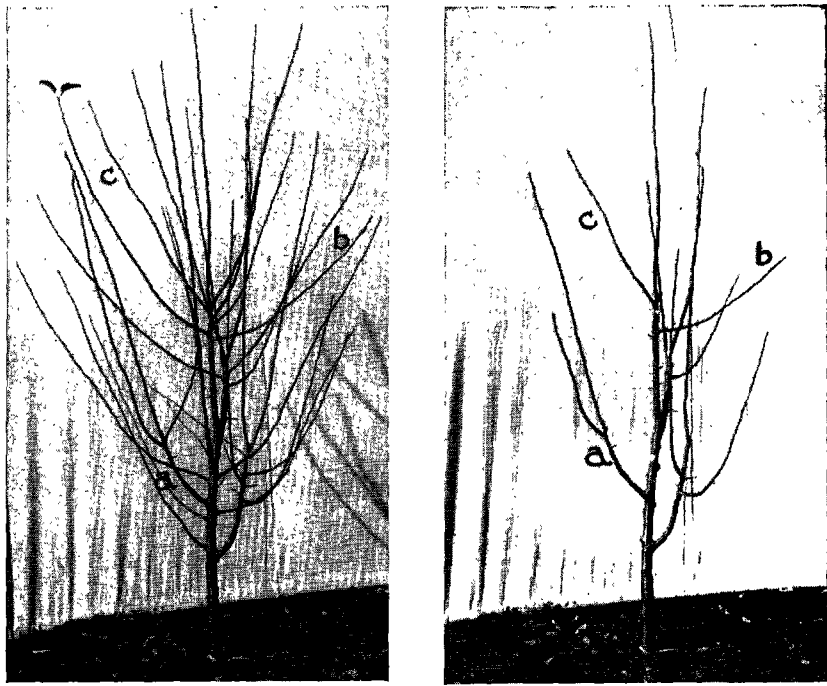


FIG. 6.—An apple tree after two years' growth in the orchard; before and after pruning. Note vigorous branch (a) to the southwest. Branches (b) and (c) were added to the previous year's three scaffolds.

and weak crotches if headed back to equal lengths. This difference in length should be as much as six or eight inches. No secondary branch should be established on a scaffold limb closer than 15 inches from the point of origin of the scaffold limb. These secondary branches arising from the leader must be more severely cut back than the others and so selected as to fill the space between the framework branches. Two or more may be allowed to remain, all others being removed close to the leader. The leader is headed back just a little higher than the tips of the other branches. The method of the third pruning is shown in figure 6.

The Fourth Pruning.—The fourth pruning will follow the third year's growth in the orchard. It is, in general method, similar to that of the preceding year and will result in an approximate doubling of the number of branches in the tree. The same degree of care must again be exercised in choosing the new twigs which are to become permanent parts of the tree, to avoid weak crotches and to induce a symmetrical growth of the whole top. The leader will still be allowed to persist, but any tendency to outgrow the other branches must be counteracted by heavier heading back and by leaving a larger number of small twigs on it.

Later Prunings.—Subsequent prunings are similar to those described except that, as the time when the tree should begin to bear fruit approaches, general heading back of the twig growth will be discontinued and thinning out of branches will be restricted to those which are superfluous, grow across the tree, are diseased or dead, or tend to throw the top of the tree out of balance by too exuberant growth. At this stage the tree begins to develop fruit spurs, if apple or pear, and will begin to set fruit buds, if peach.

The years between the ages of four and seven for early-bearing kinds and varieties and six and nine for those which are later in coming into bearing are critical periods in the development of the trees. Most growers wish to have the orchard come into bearing at the earliest possible age, and under favorable climatic and soil conditions this is to be desired. There is, however, a general rule that a close correspondence exists between the time at which a fruit tree begins to bear and the length of its productive life. Early bearing is linked with early decline and late bearing with a long productive period. A gradual change from pruning methods adapted to young trees of those better suited to bearing trees should be made during this period. It involves the substitution of branch removal for almost all heading back and a general decrease in the relative amount of wood removed.

Influence of Climate and Soil.—The fact that different kinds, and even different varieties of the same kind, of fruit trees require pruning methods adapted to their individual peculiarities, especially while young, has been mentioned. Reference must also be made to two other factors which may still more strongly affect tree growth habit; *i. e.*, the climate and the soil.

Pruning to counteract deformity due to wind has been given much study, but the opinion now seems to be general that a windbreak is a better solution. Sunscald on the trunks and large branches of young trees can usually be prevented by low heading and the avoidance of too heavy pruning. Soil exerts a dominant influence over the shape of young trees. If the soil is fertile and the moisture supply adequate the tree will make a rapid, vigorous wood growth, and may then be shaped to fit the grower's ideal. But no amount or any system of pruning can rectify bad shape in a tree which is making but a feeble growth due to infertile soil. The first step in correcting a poor habit of growth of a tree so situated is to supply it with

an abundance of soil moisture and available nutrients. After such treatment has stimulated the tree into vigorous growth the usual pruning practices may be expected to succeed in bringing it to proper shape.

PRUNING FOR TREE MAINTENANCE AND FRUIT PRODUCTION

This portion of the discussion of pruning relates in point of time to the productive years in the life of the tree. The juvenile period has passed and the objects which the grower then had in view no longer govern; the vegetative stage has given way to the reproductive stage and pruning methods must be varied to correspond.

The New Objects.—Now that the fruit-bearing habit has been established, the objects sought through pruning have taken on a different character. First, maximum production of high-grade fruit is desired. Second, the trees must make sufficient annual twig growth to produce the needed leaves to nourish the fruit and maintain the vegetative vigor of the tree. Third, the size, including the height, and the density of the tree must be regulated.

Pruning for Fruit Production.—The relative value of winter and of summer pruning for the promotion of fruitfulness cannot be fully discussed here. Results of experimental work in this problem, carried on in many parts of the country, have been conflicting. It seems best in the light of our present knowledge to do most of the ordinary pruning while the trees are dormant. If summer pruning is done, the time should be soon after the principal twig growth has been completed and the method similar to that employed during the dormant period. Pruning, whenever done, should be so performed as to raise the grade of the fruit. It may assist in thinning the fruit, thus increasing the average size, will result in much better color on apples and peaches, and will, due to the more even admission of sunlight, delay the loss of spurs and bearing twigs on the interior of the tree.

Pruning to Promote Vigor.—The use of pruning for the purpose of increasing the vigor of fruit trees is limited. It forms a part of all rejuvenation work but must be combined with soil improvement measures and general good care to result in any lasting benefits. That heavy pruning promotes vigorous wood growth on the pruned parts of the tree is generally true, but it may at the same time do many other less desirable things. It may cause the growth of many water sprouts and suckers which will have to be removed; it increases the danger from sun scald, and it may interrupt the tree's established habit of fruit bearing.

Pruning to Regulate Size and Shape of Tree.—Maintenance pruning is done, in large part, to keep the trees in proper size and shape for both maximum and economical fruit production. The size, in spread of branches, which orchard trees may be allowed to attain is governed by the planting distance and the natural development of the variety under the soil and climatic conditions prevailing in each orchard. The planting distance should permit the trees to attain

their full horizontal growth without any interlacing of their branches or undue interference with orchard operations, such as harvesting and spraying. When such interference does arise the pruning, year after year, must include some heading back of horizontal terminals to confine each tree to its own area. The height must also be controlled. This is done by cutting the upright growing leaders back to strong lateral growing branches. This prevents the formation of a higher story in the tree, and should be so managed as to keep all of the fruit-bearing wood within 20 feet of the ground.

Methods of Maintenance Pruning.— The actual operation of maintenance pruning will differ from that previously described for tree building in two main particulars; namely, the heading back of

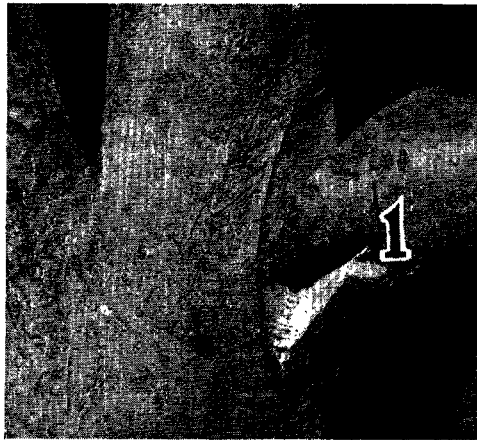


FIG. 7.—Removing a large limb. First cut was made at 1 to prevent stripping the bark down the trunk.

twigs will have almost entirely ceased and the removal of large branches will occasionally be necessary. In the latter work, care must always be exercised to make a neat, smooth wound and at the proper place. A large wound, smooth and so located that the sap flow of the tree will reach all parts of its margin freely, will heal over more quickly than a smaller one poorly made and located too far from an abundant supply of food. Pruning “stubs” should never be left. Figure 7 illustrates the removal of a large branch without danger of splitting the wood of the tree trunk. Care must also be taken when removing an upright-growing branch to make the angle of the cut such as not to weaken the wood to the extent that the weight of the lateral branch just below the wound will later cause the main stem to split and break down at this point. A light thinning out of small branches two to four years of age will be needed at each pruning. These slender horizontal or drooping branches produce

practically no marketable fruit and tend to interfere with the bearing of better-placed stout branches. At the same time crowded, crossing, diseased, dead and broken branches are removed. These cuts should be made carefully and close to the wood from which the branch is removed. The removal of all water sprouts and sucker growth requires attention also. The latter must be cut off close to the collar of the tree or the root and never at the surface of the ground. If water sprouts are removed early in the summer before they become woody, they can be snapped off by hand very quickly thus saving considerable cutting when the dormant season pruning is done.

Relation of Pruning to Pest Control.—General directions on pruning always recommend the removal of diseased branches. This is usually good policy and needs emphasis, but cannot be fully explained in this circular. It may be stated, however, that the more important diseases the control of which involves pruning are fire blight of the pear and apple, blister canker, blotch and black rot of the apple, and black knot and pockets of the plum. Wood infested with any of these diseases should be removed well below the site of the lesion and the prunings quickly and carefully burned. Bulletins which discuss the control of these diseases should be consulted. For this type of pruning the disinfecting outfit described on page 15 should always be available and used. Early removal of water sprouts aids in the control of aphids, as these insects prefer the shaded, protected parts of the tree.

PRUNING TOOLS AND THEIR USE

Necessary equipment in the way of pruning tools needs be neither complex nor expensive. It pays, however, to get the best when buying such implements and then to take good care of them.

The Implements.—A supply of pruning tools for each workman should include one tapered swivel saw with a number of spare blades, hand-pruning shears, 24-inch lopping shears, pruning knife, self-supporting ladder and a disinfecting kit. Careful, experienced workmen may find a pole pruner or a pole saw a time-saving tool, but either implement in the hands of a careless or inexperienced worker can cause much damage to a tree. Good types of some of the implements mentioned are illustrated in figure 8.

The Proper Use of Pruning Tools.—The hand shears and the knife are used to remove branches not more than three-fourths of an inch in diameter. With either of these implements the work can be better and more easily done if the left hand assists in making the cut by keeping the tissue just ahead of the edge of the blade under a strain. The knife is also used to smooth off rough wounds made by the saw or lopping shears. The saw may be used in removing all larger branches. The blade should be kept sharp and tight and every care exercised to make smooth, even wounds, nearly parallel with and close to the limb from which the branch is being removed. Branches as large as one and one-half inches in diameter

may be removed by the lopping shears. The pole pruner is used for branches high in the tree or out at the tips of the horizontal branches. It should never be used in cutting branches more than three-fourths of an inch in diameter. Practical pruners differ regarding the use of the ladder, but one of the self-supporting type is a convenience and lessens injury of the trees.

Equipment for Disinfecting. — Equipment for disinfecting wounds and pruning tools should always be at hand if the presence

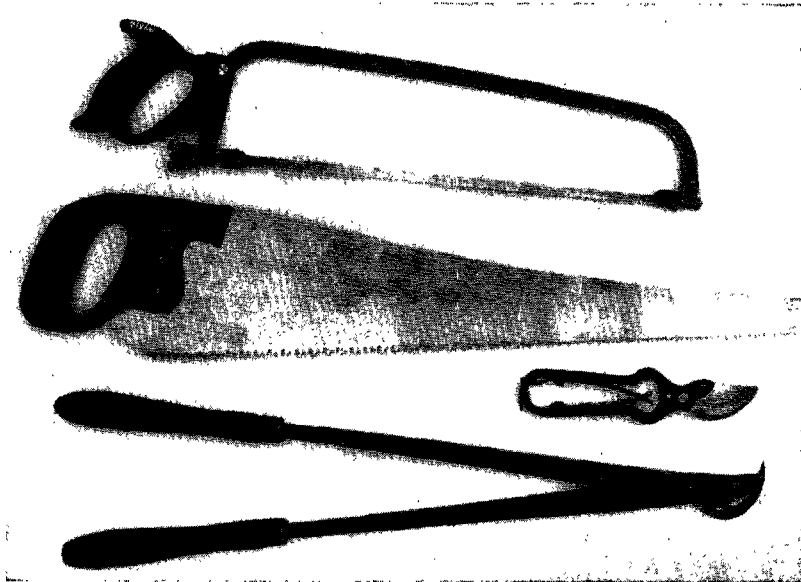


Fig. 8.—Good types of the necessary pruning tools.

of fire blight or blister canker is even suspected in the orchard. The outfit will consist of a wide-mouthed bottle containing the following solution:

Corrosive sublimate	1 part
Cyanide of mercury.....	1 part
Water	1,000 parts

A swab can be made by wrapping a number of thicknesses of cotton cloth around the end of a 12-inch stick. The swab is dipped in the disinfectant and the blade of the pruning tool, as well as the wound, is thoroughly moistened after removing a diseased limb and before starting work on another tree. This is much less bother than a description of it indicates, and should never be omitted. The chemicals may be obtained through any drugstore and will have attached directions for making the proper dilution. *CAUTION!* These chemicals are violent internal poisons, but will not injure the skin

of the hands by contact. The supply and the container should be labeled and carefully guarded.

Pruning Wound Dressings.— The rate at which wounds on fruit trees heal over is governed, by the kind of tree it is and its vigor. Wounds on apple and pear trees heal rapidly while similar wounds on cherry and peach trees heal slowly on young trees and will be slow or may fail even to start the healing process on old trees. A wound which exposes wood tissue for a year or more may become infected by various diseases if left unprotected. A good dressing for wounds should be nontoxic to plant tissue, durable, elastic, waterproof, antiseptic, not too expensive, and easy to apply. Many materials have been tested but none has ranked high in all these requirements. White lead and oil paint is one of the better dressings, but cannot be applied until the wound has dried. Turpentine should not be added and the paint should be somewhat thicker than for house use. Some grades of asphalt paint have given satisfaction and apparently stimulated healing. On large wounds the dressing may need to be renewed several times at annual or longer periods until healing is complete.

SOME SPECIFIC DIRECTIONS

PRUNING THE APPLE TREE

The foregoing discussion relates, in the main, to the pruning of all kinds of deciduous fruit plants, although the apple has been more particularly in the thoughts of the writers than have the others. Because of this, the statements applying specifically to the apple may be made brief.

Apple trees are vigorous-growing plants, under proper environment, and require moderate annual pruning. The work is usually done during the dormant period, at any convenient time after the leaves have fallen and before the spring flow of sap.

Fruit-bearing Habit.—The apple tree bears its fruit on short crooked growths known as spurs. These spurs are produced laterally on branches at least two years of age, bear the fruit from terminal buds, and, if not starved or too heavily shaded, will continue to produce for as many as ten or twelve years. Individual spurs tend to be biennial in fruit bearing and when most of the spurs on a tree produce blossoms the same season the tree as a whole is likely to assume the alternate bearing habit. Pruning should be so managed as to prolong the productive life of the fruit spurs by keeping the tops of the trees reasonably open to the sunlight. These spurs should never be pruned off as long as they remain fruitful, except in case they are situated directly on a large branch when the danger of their transmitting fire blight to the framework of the tree may make it advisable to remove them.

Trunk and Framework.— Under Kansas conditions 18 to 24 inches seems to be the proper length for the trunk of an apple tree. The first set of framework branches should be distributed over a

distance of 12 to 18 inches along the leader just above the trunk of the tree. It should consist of two or three well placed limbs and, if a choice is possible, branches should be selected which make a wide angle crotch with the leader and are evenly spaced around it. Living ties to assist in strengthening weak crotches may be made in young trees by twining together interior twigs from opposing limbs. The ends of these twigs should not be cut off until after strong union has taken place between them. Figure 9 illustrates a strong and valuable living tie. In the modified leader type of pruning additional main branches are allowed to arise from the leader until the number reaches six or even more. These must be selected with care in order that they may be strong and so placed as to make a symmetrical tree. One or two are added each year until about

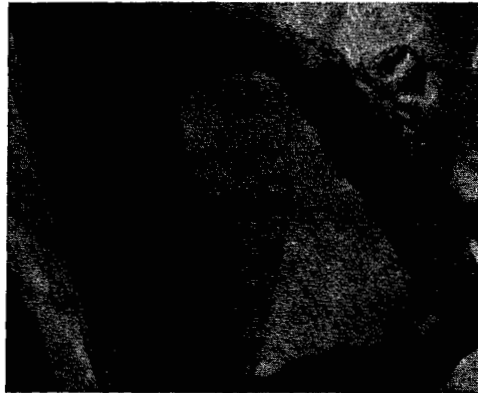


FIG. 9.—A living tie.

the sixth year when the leader is suppressed by cutting it off just above a strong lateral branch. Care must be taken to keep the top twigs of the lower framework branches nearly as high as those originating from the leader.

Maintenance Pruning.— The pruning of bearing apple trees need not be further discussed, as the preceding general remarks on that topic apply particularly to this fruit. Moderate annual pruning, such as will admit light to the center of the tree, prevent too great height growth, assist in sustaining the vigor of the tree as indicated by annual twig growth of six to twelve inches, and tend to promote abundant fruit production, is what is required.

PRUNING THE PEAR TREE

The pear is a close botanical relative of the apple and bears its fruit in much the same manner. Consequently, the same general methods of pruning apply. Two differences do exist, however. The habit of growth of most pear varieties is more upright than among the apples and the fruits do not develop red color as do those of

many apple varieties. The first variation indicates that greater care must be exercised to prevent the trees' becoming too high, and the second allows a somewhat more dense top to be tolerated. The danger of shading out valuable, well-placed fruit spurs is to be avoided as with the apple, however, and heavy pruning such as would tend to promote a soft, vigorous twig growth and water sprouts is never desirable because of the increased danger of fire blight attacks.

PRUNING THE PEACH TREE

The culture of the peach differs in many respects from that of the apple, and at no point is this difference wider than in pruning. The peach orchard should not be considered a permanent improvement like an apple orchard. It should be pushed into early and heavy bearing and a new one started as soon as the old one begins to decline. The tree also differs from the apple in its general habit of growth, the age at which it begins to bear, and in its fruit-bearing habit.

Bearing Habit.— The peach tree, in general, bears its fruit from axillary buds on twigs of the preceding summer's growth. If spurs are produced, as does occur under some conditions and with some varieties, they differ from apple spurs in that they are straight and bear from lateral instead of terminal buds. Terminal buds on peach trees are always vegetative in character. This difference in fruiting habit indicates one of the principal distinctions between the pruning of the apple and the peach. In the former the twigs are of value only in the general vegetative economy of the tree, and any specific treatment of them does not immediately affect fruit production. But with the latter the twigs have both vegetative and fruit-bearing functions, and their removal or their failure to grow directly affects the yield of fruit by the plant. (See figure 1 in this connection.)

The location of the fruit buds on the peach twig is variable. On most young trees, and on some varieties at any age, they are developed well toward the tips of the twigs. As the trees become older the fruit buds are formed lower on the twigs or distributed throughout the greater part of their length. The effect of this on pruning operations is manifest; the thinning out of twigs always thins the crop, but whether heading back does so or not depends on the location of the fruit buds, and must be made a matter of study in each orchard at pruning time.

Early Pruning.— Peach trees are usually bought from nurseries at one year of age. At that time the weak ones may be straight switches, but the more vigorous ones are likely to have lateral branches. The pruning at the time of setting will consist of heading back either type of tree at a height of 18 to 24 inches. Care must be taken to make sure there are good strong buds on the upper part of the stub which is left, and this requirement will sometimes necessitate leaving lateral branches bearing two or three buds, or occasionally, higher heading.

During the dormant period following the first summer's growth the trees should be given their second pruning. This will agree with the general directions (page 6) but will involve more severe heading back of the framework branches than with other kinds of fruit trees. The length left need not be more than one foot. Should the second

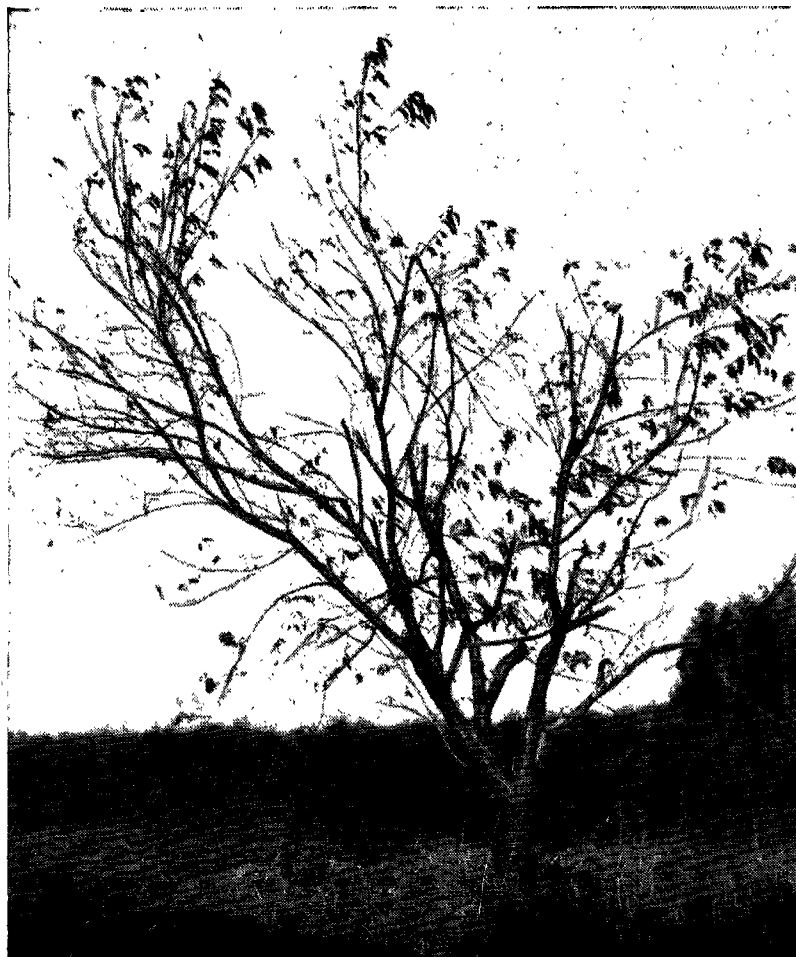


FIG. 10.—A high peach tree. Its badly broken condition is due to over-bearing.

or third season's growth of twigs show a set of fruit buds, which will be found as additional buds in the axils of the leaves and on one or both sides of the branch buds, the grower has a choice in methods of pruning. All twigs not needed for permanent parts of the tree may be cut away and those left severely headed back. This will build up the strongest tree possible but will sacrifice nearly all of the first

crop of fruit. The other method is to leave a considerable number of twigs which are not needed as permanent parts of the tree and head them back but slightly. These excess twigs will produce fruit that season and should be cut out entirely the following winter. Permanent branches left at the same time should be headed back, usually below the region where they bear fruit buds, and thus prevented from moving the bearing wood of the future too far from the ground.

The exact extent of heading back to be practiced in pruning young peach trees must be determined through local experience. The principal point to bear in mind is that too severe heading back delays fruit-bearing while too light produces high, (leggy" trees (fig. 10) which make all orchard operations more expensive. Making a correct decision in this dilemma constitutes the real test of the pruner's skill.

Pruning Older Trees.—As peach trees approach maturity constant care must be exercised to keep the tops open to the sunlight. If this is done by judicious annual thinning out of young wood, the tree will be kept low in stature and vigorous bearing wood will be retained in the lower interior parts of it. Low-hanging peach branches are of but little value. The fruit they may bear is poor in quality and color. Hence the pruner's attempt should be to keep the shape of the tree such that the framework branches will be somewhat upright, forming an angle of about 45 degrees with the central shaft of the tree. The top should be kept well open to sunlight and spray materials. All leaders should be subdued and their vigor directed into more horizontal growths.

Deheading.—Under certain conditions money has been made by "deheading" old peach trees and inducing them to grow new tops. This is usually done following a severe winter which kills the fruit buds. It consists in cutting all of the top of the tree back to the secondary branches as is illustrated in figure 11. Growth the following summer may be abundant and vigorous, may be confined to only certain branches, or may fail entirely. When abundant, it will require severe thinning out and heading back during the dormant period and probably will produce fruit buds the second summer following the deheading. Because of this certain loss of two crops and the possibility of the death of the trees, serious consideration should always be given the question whether it would not be better to grow a new orchard and, upon its reaching bearing age, remove the old one without attempting to rejuvenate it. The same tree after two season's growth is illustrated in figure 12.



FIG. 11.—The peach tree shown in figure 10 after deheading. The stubs are about two inches in diameter.



FIG. 12.—A deheaded peach tree after two seasons' growth.

PRUNING FRUIT PLANTS

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PRUNING THE SOUR CHERRY TREE

Of all the fruit trees grown in Kansas the sour cherry requires the least pruning, especially when it is grown on Mahaleb stocks and when the low spreading varieties are planted. However, the sweet cherry and the more upright growing sour varieties on Mazzard stocks require constant attention in order to prevent their becoming too tall for economical fruit harvesting.

Fruit-bearing Habit.—The sour cherry bears fruit on spurs and also in the axils of the leaves on one-year-old wood. The spurs, however, are straight, the terminal bud being vegetative, in contrast with the crooked spurs and terminal fruit buds of the apple. The distribution of fruit-bearing between these two types of organs is a characteristic of varieties and should be given study by the grower. If fruit is borne on the twigs any heading back may be a thinning process. The maintenance of the vigor of the spurs through keeping the top of the tree open is also important.

Pruning Practice.—One-year-old sour cherry trees are likely to have developed lateral branches in the nursery and the choice of the framework limbs is made at the time the tree is planted in the orchard, which should be as early in the spring as is possible and on fall-plowed land.

The principles underlying the choice of framework branches for these plants do not differ from those already described except three or four well-placed branches, six to eight inches apart along the leader, are selected when the tree is pruned immediately after planting. All others are removed. Those with wide crotches should be chosen. A trunk not more than 18 inches in length is best. The branches left to form the framework may be rather severely headed back to prevent their weakening or girdling the leader. Subsequent pruning throughout the life of the tree will consist of thinning out clusters of twigs which develop near the tips of the preceding year's growth, the removal of crossing, rubbing, and parallel branches and all water sprouts and suckers, and the suppression of any branches which show a tendency to grow too high. This, with the removal of diseased or dead branches, is usually all that is needed, though some heading back of the twigs may be desirable while the trees are young.

PRUNING THE PLUM TREE

Plum trees bear their fruit on both spurs and twigs, the relative amounts produced in each location being characteristic of the variety. This fruit does not require intense sunlight for the development of its color, but the top of the tree must be kept fairly open to maintain the vigor of the lower and interior branches.

The Method.—Five or six framework branches are usually developed on the plum tree. These are headed back as are also later permanent branches low in the tree, but after a well-balanced tree has been grown the need for heading back or, in fact, any save corrective pruning, ceases. A top not too dense but low and broad in shape is desired.

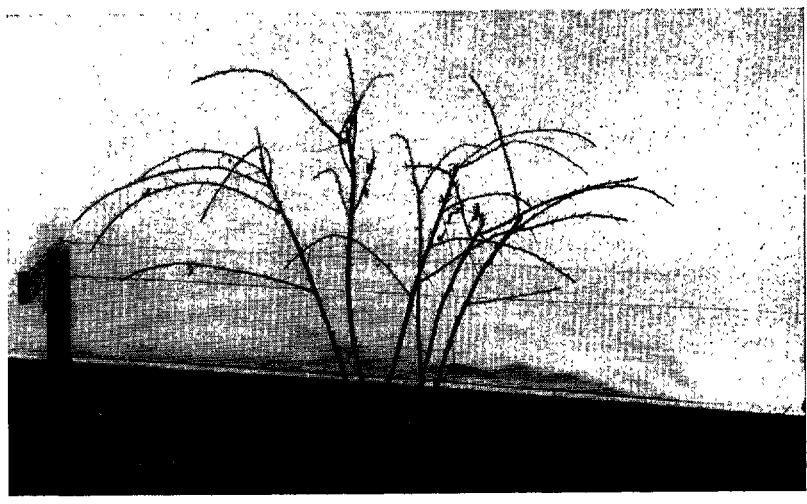
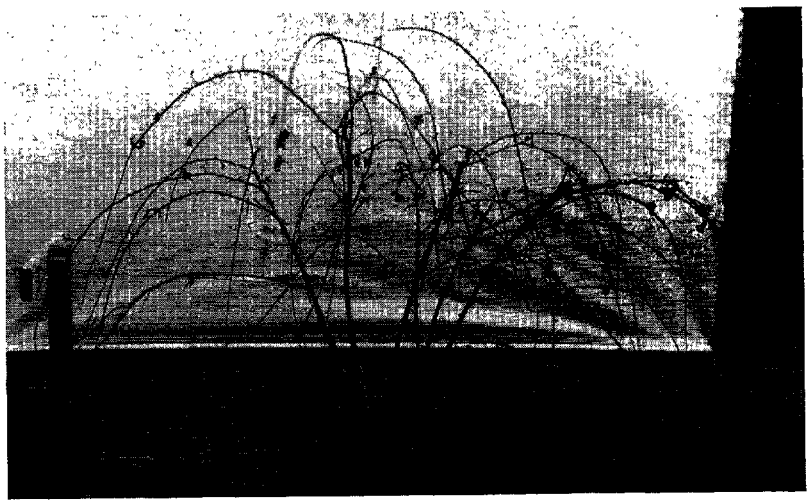


FIG. 13.—Dormant pruning of a "summer" topped black raspberry plant. (Top) Before pruning and (lower) after thinning out and heading back of canes.

PRUNING THE BUSH FRUIT PLANTS

The pomological group known as the bush fruit includes blackberries, raspberries, gooseberries, and currants. With reference to their fruit-bearing habit and method of pruning used with them, they fall into pairs, the first two and the last two belonging together.

Fruit-bearing Habit.—Blackberries and raspberries bear all their fruit on canes of the preceding summer's growth. These canes carry no separate fruit buds over the winter but bloom on shoots of the current season's growth. The fruit of the currant and the gooseberry is borne principally on spurs which are found on wood of considerable age, but which remains vigorous and productive for only three or four years.

Pruning Methods.—All of the small fruit plants should be pruned back severely when they are set out, but more especially the raspberry and the blackberry, on which but one cane bearing two to five buds should be left. The "handles" of tip layered black raspberry plants should be cut off close to the ground as they may otherwise transmit disease to the new plant. Other bush plants are cut back to but one cane and it should be only two or three buds in length. Two or three canes may be saved from the first summer's growth if the plants are vigorous, but weak plants should again be reduced to a single cane. The annual pruning during the remainder of the life of the patch will include: (1) The removal of all the canes which have borne fruit; (2) the reduction of the number of new canes to that which the plant can support through fruit production—between five and ten, depending on the fertility of the soil and the moisture supply; (3) the heading back of these canes to adapt them to the system of training followed; (4) the pinching out of the growing tip of the canes just when they reach a height of 18 inches if no trellis is used and the plants are to be self supporting. The dormant pruning of a black raspberry plant is illustrated in figure 13. All suckers which arise from the roots between plants must be dug out, but this is a cultivation problem rather than one for the pruner.

The general system of pruning the gooseberry and currant plants is similar to that sketched above except that the old bearing wood is removed each third year instead of each year. Each plant may contain about six canes, the oldest two of which are annually cut away and replaced by two new shoots of that year's growth, these to be allowed to bear three crops when they in turn are removed. All new shoots in excess of those needed to replace old canes are pruned out close to the crown of the plant.

Pruning of the American grape is discussed in Circular 177, Grape Growing in Kansas, which may be obtained free from the Director of the Agricultural Experiment Station, Manhattan, Kan.

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