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PRUNING MATURE FRUIT TREES

BY

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PRUNING MATURE TREES*

O. B. WHIPPLE

INTRODUCTION.

Many and varied are the excuses offered by the man who owns an unpruned orchard; he is ashamed of the neglected trees and tries to justify himself by advancing what he considers, or more likely what he tries to persuade himself, is a good reason. One holds that pruning is little short of sacrilege, contrary to the laws of nature; another tells of his fond recollections of childhood and what excellent fruits he picked from the old apple tree, pruned alone by nature; another says it does not pay, and in his particular case it does not, for the chances are that the orchard is neglected otherwise. The only excuse that has any semblance of justification is that of ignorance, and that does not excuse the man who makes no attempt. Nature's object is the production of seed with provision for its distribution, and she is satisfied when a cherry is produced with enough flesh to attract some fruit-loving bird that may, perchance, drop the seed far from the parent tree. Man grows the fruit for its fleshy parts, and tries to improve these parts, as much by placing the plant in a more favorable environment, as by plant breeding and selection. The man who has the fond recollections of childhood would no doubt find them only childish fancies, as did the man who returned to his childhood home and tried coasting, he would be disappointed. The man who cannot afford to prune, cannot afford to grow fruit, and the man who does not know how to prune must learn; the principles are not complicated.

PHYSIOLOGY OF PRUNING.

To be an intelligent pruner one must know something of plant physiology. He should know the effects produced by pruning at different seasons of the year, how to make a cut that will heal most readily, and the influence of pruning on the fruit bearing habit of the tree. It may be said that in Colorado the fruit grower prunes at his leisure, but luckily this conforms pretty closely to the proper season, when looked at from a physiological point of view. It is generally conceded that pruning during the dormant season incites wood growth, while pruning during the growing season promotes fruitfulness; and, since our trees tend to overbear, it is logical for us to prune largely during the dormant season.

Although it is said that pruning during the summer season may encourage the formation of fruit buds on tardy bearing varieties, it may have the opposite effect, unless done at the proper time,

*This bulletin is supplementary, to Bulletin No. 106, by Prof W. Paddock, which deals with the pruning and training of young trees.

and may cause late growth and unfruitfulness. To give the desired results one must summer-prune shortly before the season of growth ends; earlier pruning starts new growth, while late pruning gives no results. The benefit derived from summer pruning seems to depend upon the ability of the pruner to prune at a time to bring about early maturity. In an irrigated section where soil conditions are easily controlled, the same end may, no doubt, be more easily attained by proper manipulation of the irrigation water.

Both the season at which the wound is made and the character of the cut have an influence upon the healing process. The pruner should remember that all food material capable of healing a wound is taking a downward course through the inner bark and that, to heal well, a wound must be in a position to intercept the downward flow of sap from foliage higher up. When a limb is to be removed entirely, the cut should be at the union with, and parallel to the surface from which the limb arises. Where limbs are to be headed-back they should be cut to a side limb and not to a bare stub. Wounds naturally heal best when made at a season of the year when growth is most active, but, with the possible exception of wounds made in early winter and subjected to a long season of drying, the season at which the wound is made has no important bearing upon the healing process. The grower who has a small orchard that will permit of such a practice, should delay the pruning until as near the opening of the growing season as possible.

The influence of pruning upon the fruit-bearing habit of the tree has been briefly mentioned, but the following pages will show how a fruit-bearing habit may, to a certain extent, dictate a course in pruning. The fruits with which this discussion has to deal have two general types of fruit-bearing; from terminal fruit buds and from axillary fruit buds. The first type of fruit bud is well represented in the apple and pear, and the latter in the stone fruits. Trees which produce axillary fruit buds are naturally more prolific and require severe pruning as a means of thinning the fruit. In fact, a system of pruning under which the tree with axillary fruit buds would thrive, would cause the apple tree to overgrow to such an extent that it would be rendered almost barren. The point may be more fully illustrated by comparing the peach and the cherry. Although both develop axillary fruit buds they differ in their fruiting habits; the fruit buds of the cherry are seldom found on the stronger growing new wood, and severe pruning, as practiced on the peach, would throw much of the strength of the tree into the production of strong wood that would carry very few fruit buds. We have said that in the apple the type of fruit-bearing is from terminal buds, yet, many varieties develop axillary fruit buds. Varieties which develop axillary fruit buds and bear terminal fruit buds on young

spurs all tend to overbear, and require severe pruning. So to a certain extent one can decide for himself how much to prune by observing how the tree bears its fruit.

TREATMENT OF WOUNDS.

The argument in favor of dressing wounds is that it prevents decay and checks evaporation, both of which might interfere with the healing process. While in our arid climate the first is hardly applicable, the second should probably be doubly important. Yet, the matter of dressing wounds is not so important, but that work improperly done is worse than no treatment. A good lead paint is one of the most satisfactory dressings yet found. Rather a thick paint should be used, and careless daubing of the surrounding bark should be avoided. Grafting wax is a good dressing, but is rather expensive and difficult to apply. Other materials have been used, some successfully and some disastrously, and the grower is to be cautioned about experimenting; better stick to materials known to be safe and efficient. Growers often overdo the matter and waste time treating small wounds. Surely a wound less than one and one-half inches in diameter is not worth bothering with.

These suggestions apply to wounds made by the careless cultivator, as well as those made by the pruner. Unsightly wounds and permanent injury may often be avoided by proper treatment of trunk wounds. When the body of the tree is injured the ragged edges of the bark should be pared off to sound tissue and the whole injury covered with paint or grafting wax. If promptly done, this prevents drying out of the tissues, and new bark will readily form, except on parts where the outer wood cells are actually destroyed, and in time this will grow over. Wrapping the injury with cloth, or if it is near the ground, mounding earth up over it will often answer the same purpose.

PRUNING TOOLS.

Every pruner should be furnished with good tools; good tools encourage him to do good work. This does not necessarily mean that he must have every tool on the market, many of them are useless; it does mean, however, that the axe and a dull saw have no place in the catalogue of pruning tools. The pruner needs a good saw, a good pair of light shears, a pair of heavy shears, possibly a good heavy knife and, of course, a good ladder. Two common types of saws are found on the market. The common saw with teeth on both edges is a good, cheap one and will answer the purpose in many cases. The various makes of the swivel saws are much handier, however. The blade is stretched between swivels and can be turned to any angle with reference to the frame. It is well adapted to close work in the crotches of the tree. This type of

saw can generally be bought for three dollars. The blades are not so frail as they look and seldom break, if properly handled; they can be replaced at a cost of fifty cents. It is really the best type of pruning saw and should be more universally used.

A good type of hand shears is indispensable for light work. Various makes are on the market; buy the one that appeals to you. A pair of heavy shears is almost as essential; they take the place of the saw in many cases and will do the work in less time. They are used in heading in limbs where the saw can hardly be used; the peach pruner finds good use for them. They work well on limbs up to one and one-half inches in diameter. The only objection the writer has to this tool is that the pruner sometimes gets careless and leaves stubs. There is a type of heavy shears on the market that has two cutting edges instead of one, but it seems to do no better work. The pruner finds very little use for a knife in pruning mature trees and seldom carries a special pruning knife. Several types of the long-handled tree-pruners are on the market, but they are of little value in the orchard. The pruner should be close to his work, and with a good ladder and short-handled tools he will do better work.

SUGGESTIONS FOR PRUNING AS APPLIED TO SPECIFIC PLANTS

THE APPLE.

With the young orchard well grown, the pruner has probably solved the most difficult problem in the pruning of the apple orchard; the principles involved in the pruning of the old orchard are not complicated. Nearly all of our standard commercial varieties of apple tend to overbear in Colorado, and one of the first objects of the pruner should be to overcome this tendency; the more prolific the variety the heavier the pruning. To be an intelligent pruner one must also acquaint himself with the habits of growth of the different varieties, as well as habits of fruit bearing. Upright-growers will require pruning to spread them, and straggling-growers such heading in as will make them grow more upright. The head should be kept reasonably open and well supplied with fruiting wood throughout. The idea of the open head, however, can be overdone. (Fig. 1.) Limbs that interfere or are liable to form bad crotches should be removed and the main branches headed in as the tree indicates the need by overbearing or by weak growth. Moderate annual prunings are always to be preferred to heavy pruning at irregular intervals; these heavy prunings tend to upset a regular bearing habit and may bring on an "off-year." However, if it should become necessary to employ drastic measures in pruning the neglected orchard, do not be afraid to do it, but do not make the mistake of selecting an "off-year" in which to do the heavy pruning.

A discussion of the amount of pruning required by different varieties could almost as well be introduced as those on the pruning of different kinds of fruit trees. Yet, the growth of the tree, and necessarily the pruning, depends much upon soil conditions; and, while it might be possible, it would hardly be safe to lay down definite rules for the pruning of any particular variety. Both the Winesap and Missouri (Pippin) may be classed as prolific varieties that require severe pruning. The Jonathan, at the age of eleven or twelve years, almost invariably begins to grow spindling in the top and requires frequent cutting back to keep the tree in a thrifty condition. Figure 3 shows a Jonathan tree well headed-in, with stocky growth, while Figure 4 is of a neglected tree of the same variety, of the same age. These willowy limbs bear small leaves and an abundance of apples that rarely come up to size, and the liability of such neglected trees breaking down under a load of fruit is well shown in Figure 2. Figure 3 shows how sprouts are largely avoided by cutting to side limbs. Varieties that bloom heavily but set very few fruits should be treated as varieties that overbear; prune them heavily during the dormant season. Varieties that refuse to develop fruit buds should not be pruned excessively, during the dormant season at least. Summer pruning is supposed to incite fruitfulness, but does not always give uniform and satisfactory results. Such varieties may be forced to fruit more easily by withholding water in midsummer, or better still, plant them on a light soil; poor bearers are nearly always strong growers, and very often a shy bearer on heavy soil is prolific on a gravelly hillside. The Yellow Newtown is a striking example of a variety of this type. The growth and fruiting habit of the tree, we will see determine largely what treatment it shall receive at the hand of the pruner. While pruning may not take the place of thinning entirely it may be employed as a means of correcting the faults of alternate bearing and of overbearing.

PRUNING THE APRICOT.

In the general growth and fruiting habit of the tree the apricot occupies a position between the cherry and the peach. The fruit buds are developed in the axils of leaves on both shortened spur-like twigs and the stronger growing new wood. These fruiting spurs of the apricot differ from those of the cherry in that they develop no true terminal buds. The apparent terminal of the new growth is a lateral bud and may be either a fruit bud or a branch bud. It is generally a branch bud, but it is not uncommon to find weak spurs bearing only fruit buds, and such spurs with no branch bud to continue their growth must perish at the close of the fruiting season.

The general plan of pruning the apricot will resemble that fol-

lowed in pruning the peach, although, as a rule, it should be hardly as severe. The young tree is a strong grower and must be put through about the same course of training as the young peach. This strengthens or stiffens the frame work and develops a broad, low-headed tree. Normally the tree does not grow as much new wood as the peach, and it is often possible to do the majority of pruning by simply heading in the strong growth. The pruning should be sufficient to keep the fruiting wood growing thriftily and the tree well within bounds. While to a certain extent pruning reduces the labor of hand thinning, it will not take its place entirely. If properly thinned, the apricot will stand much neglect as regards pruning, but proper pruning is a matter of economy. As the tree grows older it will need more severe pruning to force new fruiting wood in the center. The absence of fruiting wood in the center of the carelessly pruned apricot tree is even more pronounced than in the neglected peach tree. The top should be well spread and the fruiting area of the head maintained near the ground.

While the season for pruning the apricot in Colorado generally extends through February and March, summer pruning is quite extensively practiced on the Pacific coast, where the trees are headed in as soon as the crop is harvested. This starts the smaller laterals into stronger growth and they develop an abundance of fruit buds. Limited observations of the same system employed in our climate suggest that it may not be without merit here. While this late growth is inclined to be immature and may suffer from severe winter freezing, it is more desirable from the standpoint of late blooming. Fruit buds on this immature wood open from four to five days later than those on mature wood. This may frequently be an advantage in localities where late spring frosts are not uncommon. The advisability of such a practice has not been fully demonstrated and is given only as a suggestion.

THE CHERRY.

The man who objects to pruning, vowing homage to nature, should grow cherries, for there is no fruit tree of which it may be said that nature is a more efficient pruner. In fact, it is a common impression among fruit growers that the mature cherry tree needs no pruning. This condition of affairs, however, is more largely due to indifference on the part of the markets than to an inability to get results from pruning. When competition becomes more keen, fancy grades of cherries will gain in popularity and, as in the growing of other fancy fruits, pruning will be found expedient.

With the cherry the fruit is borne on one-year-old wood and mostly on short growths, or spurs. An examination of the spurs will show that they differ from those of the apple in that they carry

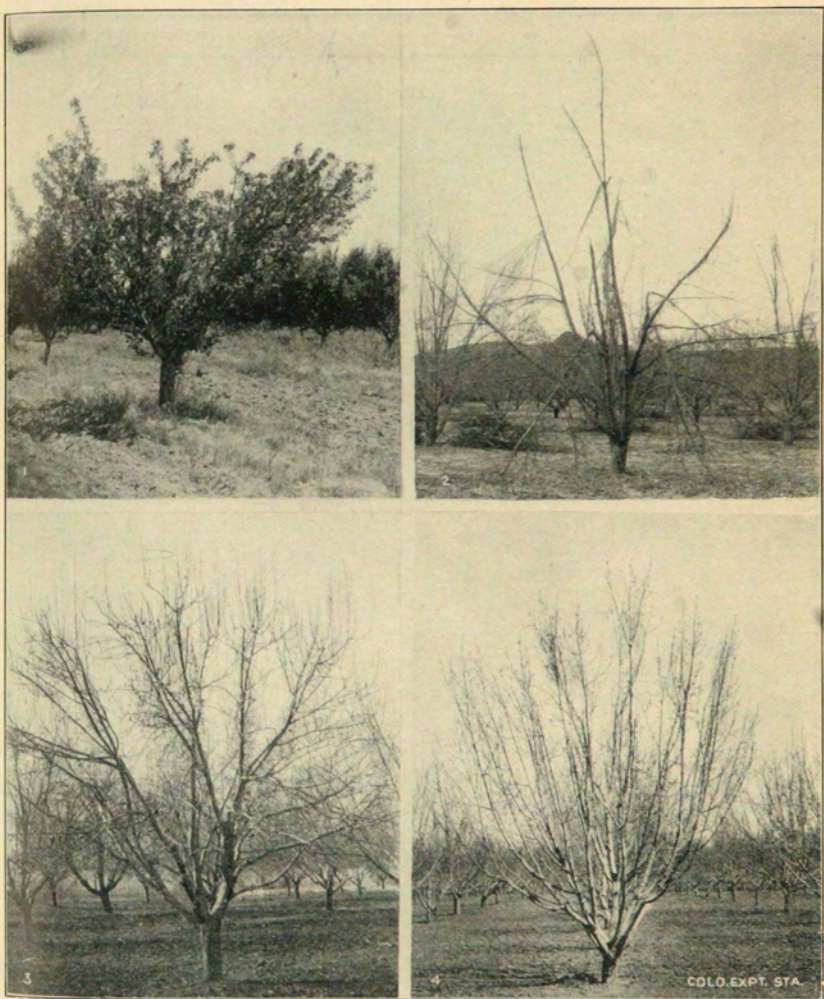


Fig. 1.—An exaggerated type of open head; a waste of fruiting space in a Colorado apple tree.

Fig. 2—A tree allowed to grow at will. Ruined by a heavy crop of fruit. It was not overloaded for it matured its crop, but the fruit was all near the tops of the long arms.

Fig. 3—Jonathan tree well headed-in and stocky. Such a system of pruning is necessary with the mature Jonathan.

Fig. 4—A neglected Jonathan. The leaders are long and willowy and the tips are loaded with fruit spurs. The top of these leaders develop small leaves and set a large crop of fruit that rarely comes up to size. All these leaders should be cut back to strong laterals. A candidate for the same fate as Fig. 2.



Fig. 5.—A five-year-old Elberta peach tree. Almost perfect. This tree should not be allowed to grow much higher.

Fig. 6.—A four-year-old Elberta. Good form; has made a good growth with fruiting wood near the bottom as well as in the top.

Fig. 7.—The same as Fig. 6 after pruning. Plenty of fruiting wood still left, and a good framework for a productive tree. In about one more season it will have reached the limit or height. It will broaden out a little yet if it is properly pruned in the top.



Fig. 8.—A seven-year-old peach tree getting too high. Notice how the fruiting wood is being smothered out below. About two more years of such pruning and it will be like the tree shown in Fig. 11. Severe pruning in the top will yet save such a tree without cutting down the yield in any one season. This tree has been spoiled largely because the pruner did not have the room to properly spread it.

Fig. 9.—Type of tree similar to that of Fig. 8, showing about how such a tree should be pruned. Could have been cut back a little more severely in the top to force more new wood below.

Fig. 10.—Eight year old peach tree that has been well pruned and trained. Notice how well the fruiting wood is distributed throughout the head. See how nearly it conforms to a right angle. An ideal shaped tree and the heavy pruning in the top indicates that the pruner does not intend to let it grow away from him. This tree is good for seven more years at least.

Fig. 11.—A tree of the same age as that shown in Fig. 10. The pruner has tried to increase the bearing surface by increasing the height of the tree, and notice the result. A tall, leggy tree with no fruiting wood below. This tree would be a good subject for a system of pruning similar to that shown in Fig. 12.



Fig. 12.—A peach tree severely cut back for the purpose of forming a new top. Some of these stubs will die back but the tree will form a good, new top. It would have hardly been safe to cut to stubs of this size had it not been for the smaller wood below.

Fig. 13.—A new top, two years old, on an eleven-year-old peach tree. Such a new top is well worth the loss of one crop of fruit.

Fig. 14.—A pear tree improperly headed-in. It is only reasonable to suppose that leaving large stubs with numerous fruit spurs bearing branch buds would result in a large number of sprouts. Heading-in will, of course, always start some sprouts, but their number may be greatly lessened by cutting back the leader to side branches.

Fig. 15.—Is the same tree as that shown in Fig. 14 one year later. It tells the whole story.

both terminal and axillary buds, the terminal with few exceptions being a branch bud and those developed in the axils of the leaves mostly fruit buds. Fruit buds are also found as axillary buds near the base of the stronger growing new wood. The cherry, then, has a fruiting habit which would indicate that the tree will stand only moderate pruning. Trees overpruned produce an excess of strong, new wood with few fruit buds. In neglected trees the spurs become weak and spindling from constant bearing; the flowers are borne singly in the buds, when they should be in pairs or triplets, and the tree produces a large number of medium-sized fruits.

The manner of pruning will depend somewhat on the variety, but the general plan should be to keep the fruiting area of the tree as near the ground as possible; to shade the trunk, to prevent sunscald, and to encourage the growth of fruiting wood throughout the entire top. The sweet and semi-sweet varieties are upright growers and will need some heading in to keep them within bounds. The rapid growth forced by pruning must be checked by careful watering. Unless this precaution is heeded immature growth will result and, young trees especially, may be killed outright during severe winters. Like the Anjou pear, some of the cherries produce an excess of weak fruit buds that fail to set fruit. When this is found to be the case it is a good sign that the tree is not being pruned as severely as it should be. Heavy pruning during the dormant season will often correct the fault. On the contrary, lack of bloom is generally due to excessive pruning or overwatering. Occasionally we find a variety where this fault is characteristic, but it may generally be overcome by proper handling.

PRUNING THE PEACH.

There is probably no fruit tree that gives the careful, observing pruner as much pleasure in pruning as does the peach. Results soon indicate whether the pruning is right or wrong, for no fruit tree will suffer more from neglect, and none respond more promptly to careful treatment. This prompt response, so plainly indicated, lends not a little inspiration toward the proper training and care of the peach orchard, and it is safe to say that, largely on this account, no fruit tree is better pruned than is the peach in our recognized peach sections. The practice is simple, and lack of courage is more often responsible for failure rather than complicated principles. As mentioned before, the peach develops its fruit buds in the axils of the leaves, and the fruit is borne on one-year-old wood; a system of fruit bearing that makes severe pruning a prerequisite to successful peach growing.

In pruning the peach the object of the pruner should be to cut out enough wood to force good, strong growth each year; to re-

move superfluous fruiting wood, and to give the tree the desired shape. The mature peach tree should make an annual growth of at least eighteen inches. With such new growth much of the new wood will have to be removed entirely while that remaining may be cut back to remove a part of the fruit buds it carries. While some object to shortening-in the fruiting wood, contending that it injures the fruit, the years of experience of our most careful growers recommend rather than condemn such a system of thinning. While it does not take the place of hand-thinning entirely, it does save a great deal of tedious hand work. It is hard to say just how much of the new wood is to be removed or how much the remainder should be shortened in. Probably four-fifths is removed entirely, the amount removed from that remaining depending more upon the location of the fruit buds. With the older tree it may be half or even more, while in the case of the young tree it may be necessary to leave the laterals unpruned, on account of the fruit buds being nearer the tips. Figure 6 shows a four-year-old Elberta that has made a very satisfactory growth. Figure 7 shows the same tree well pruned. From now on this tree must be carefully watched to keep it within bounds. As the framework stiffens the tree may be spread a little more, but it should not be allowed to go much higher. It is a common practice to do the heavier pruning earlier in the spring, leaving the clipping back and thinning of the new wood until later, some waiting until all danger of frost is past. The pruner should constantly keep before him an ideal form for the peach tree, the well grown young orchard, at the mercy of a careless pruner, may become ungainly and unproductive at the age of ten years. Effort should be made to keep the fruit as near the ground as possible; most of the fruit on a five-year-old tree should be reached from the ground, and in no peach orchard should the picker need a ladder longer than six feet. (See Fig. 5.) The depth of the fruiting area of the peach tree will seldom exceed six or seven feet, and an attempt to increase this depth only results in a smothering out of the wood below. Figure 8 shows a seven-year-old tree that is really getting too high.. Note the scarcity of fruiting wood in the lower part of the tree. This tree may be forced to develop new wood below if the top is well cut back. Figure 9 shows about how such a type of tree should be pruned. This tree could have still been pruned a little heavier in the top. A better plan is to increase the productiveness of the tree by increasing its spread rather than its height. The ideal peach tree is one in which the top just comes within a right angle or, in other words, the spread should be almost double the height. Figure 10 illustrates the point very well. Notice how the head is well filled with fruiting wood, and compare with Figure 11, a tree of the

same age. With such a system of training the first tree will be productive at the age of fifteen years, while the latter, now ten years old, must be rejuvenated by severe heading-in or be discarded as unprofitable. There is no fault to which the old peach tree more often falls heir than that of the absence of fruiting wood in its lower parts. Such wood below can only be maintained by vigorous pruning in the top. The center should also be well filled with fruiting wood, as space may be unnecessarily wasted by training the top too open; the open center is not a necessity in our arid sections where we enjoy an abundance of sunshine. The fruiting wood in the center of the tree will hardly appear as strong as that nearer the tips, but, nevertheless, some of our best fruit comes from short and apparently weak spurs along the larger limbs. Some have tried summer pruning (thinning out the new wood in the center of the tree), hoping to strengthen the wood remaining, but it has not given satisfactory results; too often it starts new growth that is immature and unfruitful.

It is seldom that we read a paper upon the subject of pruning the peach orchard without we see some reference to the treatment of winter-injured trees. With the exception of young trees grown too late, or orchards in higher altitudes or northern latitudes, such injury is not often experienced in Colorado. It is well for the grower to remember, however, that the winter-injured peach tree makes the best recovery when it has received a moderately severe pruning. Another subject more worthy of mention is that of the rejuvenation of the old peach orchard. The occasional loss of a peach crop by late frosts offers an excellent opportunity to grow a new top on the old peach tree. Figure 12 shows a peach tree headed-in to secure a new top, while Figure 13 shows a tree eleven years old, two years after such a pruning. The cutting back should be done as soon as possible after the loss of the crop can be ascertained; severe pruning as late as the first of June forces rank new growth that develops very few fruit buds. Rather large limbs may be cut if the bottom of the tree has some smaller growth, but cutting to bare stubs over two or three inches in diameter is hardly advisable.

THE PEAR.

The mature pear tree is not one that requires a great deal of pruning, nor does it allow lack of pruning to interfere seriously with its proper behavior, so far as fruit bearing is concerned. However, when the market demands that the fancy pear be from $2\frac{1}{4}$ to $3\frac{1}{4}$ inches in diameter, the owner of the old pear orchard is often reminded that the trees need pruning. In general, the manner of fruit bearing of the pear is practically identical with that of the apple. The spurs are a little shorter and give the tree rather a

more barren appearance; and, although some varieties develop axillary fruit buds quite freely, the majority of the fruit buds are terminal on these short spurs. The different varieties vary somewhat in their fruiting habits, and a study of this character will, to a certain extent, indicate how much pruning each will require.

Apparently the grower accepts the upright-growing habit of the pear as the inevitable, with hardly so much as an effort to train it otherwise. With proper training there is no reason why the pear tree may not be grown with a moderately broad and low head. Pears that grow in the tops of high trees are too often scarred, if not whipped off by wind, before they are mature and, besides, it is too expensive to pick them. The forming of the tree belongs more to the province of pruning the young tree; but a little judicious heading-in practiced on the old tree, taking care to cut to outside buds or branches, will improve on an undesirable form. Too often the tree is allowed to grow at will until it is out of reach, and then, in a fit of desperation, the grower resorts to a system of heading-in shown in Figure 14. This system may be all right for the lawn hedge, but it is not well adapted to the pear, as is shown by Figure 15, the same tree one year later. By the time the pruner gets through with this tree he will have decided that it is poor policy to head-in pear trees. Had the pear tree been properly headed-in from the beginning, the result would have been different. It is only reasonable to suppose that leaving stubs of large limbs which bear numerous fruit spurs will result in rank growth from these spurs, especially during an "off-year" when the spurs carry a large proportion of branch buds. When it becomes necessary to head-in the large pear trees, always cut to side limbs and do not make the mistake of choosing an "off-year" to do this severe pruning; a heavy crop tends to check rampant growth encouraged by rigorous pruning.

While some growers really believe that the pear tree will not stand pruning, we know of no variety to which moderate pruning is detrimental. On the other hand, there are varieties which require severe pruning. In spite of the fact that the Anjou pear is a favorite on the market, many growers will not consider the planting of this variety. Yet a few of its more forbearing admirers have demonstrated that its one bad fault (tardy bearing) may be overcome by proper pruning. The young tree blooms freely and apparently sets very well, but before the fruits reach any size the crop thins itself to almost nothing; even the old tree carries a very small proportion of its bloom to maturity. Heavy pruning during the dormant season will stop this shedding and insure a good crop of fruit. The practice of the most successful growers is to cut the tree back each year and remove some of the new wood that may have been forced by the last pruning. When once the tree begins to bear

good crops, there is less trouble about its shedding. Some other varieties are more tardy about blooming, and heavy pruning during the dormant season would only augment this objectionable character. Such varieties often respond to June pruning; and, if they do not, girdling in June will often prove beneficial. In girdling, a strip of bark one-quarter of an inch in width and extending entirely around the trunk may be removed; but perhaps a safer plan is to remove vertical strips of bark one and one-half inches in width, leaving other strips of about the same width intact. If the wood is uninjured these wounds soon heal and do not permanently injure the tree.

It is difficult to say just how much the pear should be pruned; the grower will have to decide that for himself. The main object of pruning the mature tree should be to thin the fruit and thus improve the quality, as well as to encourage more regular bearing. However, the grower must not feel that pruning will take the place of thinning entirely; to get the best results the two must go together.

The subject of pruning the pear could hardly be considered complete without some reference to the control of pear blight. While it is true that when once the pear tree is inoculated with blight, we must lay aside many of our ideas about pruning and cut to remove the affected parts, it is also true that, in a way, the tree may be trained to reduce to a minimum the loss from attacks of this disease. After the tree begins to bear, heavy pruning which may induce rampant growth should be avoided, if possible, as it is generally conceded that blight is more destructive to trees making rank growth. The majority of inoculations take place through the blossoms, and one of the most serious types of injury is that occasioned by the entrance of blight into larger limbs through short spurs. Through these short spurs the germs gain entrance to the larger limbs and often girdle them before discoloration indicates their presence. It is the nature of the pear tree to develop these short spurs in abundance, and it will be necessary to remove them from the base of the larger limbs. Strong new wood may be allowed to take their places, which may later be developed into fruiting branches. Then should blight enter these blossoms, they are far enough removed from the main limbs that the disease may be detected and intercepted before it reaches them.

PRUNING THE PLUM.

Under this head is grouped a large number of species and varieties of fruit differing widely in their habits of growth and of fruit bearing. Were it not for the fact that common practice seems to discourage the pruning of many varieties to any considerable extent, this would be a difficult subject to handle; no well defined

system of pruning would suit all. In their habits of fruit bearing the majority of the plums resemble the apricot very much. Still many of them, like the cherry, show more of an inclination to bear only branch buds on the thriftier new wood. Like the apricot, the plums, with possibly a few exceptions, develop no true terminal buds. Except on weak spurs, the last axillary bud is generally a branch bud which continues the growth of the branch or spur the following season. The fruit buds are developed in the axils of the leaves on both spurs and the ranker growing new wood, the different varieties showing considerable variation in this respect.

The body of the plum tree is subject to injury from sun-scald, and it goes without saying that the tree should be headed low. The young trees of most varieties will need cutting back, and the tops thinning out, to develop them into desirable shaped trees. Some varieties will require pruning to spread them, and others of a more straggling habit, will need cutting back to inside buds or branches to make them grow more upright. As mentioned before, the bearing plum tree, according to local custom, receives at most only moderate pruning. As a rule, the *Domestica* plums, locally represented by the various prunes, are pruned very little after they reach the bearing age. There are certain varieties which tend to overbear, however, and a certain amount of thinning out of the fruiting wood would greatly facilitate hand-thinning, promote more regular bearing, and improve the quality of the fruit. The pruning of the native plums is left largely to nature, although there is no reason why moderate pruning might not improve the quality of the fruit and lessen the difficulty of picking. There is little doubt but that such varieties as the Burbank, Abundance, Satsuma, Red June, and others of the Japanese group, respond satisfactorily to rather severe pruning. In fact, they are more like the apricot in their fruiting habit and thrive under the same system of pruning. When neglected they tend to overbear alternate years. They should receive an annual heading-in and thinning out to force strong new growth, which makes very desirable fruiting wood. While pruning as a means of thinning the fruit is not without merit in the case of the plums, it does not seem to give results comparable with those obtained in pruning the peach. The grower of fancy plums must supplement moderate pruning with hand-thinning.

PRUNING THE QUINCE.

While the importance of the quince industry in Colorado might not warrant the insertion of this paragraph, the almost criminal neglect from which the quince tree suffers as regards pruning would move one to writing a book. Among the fruit trees herein considered, the quince has a fruit bearing habit peculiar to itself. With the advance of spring the dormant buds on the one-year-old wood push out leafy shoots from three to four inches in length and these are terminated by a single flower. While both axillary and terminal buds produce these flower-bearing shoots, the stronger flowers come from the axillary buds on the last half of the annual growth; terminal buds more frequently give rise to branches or, at most, weak flower-bearing shoots. Considering its fruiting habit then, the quince should receive about the same pruning as the peach. While with some varieties the plant assumes a tree-form quite readily, others are, at their best, only a bush. A course of severe pruning for the young tree, however, will aid the grower in securing a desirable shaped tree. When the tree has reached a bearing age it should be pruned annually by thinning out the new wood and clipping that remaining back to about two-thirds of its length. With proper pruning, the quince should produce annual growths from twelve to twenty-four inches in length. Too rank a growth is not

desirable on account of the stronger fruit buds being nearer the tips, and in cutting back such rank growth the pruning must not be too severe. The plant should be made to assume as near a tree-form as possible, and then, in addition, it should be pruned with the idea of growing a goodly supply of new wood each season.

THINNING FRUIT.

In fancy fruit-growing, the necessity for thinning will become more and more apparent as the acreage devoted to orchards increases and competition becomes more keen. While the wisdom of thinning peaches is no longer doubted, the growers are not so willing to take up systematic work in thinning apples and pears. But the time is coming when the fruit-grower will be forced to conclude that it no longer pays to grow poor fruit. Even now, the years that the grower makes a profit in shipping choice fruit, are the exception rather than the rule. There are but few localities where choice fruit cannot be grown, and wherever shipped, such fruit must generally compete with the home-grown product. On the other hand, localities where strictly fancy fruit can be grown are limited, and competition in this class is more impartial. The competition is between localities which are probably equally distant from the market, and the one producing the best fruit is the successful competitor.

To a certain extent, pruning is a method of thinning, but it will not take the place of hand-thinning entirely. The production of a fancier grade of fruit is not the only benefit derived from thinning; it encourages more regular bearing; lessens the loss from the breaking of limbs and gives the grower a chance to destroy insect infected fruit and thus check the spread of insects early in the season. The tree that has been properly thinned should produce a good crop of fruit buds each year, and if it has been properly trained and thinned it will never need a prop. While many have observed that apple and pear trees are inclined to bear alternate years, probably few understand the cause. Fruit spurs with terminal fruit buds, as those of the apple and the pear, generally bear only alternate years, and if the spurs are all full of fruit one year, the next must be an "off-year," as we say. Not only do the spurs fail to bear annually, but if the tree is overloaded, spurs that produce bloom, even though they fail to set fruit, may not be sufficiently nourished to produce fruit buds for the following season. If the tree bears only a moderate crop of fruit, spurs that produce bloom but no fruit, often develop fruit buds the same season. Where the tree is bearing a light load, spurs may mature fruit and develop fruit buds the same season. Varieties differ and, while some are regular bearers under almost any treatment, others show a stubborn inclination to bear alternate years. After the old tree has fallen into the habit of bearing alternate years it is no doubt harder to get it back to a regular bearing habit. "Off-years" are not uncommon with some of the fruit trees bearing from axillary fruit buds, but it is not so pronounced as with the apple and pear.

Thinning the Apple.—Fixed rules to be followed in thinning are hard to give. Much depends upon the general thrift of the trees, and, as in pruning, the grower will have to learn much by experience. If we thin to encourage annual bearing, it will be seen that all the fruit must be removed from some of the spurs and, at the same time, the number of fruits remaining must be reduced to such an extent that the tree is not overburdened. Some thin to leave the fruits so far apart, but a rule fixing a certain space between apples will not hold good in all cases. If we were always sure the tree had been properly pruned, we might be able to give a satisfactory rule to be followed, leaving the fruits so many inches apart. A plan the writer has tried and found very satisfactory is to so thin as to have a certain number of boxes of fruit on the tree. Suppose you decide that the trees should produce ten boxes of fancy fruit each. A fairly uniform grade of apples ranging from two and one-half to three inches in diameter will pack about 150 to the box, and by thinning two or three trees and leaving the 1,500 apples, actually counting them or estimating them as closely as possible, one

learns what a tree properly thinned should look like. With these trees as a model it is surprising how close one can come to leaving just the right number. I think it is possible, by careful work, to come within a box of the ideal. But knowing how much the tree should produce is where the experience counts. Not many varieties of apples will require much thinning before they are ten years old, and at this age the average tree should produce about eight boxes of fancy fruit; some will produce more and some less. After the tenth year a gain of a box per year would be a conservative estimate. Of course, the yield will vary under different conditions; and, while this is not a rule that can be implicitly followed, it is surely more accurate than thinning to a certain distance. The thinner first removes defective or wormy specimens, and he should be supplied with a bag to carry the wormy ones from the orchard to be destroyed; then those from the tips of the limbs may as well be removed, for they seldom make fancy fruit; and, if possible to do it and leave the required amount, thin to one fruit on the spur. June and early July is the proper season for thinning apples and pears. Experiments have shown that it pays to thin apples. The fruit is improved in both size and color; the trees bear more regularly, and trees that may break under heavy loads are saved. Some say it is expensive to thin; but, if one stops to think, it really costs no more to pick fruit in June than it does in October. A man can thin from ten to fifteen twelve-year-old trees per day, and the actual cost of thinning should not add to exceed two cents per box to the cost of production. It is true that the results the first season are often disappointing, for an unthinned tree may produce sixteen boxes of fruit that will grade 50 per cent. fancy, while the thinned tree of the same age only produces ten boxes that will grade 95 per cent. fancy. It hardly seems profitable, but the next year will tell, and it is safe to say that two years running the thinned tree will produce as much fancy as the unthinned tree will produce of both fancy and choice.

Thinning Pears.—Methods of thinning pears differ little from methods of thinning apples; the principles are the same. As a rule, the pear tree will produce about as many boxes of pears as will the apple tree of the same age produce boxes of apples. The fruit is generally picked on the installment plan, and it is possible to mature a large crop of fancy fruit; and fruit that is small may be left until it reaches the decided size. Pears running from 135 to 150 to the box are considered ideal size, and pears for such a pack must measure from two and one-fourth to two and three-fourths inches in diameter. Pears larger than three inches are really not as desirable for the fancy fruit trade as those of smaller size. The fruit stands like a pear that can be sold at a profit, two for five cents, and there is no profit to be made in selling the larger ones for that price, and they are not large enough to sell for five cents each.

Thinning Peaches.—In growing peaches much of the thinning is done with the pruning shears during the pruning season, but additional hand-thinning is absolutely necessary. A good grade of peaches should run less than 90 to the box, and we may say it seldom pays to ship smaller fruit. A size that will pack less than 80 to the box is desirable. The young peach orchard that has been properly pruned will do well to average a box of fruit to the tree during its fourth season's growth, and the yield should increase at the rate of about two boxes per tree per year. Unless the trees have been exceptionally well pruned and cared for, they will rarely more than hold their own after the eleventh or twelfth year. The one object of thinning, as practiced with the stone fruits, is to produce better fruit. The thinning should be done before the foliage gets too heavy and before the pits begin to harden. By carefully thinning a few trees and estimating the number of fruits left, one can soon form an ideal to work by. The pruning shears may be used as a help in thinning, and fruiting wood not necessarily needed may be removed entirely.