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**UNIVERSITY OF IDAHO**

**Agricultural Experiment Station**

**Department of Horticulture**

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**Planting the Apple Orchard**

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**By LOWELL B. JUDSON**

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# IDAHO EXPERIMENT STATION

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39. Some Experiments with Fungus Diseases in 1903.
40. Winter Spraying for the Apple Aphid.
41. Grasshopper and Cricket Outbreaks.
42. Experiments in Feeding Pigs.

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## **PLANTING THE APPLE ORCHARD**

**L. B. Judson**

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Apple-growing is a young industry in this state, where scarcely an orchard can be found in which the trees are over twenty years old. Yet is old enough to show how profitable it may be; and many farmers, attracted by the large rewards, are each year putting out new orchards or enlarging the old. In some cases syndicates have been formed and liberally backed, which have laid out orchards of several hundred acres in extent, and now rumors of thousand acre orchards are beginning to be heard. From these prospective planters inquiries as to what varieties to plant, and how and where to plant, have been frequently received at this Station; accordingly it seems best to issue a concise statement of well known facts for their use.

### **Selecting the Site**

Sloping ground, except in the arid belt, is preferable for the orchard, as the natural drainage is good, and trees, as the saying goes, will not stand wet feet. Too much water in the soil cuts off the supply of air and tends to suffocate the roots, for it is just as necessary for them to breathe as the leaves. If the soil is underlaid at a depth of several feet by a stratum of gravelly or other porous material, so much the better, for good drainage is then doubly assured. An orchard on a slope also has the advantage of air drainage; that is, cold air, being heavier than warm, always seeks the lower levels, and hence

tends to slide off the hillsides and settle in the draws and gullies, where frosts are heaviest, and come later in the spring; so the orchard on the side hill will often escape frosts that would be fatal to one in the hollow. Never put an orchard, when you can avoid it, on land which is surrounded by higher land, as both air and water drainage are sure to be bad. In the irrigated section, however, ease and thoroughness of irrigation are more important than drainage, and the level site is best. As to the direction of the slope, one to the north is perhaps the more desirable, because the time of blossoming is delayed enough to avoid much of the danger from late frosts, and also for the added reason that north slopes, at least in the Palouse region, have the thickest soil.

The kind of soil best suited to apple-growing is a clay loam, which is even better if there is an admixture of fine gravel. In the South any land that grows tall thrifty sage-brush may be counted on to produce good trees; and in the North, the ordinary black soil, such as that which produces forty to sixty bushels of wheat to the acre, succeeds admirably with the apple.

### Preparing the Ground

There is not a piece of ground in the state, no matter how rich and fine naturally, that will not be greatly improved as an orchard site by a preliminary cropping of two years, or—if that is too long for the impatient grower—even one. Grow crimson or red clover the first season and turn it under in the fall, and the following spring plant potatoes or some other hoed crop. This treatment will leave your land well stored with fiber and humus, and in excellent tilth, deep and mellow.

I cannot forbear here to say a few words about the part humus plays in the soil, for its importance can scarcely be over-emphasized. Humus of course means the part of the

soil which has been formed by the decomposition of organic matter, mostly vegetable. It is the humus which gives ordinary garden loam its dark color, and as a rule light colored soils are deficient in it. Besides making sandy soils more compact and of closer texture, and heavy soils more friable or crumbly, it gives a soil the power to take up and hold moisture like a sponge. Soils rich in humus stay moist far longer and bake down much less than those deficient in it. Humus also promotes nitrification, or the activity of the bacteria in the soil, which are always busy in warm weather transforming the nitrogen in decayed organic matter into nitrates, the only nitrogen compounds very useful to plants. These bacteria require air, moisture and considerable warmth, and humus contributes to all these conditions. It increases the supply of air by making the soil looser and mellow so the air can more readily penetrate it; makes the moisture surer and more uniform by conserving it; and raises the temperature, since the darker color of the soil allows it to absorb more heat when the sun shines upon it, and the looser condition makes it a poor conductor, so that radiation at night is somewhat checked. Any preliminary storing of the soil with humus, therefore, will pay you richly.

Good tilth is also important, and if for any reason you are unable to crop the land previous to planting, you at least owe it to the trees about to be put out to get the land into the best possible tilth. It is not the same proposition as putting in a crop of wheat, which comes off the ground in a few months, and gives you a chance next season to correct your mistakes or neglect; the trees are to stand, twenty or thirty years, and if they only get about half a start the first season, you will feel the effect in your pocket book for years. If there is any stubble, sod or manure to be turned under, the plowing should be done in the fall, as spring plowing

would dry out the land too much; and even when it is bare, it is generally best to plow in the fall, as the action of the frost is beneficial, especially on heavy land, and the land can be harrowed and put in condition earlier the next spring. If there is hard pan within a foot or two of the surface, the long and useful life of the orchard is a matter of serious doubt, and another site should be chosen, if possible; when this is not feasible, sufficient drainage and root run can be secured by exploding a charge of dynamite on the spot where each tree is to stand, unless the hard pan is several feet thick. It is said there are successful orchards in the state on land with hard pan less than two feet down, but they are to be considered exceptions which merely prove the rule; and it must also be remembered that some hard pans are far more pervious to water than others. An easy way to test your land for hard pan is to take an iron rod about half an inch in diameter and four feet long, with a loop at one end for a handle, and a long sharp point at the other, and walk over the land, pushing the rod down three feet or so at frequent intervals. Any hard pan will quickly make itself evident, and the stiffness or looseness of the subsoil can also be estimated.

### **Buying the Trees**

Where to Buy.—There are several advantages in buying your trees of a local nurseryman. Many large firms get out attractive catalogues in several colors, and employ literary talent to write up their wares in choice language; and though there is often no deception sought in this, yet these attractions should not blind the fruit grower to the advantages of buying near home. In the first place, the local nurseryman's trees are grown under the same climatic conditions and very likely in the same kind of soil that you have in your own



orchard. The trees have become acclimated, and will suffer no violent changes when transplanted to your land; the very fact that they have withstood the rigors of the climate and made good growth in the nursery argues equal success for you. Furthermore, it is generally possible to visit the local nursery in person and make the acquaintance of the proprietor, when business can be conducted on a friendly basis hardly possible by letter. It is only human nature that a man should strive more to please you under these circumstances than as a mere stranger. Being on the ground, too, you can select from the entire stock, instead of having your order filled from the first that comes to hand. Then the trees can be delivered without boxing or baling, which not only means added expense, but more or less maltreatment of the stock. When it is packed, the roots and tops are usually severely pruned, so as to make the bundles more compact and sightly; and there are always the dangers of drying out and freezing, during transportation. The avoidance of the long haul must be reckoned one of the chief advantages of buying at home. It is often better to order in the fall, as the stock is then more complete than in the spring, and you can see that the trees are heeled in properly for the winter, instead, perhaps, of being placed in some sort of cold storage.

Travelling agents are as a rule less reliable than the home nurserymen, because the latter have invested in a local business and become more or less of a fixture in the community, and must please their customers if they expect to make the investment pay. The travelling man is less responsible, for if he fools you and your neighbors once he can pocket the profits and seek "pastures new" for future operations. On large orders, too, the saving of the middleman's profit is quite an item.

Kind of Tree to Buy.—Nurserymen usually offer two grades of trees, known as first class and second class. The first are clean, straight, well grown trees; the second are those which are somewhat lacking in size, or they may be fully as large as the firsts, but crooked and less sightly. If you are obliged to order from a distance, it is advisable to get only first class trees, but when you can visit the nursery and make your own selections, amply good trees of the second class can often be obtained, and of course at less cost. Of course the presumption is against an undersized tree, but it may merely have been the victim of crowding or some other untoward circumstance, the effect of which it will quickly overcome under more congenial conditions; and as for crooked trees, there are some varieties which tax the nurseryman's ingenuity to get anything like a fair proportion of them to grow with seemly straightness, for it is not their nature, nor will they be rejected on that ground by the intelligent grower.

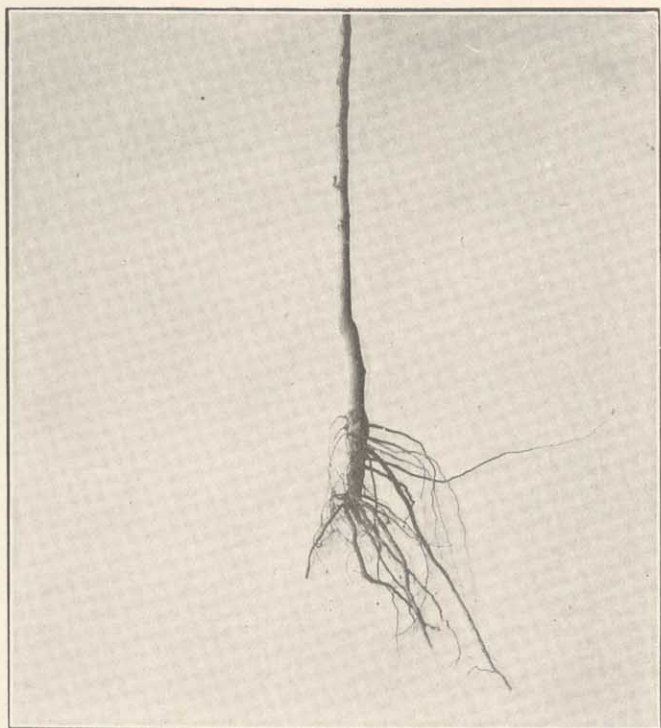
Most of the trees now being set out are two years old, that is, two years from the bud or graft, but I rather favor the planting of yearlings. Of course the two-year-olds will come into bearing sooner, but it is an open question whether they will give you any greater returns in a series, say of fifteen years, as the yearlings can be transplanted with less injury to their root system, and recover from the operation more quickly than the older trees, so they should go far toward overtaking the latter as the years pass by. This point will be subject to experiment in the orchard about to be planted at the Station. But the great advantage in planting the yearling is that it comes to you with the top untrimmed, for it is a mere whip, and you may head it to suit yourself. The two-year-old always has numerous side branches, and most of these are taken off by the nurseryman in conformity with his ideas of

what the head ought to be, but which may not be yours at all. The general tendency is to trim them up too much, so that the first branch is often four feet or more from the ground; this makes a neater looking but less serviceable tree, as the long exposed trunk greatly increases the danger of sunscald and attacks by borers and the wind has a purchase on the slender tree which will cause it to lean badly unless the location is unusually sheltered. Fig. 9 shows a typical tree of this sort, and Fig. 13, how the wind will flx it in four or five years. The yearling tree has buds scattered along from near the ground to the tip, (Fig. 2) and you can select such of them as you please to form the branches which will be the main framework of the tree. The method of pruning will be discussed further on. Of course if you can arrange with the nurseryman to prune them just as you want, part of the objection to the two-year-olds falls away, but it is still an advantage to have the trees established in the orchard after the first year, though it will prevent complete cropping of the ground one year earlier.

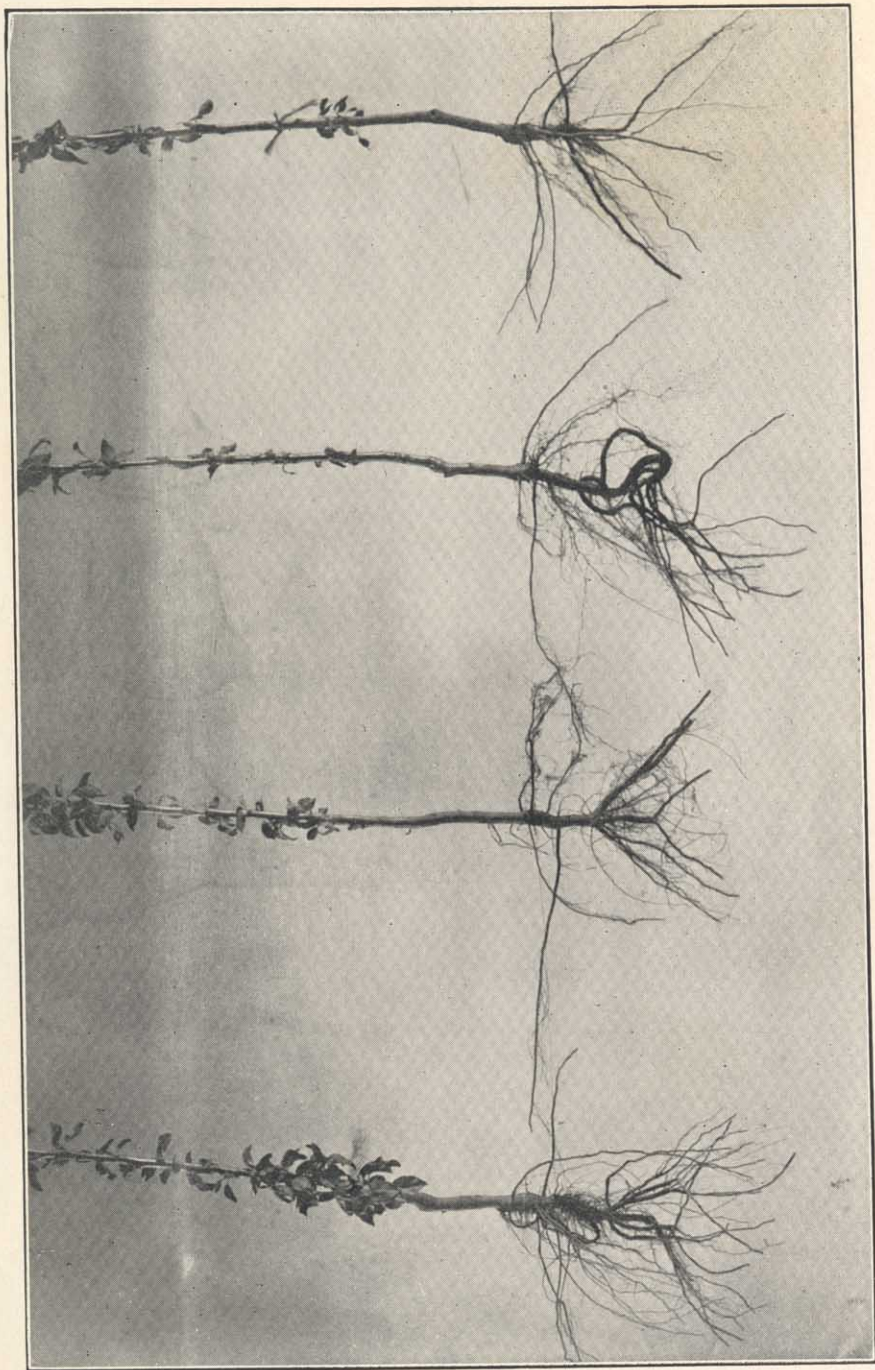
There is practically no difference in desirability between budded and root-grafted trees, (except that the former may be slightly larger at the same age) provided the stocks are of the same length. If the root-grafts are made with pieces of root only two or three inches long, they frequently develop a prongy and one-sided root-system, because on a short piece of root the branches are seldom evenly distributed around the axis, but come out mainly on one side, and these develop later into the main branches of the root. Fig. 1 shows the one-sided character of such a root. But grafting does no more violence to the tree than budding, and as the stocks which are budded are commonly dug and trimmed, there is nothing to choose between a budded tree and that grafted on

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*FIG 1. PIECE-ROOT TREE, SHOWING ONE-SIDED ROOT SYSTEM.*



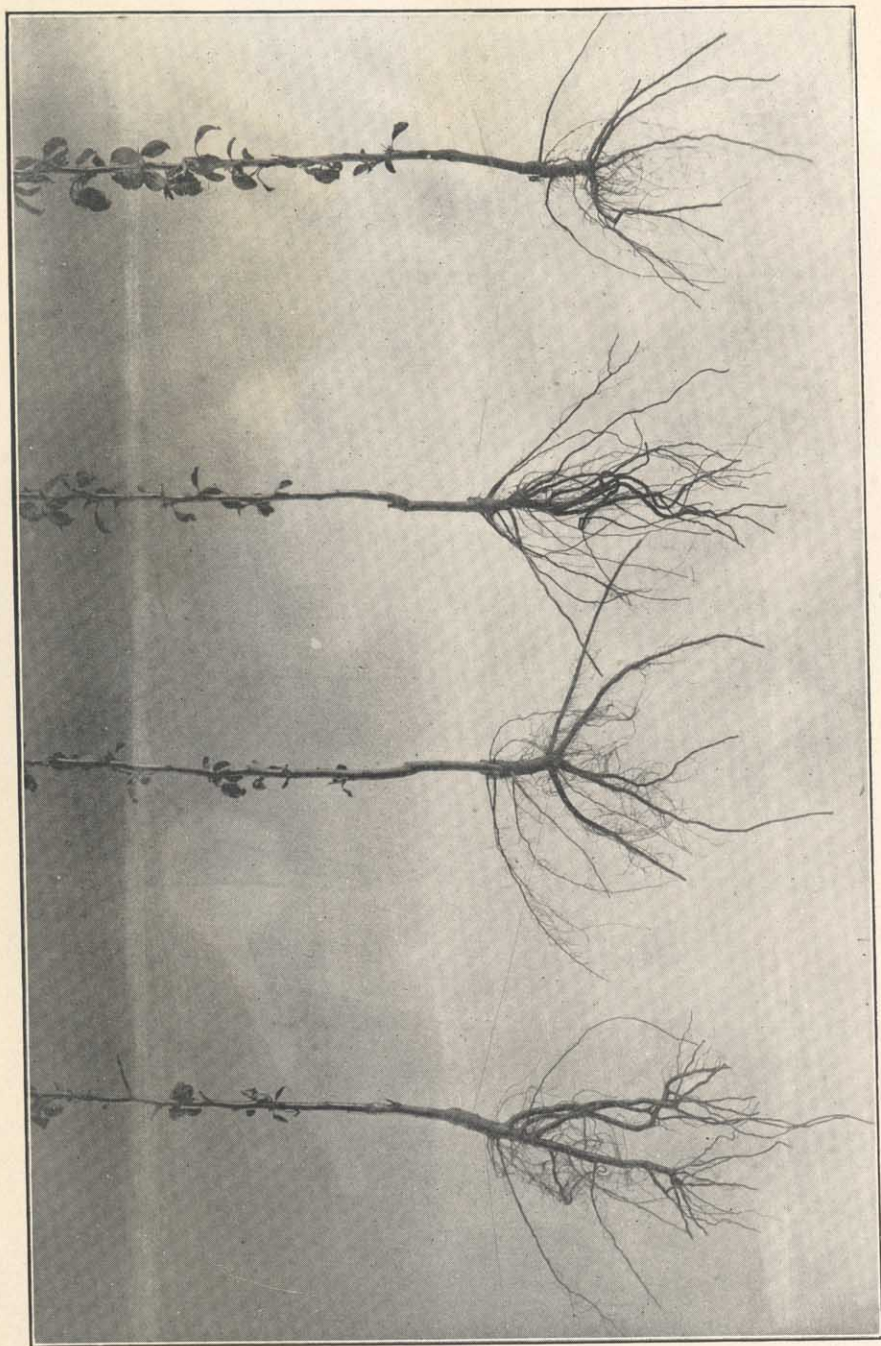
NO. 1.

NO. 2.

NO. 3.

NO. 4.

THESE PLANTS WERE GROWN IN THE LABORATORY OF THE U. S. GEOLOGICAL SURVEY, WASHINGTON, D. C. THE PLANTS WERE GROWN ON PIECE ROOTS.



NO. 4.

NO. 3.

NO. 2.

NO. 1.

FIG. 3. YEARLING WHIPS, ARRANGED SAME AS FIG. 2.

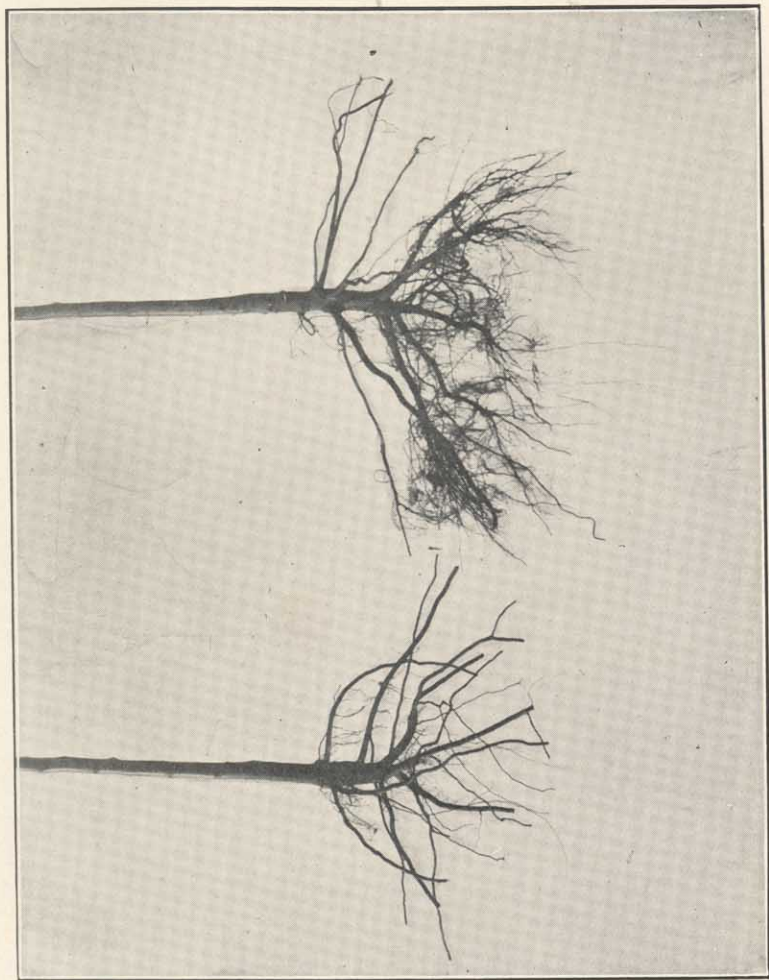


FIG. 4. ROOT-SYSTEM OF TWO-YEAR-OLD AND THREE-YEAR-OLD PIECE ROOT TREES.



To avoid misapprehension let me say that the term whole-root tree has been used in this discussion to mean a tree to which a whole seedling root has been devoted: that is, each root has served to make only one graft, though it may have been trimmed up so as to be not over five or six inches long. In fact, it will usually be a mistake not to trim the root pretty well, for if left intact, and then set out with a dibber in the common way, a grotesquely contorted system like that in Fig. 2, No. 3, will result, all the roots having been crowded into a slit-like opening. Some nurserymen, however, have an understanding with themselves that a tree grafted on the top piece of root, or crown, is a whole root tree, even though the piece be only two or three inches long, and only one of several made from that root. Scarcely it is a misnomer, a mere juggling of terms, to call a tree a "whole-root" tree when the seedling root on which it was grafted serves as the foundation for several trees. A whole-root tree should have all the best of the seedling root, and so much of it that there will not be enough left to make another good tree.

No. 1 of Fig. 3 shows the root system of a piece-root tree at two years old, one that leaves little to be desired. No. 2 of the same figure is that of a similar tree of three years, which was run under with a digger in the fall of the third year to thicken up the root system, and dug for setting the following spring. This treatment greatly increased the number of fibrous roots, and is very commendable practice if a nurseryman has to carry over two-year-old stock or finds customers who demand three-year-old trees.

Varieties.—The first consideration in the selection of varieties is the purpose for which the orchard is planted. Many delicious varieties are so early or such poor shippers that they are worthless as commercial sorts, while some of the best commercial apples are very inferior for home and

dessert use. The greatest favorites, the state over, for commercial plantations are *Jonathan*, *Rome Beauty* and *Ben Davis*. Of these the *Jonathan* is the highest in quality, having a tender fine-grained flesh and pleasant perfume; while the *Ben Davis* is notorious for its inferior quality, retaining its popularity among growers because it keeps so long and ships so well, and is withal so handsomely colored, at least in the Boise and Payette valleys. It "smiles and smiles, and is a villain still." Its popularity in the Chicago market is said to be immense among the bakers, who prefer it to all other apples for pies because the juice never runs over and burns on the tins. The *Rome Beauty* is something between these two; it is not an apple of choice quality like the *Jonathan*, though it has a crisp tender flesh of an agreeable sub-acid flavor. It keeps somewhat longer, and is larger in size than the *Jonathan*. When well-sunned it develops a beautiful scarlet cheek which takes a high polish. It comes into bearing early, and is nearly as regular and prolific as the *Ben Davis*, and altogether is a very satisfactory fruit.

Other varieties which have given excellent results commercially and some of which are scarcely less popular than those just mentioned, are *Winesap*, *Spitzenburg*, *White Winter Pearmain*, *Gano*, *Grimes Golden*, *Stark*, *Lawver*, *Northwestern Greening*, *Wagener*, *King* and *Rhode Island Greening*. The *Winesap* and *Spitzenburg* (*Esopus Spitzenburg*) are apples of highest quality, but the *Winesap* is apt to bear only a small crop in off years, and the *Spitzenburg* has the reputation of being a shy bearer at all times. The *Winesap* is too small except in the warmest parts of the state. *White Winter Pearmain* is a small apple of excellent quality and a most delicate perfume, the most serious objection to it being its yellow color. The demand of the consumer seems to be for something red, whether in apples, or jellies and catsups; and it has been

commonly noted that the more flaming the color, at least in the manufactured articles, the readier the sale. Its small size is as much of a drawback as in the case of the *Winesap*. *Grimes Golden* is another yellow apple of prime quality, but averaging somewhat larger than the *Pearmain*. The *Gano* is a seedling of the *Ben Davis*, and scarcely to be distinguished from its progenitor save in having a less streaked, solid color, and even this mark often fails. It is commonly thought to be somewhat better in quality than the *Ben Davis*, but the difference is very slight. *Stark*, *Lawver* and *Northwestern Greening* are all long keeping, good shipping varieties of medium quality. The *Lawver* (Delaware Red) is perhaps the poorest in quality, but the best colored, being almost wholly overlaid with a deep dull red; *Stark* is thickly striped with faded red, overlaid with a whitish color that considerably dims the red. *Northwestern Greening* is a large apple of fairly good quality which seems to be growing quite rapidly in favor. The *Wagener* is an apple of excellent quality, nearly or quite as attractive in appearance as the *King* and comes into bearing very early, but has not been planted as much as it deserves. The *King* is of good quality, keeps and ships well, and is a regular though not heavy bearer. The same may be said of the *Rhode Island Greening*, except that it bears heavily. Some of the standard sorts to be avoided are the *Yellow Newtown* which is too small and late except in the hottest parts of the state; the *Yellow Bellflower*, which has a bad habit of dropping its fruit early in the season; the *Blue Pearmain*, which is shy and irregular in bearing; and the *Mann*, which is not only uncertain in bearing, but lacks attractive color. Among the best summer and fall varieties are *Red June*, *Whitney*, (*Whitney No. 20*), *Yellow Transparent*, *Early Harvest*, *Duchess (Oldenburg)*, *Red Astrachan*

and *Wealthy*. All these are of excellent quality, but will endure little handling or shipping.

So much for varieties in most parts of the state. To the higher regions like Bingham, Fremont, Bannock, Bear Lake and Oneida counties the foregoing discussion does not altogether apply. The short seasons make the *Jonathan* and *Rome Beauty* commercially unprofitable, and while the *Ben Davis* is grown to some extent, it is small and does not color well except near the foot hills; and of course it is size and color which sell the *Ben*. Very commonly a few trees are planted in the dooryard, because it is such a sure and prolific bearer, and will furnish a supply of apples for home consumption in years when every other variety fails. Poor as the quality, they are far better than none at all, and a great boon to the farmer whose fruit crop has failed. In these regions the *Ben Davis* is the poor man's apple *par excellence*. Perhaps the best winter varieties for commercial planting are *Northwestern Greening*, *Gano* and *Lawver*. Only large varieties should be used, as none develop their full size here; for instance, such medium-sized varieties as *White Winter Pearmain* and *Winesap*, while of good quality, are hopelessly small for the market. Among the best fall varieties are *Wealthy*, *Fameuse (Snow)* and *Wagener*; and for summer. *Yellow Transparent*, *Tetofsky*, *Whitney*, *Chenango Strawberry*, *Red Astrachan* and *Duchess*.

Finally, in whatever part of the state the orchard, more than one variety should be planted, instead of having the trees in solid blocks, in order to secure cross-fertilization. Not more than two rows of a variety should be set together, and the adjoining variety should be one that blossoms at about the same time. Information on this point is still meager, but the Station is collecting data this spring, and by

another year hopes to be able to give definite information as to the blossoming time of all the varieties of apples commonly grown in the state. It is better to have two rows of a variety together instead of alternate rows, because of the greater ease of harvesting.

### Setting Out the Trees

Nearly every grower in the state plants his trees in the spring. This is wise in the coldest localities, as fall planted trees are liable to winter kill, not because the tree has been made tender through any shock due to transplanting, but the earth, even when well packed about the roots, is often too loose to keep out the frost. In other regions, however, which comprise most of the area devoted to fruit, fall planting is safe enough, and has this considerable advantage over spring, that wounds on the roots are callused over during the dormant period, so that growth starts promptly in the spring. The tree is also less apt to dry out when planted in the fall, as months will intervene before leaf activity begins.

Most planters make the mistake of setting their trees too close together. It seems to them no better than an extravagant waste of ground to set little spindling trees thirty-five feet apart, and it requires some imagination to think of them ever completely occupying the ground. As the man stands off to survey his work, it actually seems as if there were nothing there. But if he could see a certain orchard near Boise, these feelings would scarcely overpower him. The trees there are one rod apart in the row, and the rows twenty feet apart. Though but eight years planted, and well pruned, the trees are already locking horns in mortal combat, and the owner will have to take a hand in the conflict at once and remove every other tree, or suffer increasing loss of size and color in his fruit, as well as serious inconvenience in

spraying. Even then the remaining trees will not be in as good condition as though they had been given ample room from the start; and while the larger number of trees has given increased yield, the average size of the fruit has been undoubtedly diminished, and the proportion of seconds and culls unduly large. On the fertile soils generally used for fruit growing thirty-five feet each way is none too far apart, and on no soil should apples be set less than twenty-eight, unless propagated on dwarf stock. Mr. L. A. Porter, of Lewiston, who has a fifteen-year-old orchard planted 25x32, tells me he would not think now of setting apple trees less than 40 feet apart each way. The tops of his trees are already beginning to touch, and severe pruning will be necessary henceforth to keep them apart. Prof. L. H. Bailey, of Cornell, advises 40 feet for apples in New York State. Sometimes the rows are made thirty-five feet apart, and the trees seventeen and one-half in the row, the plan being to remove every other tree when they begin to crowd, leaving them thirty-five feet apart each way. The trouble with this, as with all systems where fillers are employed, is that the owner has not the courage to clear them out at the right time, for that usually comes just when the extra trees are becoming very profitable, and it takes more than ordinary resolution to destroy them.

In nearly every orchard in the state the trees are set in squares, a neat and simple arrangement, and one which allows driving through and cultivating in four different directions. A convenient way of laying out small orchards of an acre or two is to use a line. It should be not less than one-eighth inch in diameter, and twisted hard enough to prevent much stretching. Bits of bright colored yarn are tied on to mark the intervals. This line is then drawn taut along

one side of the field where the outside row of trees is to stand and stakes are set at the yarn marks. This row should be not less than 25 feet from the line fence, or much inconvenience in spraying and cultivating will result. The two sides at right angles to this are then staked off in a similar manner. The corners can be made true by sighting along a steel square which is laid on three stakes, the middle one being exactly at the corner. Stakes to mark the places where the inside trees are to stand are now placed by stretching the line from side to side between the stakes at the ends of the row, but the rows at right angles to the line should constantly be sighted, as the line is bound to stretch a little under the best of management, and some crookedness will result if no sighting is done.

In larger orchards a surveyor is sometimes hired to set the stakes with compass and chain, but this is expensive, and even then the rows are not always perfectly straight, because the planters fail to sight, and in digging the hole lose the exact spot where the stake stood. The best way to lay out a large orchard where the land is fairly level, and one that is coming into pretty general use, is to use a wire line. Telephone wire is good for the purpose. Prepare it by winding short pieces of stove pipe wire tightly around it at the desired intervals, and it is better to solder them on to prevent slipping. A bit of bright colored cloth is then tied over each winding to make it more conspicuous, and after making a loop in the end of the wire twenty-five feet from the last winding, it is ready for use. Stakes to mark the rows should be driven along the boundary line on opposite sides of the orchard. The wire is then stretched between each pair in turn, and if the stakes have been set exactly on the boundary line the first row will come twenty-five feet inside it. No stakes are set where the trees are to stand, but the holes

336

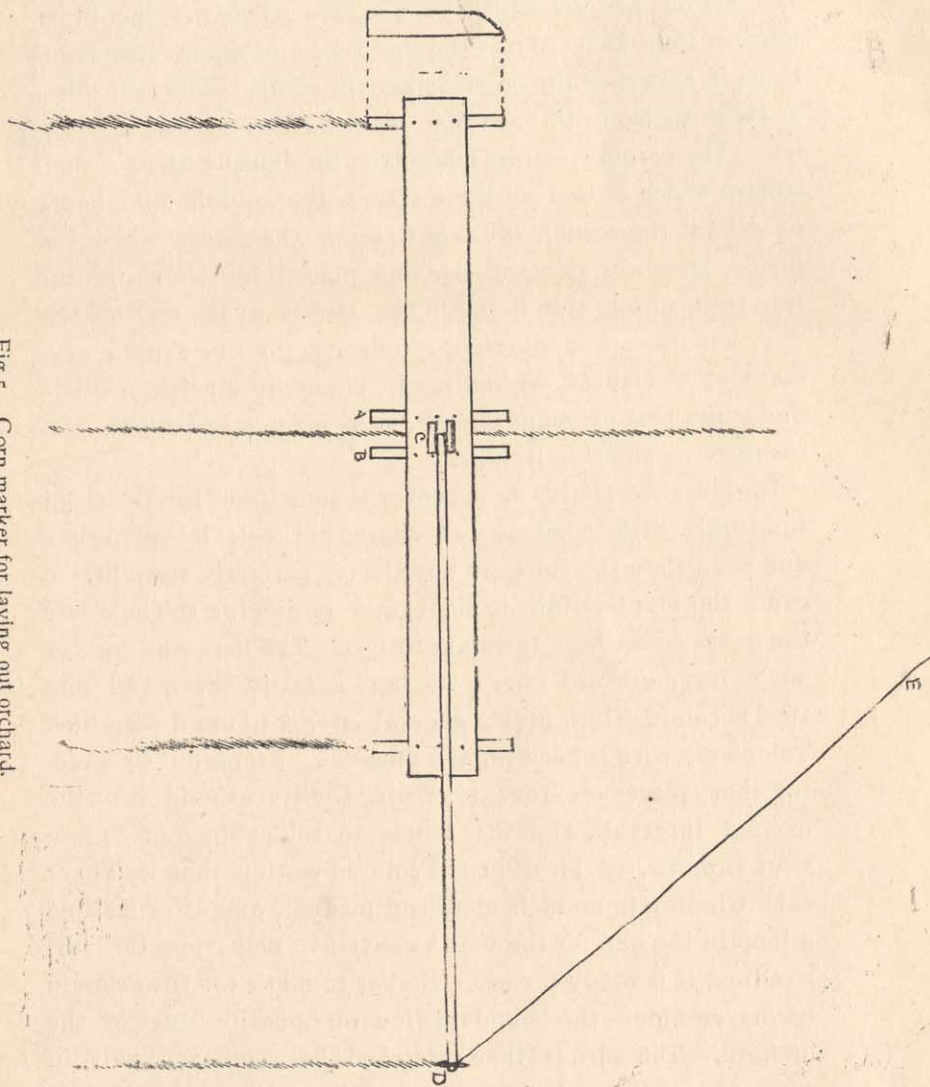
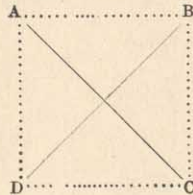


Fig. 5. Corn marker for laying out orchard.



are dug under the marks on the wire and the trees set by them before the wire is moved. When not in use it can be rolled on a drum and conveniently stored. If the land is very hilly it will be hard to use the wire, or any scheme of laying out with the plow by using sighting poles, and the most satisfactory method will probably be to use an old-fashioned corn marker, like the one represented in Fig. 5. It consists essentially of a plank with four 2x4 runners, and an extension pole (CD) with stake at end to make a guide mark. If 35 feet is the distance apart the rows are to be planted, the two outside runners should be just  $17\frac{1}{2}$  feet apart, and every other mark will show the place for the rows. Each time across, the two middle runners (A and B), which are six or eight inches apart, are made to straddle the guide mark made by the stake at D. The pole is fastened between the blocks at C by a bolt so that it can be thrown over on the other side on return laps, and the end is steadied by a rope (D E) running to the hames. With ordinary care an orchard can be laid out pretty accurately by this method.

The one objection to planting in squares is that it does not cover the ground uniformly with trees; for instance, A is farther from C, and B from D, than A from B or D, or B



from C. making a waste of space in the middle of the square. This is sometimes utilized by planting a tree there, such as a peach or some quick bearing or short lived tree, temporarily to occupy the ground; but this results in crowding in a very

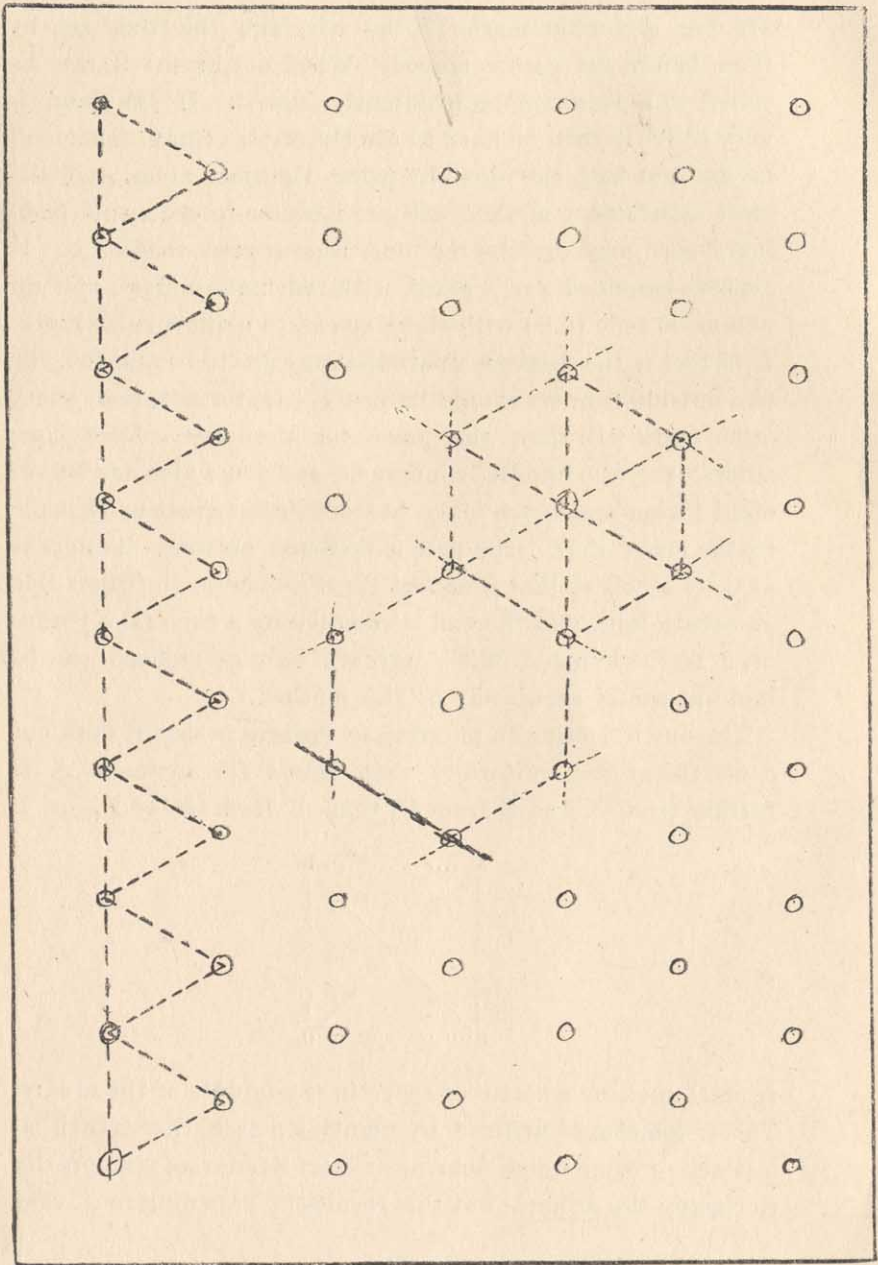


Fig. 6. Plat of orchard on hexagon System.

few years, without much return from the filler, and the practice should be avoided. The best scheme for getting the maximum number of trees at a given distance apart on the land is the hexagon or triangle system, which makes every tree exactly the same distance from each of its neighbors. The accompanying diagram (Fig. 6) shows the arrangement, and the dotted lines make plain the triangles and hexagons. If each tree is joined to each of its neighbors by a straight line, a network of triangles will be formed, and each group of six triangles around each tree forms a hexagon with a tree in the center. There are several ways of laying out an orchard on this plan, the most expeditious perhaps being to use the wire already mentioned. The end stakes of the second row are found by means of a wire triangle like that figured.

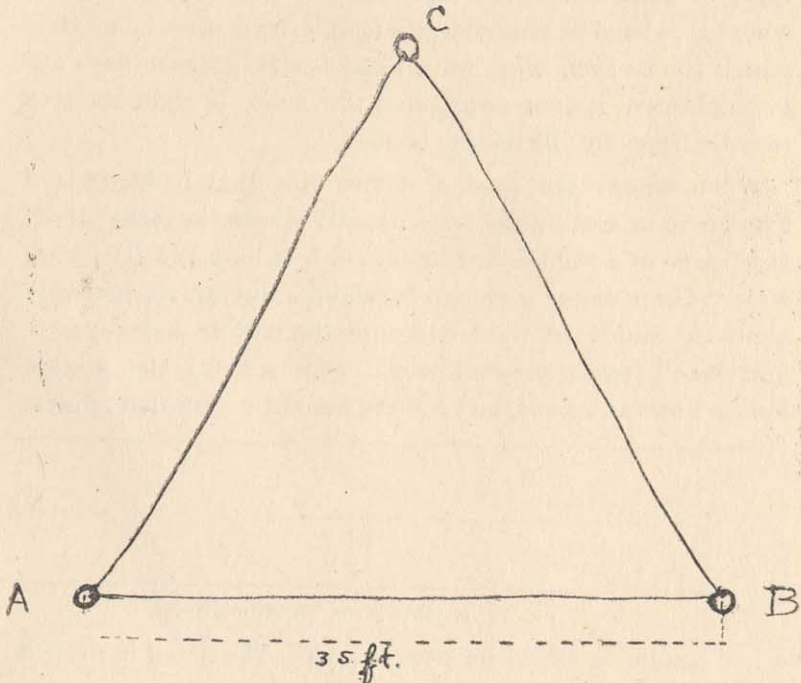


Fig. 7. Wire triangle for laying out orchard on hexagon system.

(Fig. 7.) It is made by attaching rings at each corner so that the distance from the center of each ring to that of each of the others is exactly the distance apart of the trees. Three men (or two boys and a man) are required to handle it expeditiously, each carrying a corner. The rings at A and B are slipped over the first two stakes in the first row (or held against the trees) then the man at C stretches the wire as taut as possible and pushes a stake through the ring, marking the place for the first tree in the second row. Then the stake at the other end of the row is located in the same way, and the marked wire stretched between them, making stakes in the rows unnecessary. Of course it is a simple matter to locate all the trees in the orchard by the triangle device, and this will generally be the best way on rough, hilly ground where it is hard to stretch a line; but on level sites no method equals the marked wire, for all stake-setting where trees are to be planted is done away, and the mark is right there to true the trees by till the job is done.

When stakes are used, a device like that in Fig. 8 is a great help in getting the trees exactly where the stake stood. It is made of a light board about six feet long and six inches wide. Three augur holes are bored on a line drawn precisely along the middle of the board, and the middle hole exactly half way between the end holes. One side of the middle hole is now sawed out, and the implement is complete, unless

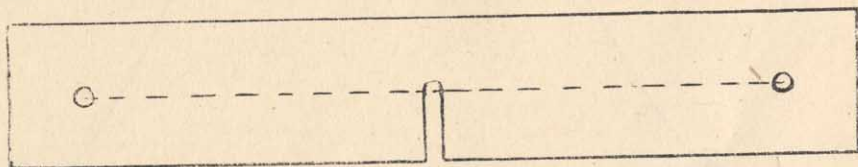


Fig. 8. Notched plank for setting trees.

a low handle be added for convenience. The notch is slipped around the stake which marks the location of a tree, and a

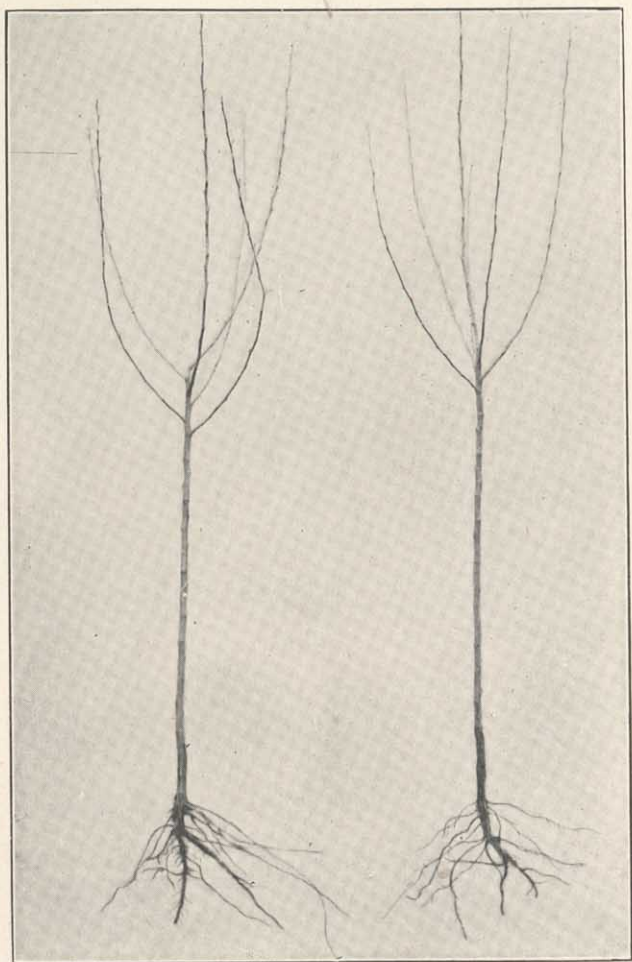


FIG. 9. TWO-YEAR-OLD TREES, UNPRUNED

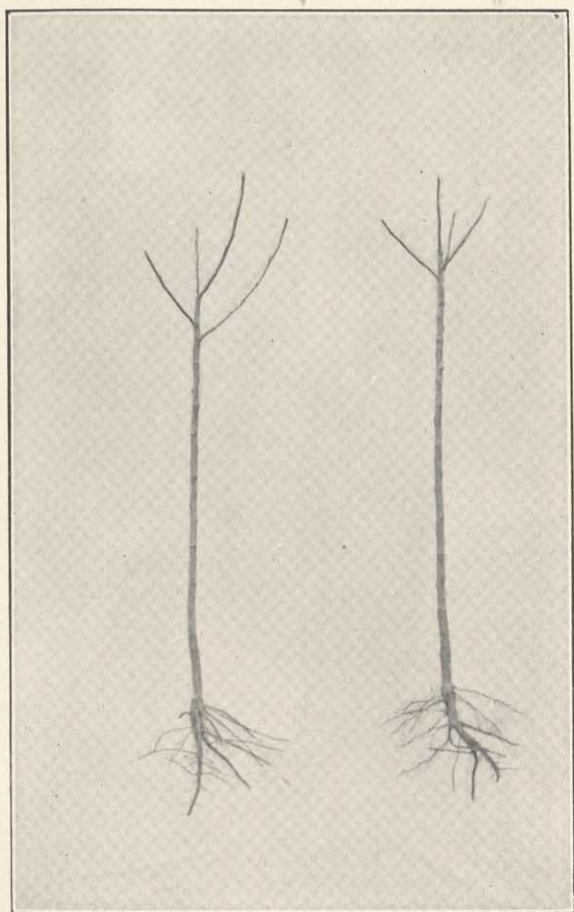


FIG. 10. SAME TREES AS IN FIG. 9, PRUNED.

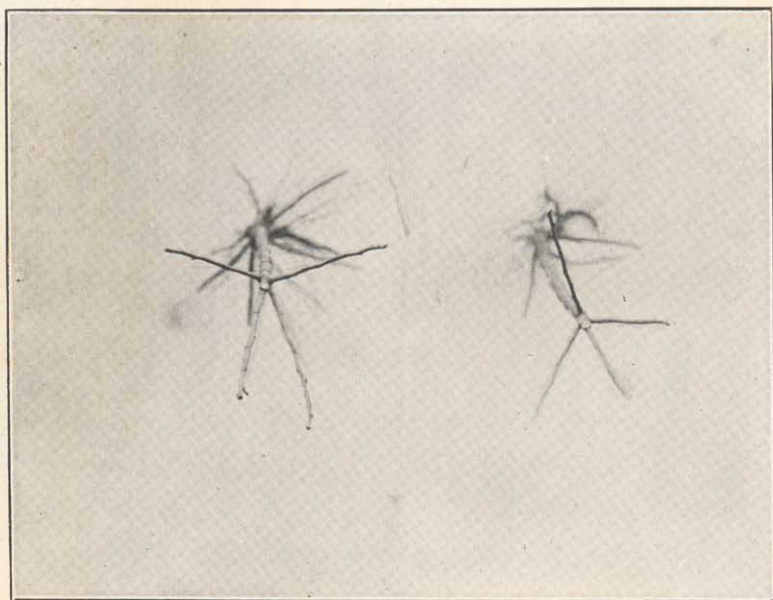


FIG. 11. SAME TREES AS IN FIG. 10, END VIEW.

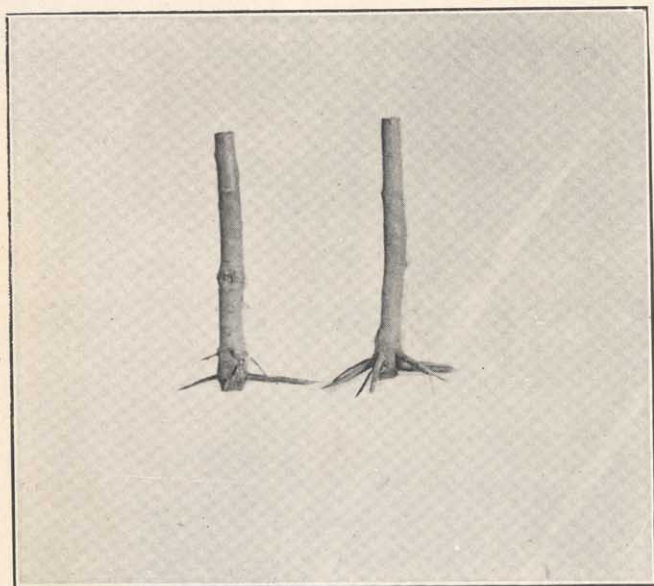


FIG. 12. TREES PRUNED BY STRINGFELLOW METHOD.



FIG. 13. LEANING CAUSED BY THE WIND.



stake put through each of the end holes; the board is then lifted off while the hole is being dug, and when ready to set is replaced over the two end stakes, which have remained undisturbed, and the trunk of the tree placed in the notch.

The hole should be made large enough to receive the roots stretched out in their natural position without bending or cramping, and if the bottom is hard it should be loosened up with a spade. The best job can be done when the soil is in the best condition for plowing, that is when a handful can be easily squeezed into a ball, yet without sticking to the hands. Too dry a soil delays the beginning of root activity, and will cause the tree to suffer from drought, even when watered freely at setting, as the surrounding dry soil acts like a sponge to draw off the water applied about the tree; while too wet a soil makes the work sticky and disagreeable, as well as difficult to do satisfactorily. The holes should not be dug much in advance of setting, as they dry out too much. The roots of the trees should be kept covered with earth while the hole is being dug, as even a few minutes of exposure to the hot sun may do much damage; or they may be carried around in a barrel mounted on wheels, with a few inches of water in it.

All broken roots are now removed, and ragged ends trimmed off smoothly, so as to allow healing to take place promptly. The ends should be cut off with a sloping cut on the under side, the cut being at right angles to the stem, allowing the ends to rest flatly on the ground when placed in the hole. Figs. 9 and 10 show the manner of pruning the roots. The tree should be planted an inch or two deeper than it stood in the nursery, unless the precaution is taken to mound up the earth to that extent around the trunk, as the ground is sure to settle somewhat. I have heard nurserymen advise setting the tree with the same side to the north as it stood

in the nursery, for the reason that the bark is thinner and less inured to the hot sun on that side, and if set toward the south would be very apt to suffer from sun scald. I suspect it would puzzle the average planter to tell north side from south side by mere inspection of the tree, and such cross sections of the stem as I have seen show no difference in the thickness of the bark. A better plan is to place the stronger limbs, if those on one side are better developed than the other, toward the direction of the prevailing winds; and if the situation is very exposed, it is a good plan to slant the tree in that direction, as it will straighten up in a few years and then be strong enough to resist the warping of the wind. Trees set erect in a windy situation are sure to need staking in a short time or if left will present the unsightly appearance of the one in Fig. 13, which is far too common a sight in our orchards; and if, as is usually the case, the strongest and steadiest winds come from the west, the tree is bent over so as to expose its trunk almost perpendicularly to the hot rays of the afternoon sun, generally resulting in scalding and serious injury to the bark.

The tree is now placed in the hole and a few shovels of fine earth thrown in. By grasping the tree in the left hand and settling it by moving it gently up and down a few times while working the earth up under the center of the root system with the fingers of the right, all large air spaces around the roots can be avoided. The place directly under the crown, where the roots often form a sort of cone-shaped cavity, needs especial attention. A large air space here means severe drying. The hole is then filled, tamping well after each few shovels. A tamper shaped somewhat like a base ball bat, four or five feet long and about three inches through at the larger end is very good for the purpose. (Fig. 14.)

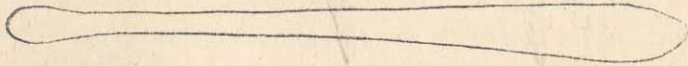


Fig. 14. Tamping for setting trees.

The rounded end will not easily injure the roots, and it is small enough to work among them readily. When the hole is filled, a little loose dirt should be left on top as a mulch to retain the moisture. It is not advisable to put manure in the hole, as it will heat and cause the roots to dry out unless very well rotted, or may introduce fungus spores which will prey on the roots; and in any case it is apt to interfere with packing the earth well around them. A mulch of manure or old straw about the tree is not so objectionable, though anything piled up much around the trunk will make the bark somewhat tender, and more susceptible to injury when the mulch is removed. Such a mulch also makes the roots come close to the surface, which dry out when it is removed or not renewed.

The newly set tree must now be pruned. As it stood in the nursery row there was approximately a balance between the top and the roots, these being just about enough, under the conditions of that soil, to supply what moisture the leaves and branches needed. Evidently if half of the roots were suddenly removed this equilibrium would be destroyed, and each leaf would show its distress at the decreased sap pressure by wilting, and the weaker ones would probably die. Now this is essentially the condition of the young tree; no matter how carefully it was dug, many of its fine feeding roots are sure to have been broken off, or have dried up; and until it can re-establish its relations with the soil, and put out new roots to take the place of those destroyed, it is totally unable to support and nourish the original amount of top. The fine root-hairs, which appear like

fuzz near the tips of the smaller roots, and do most of the absorbing for the roots, dry out almost instantly on exposure to air, and are practically all destroyed in transplanting. It takes some time to form these anew, and if the whole top is left to leave out during the process, the rapid evaporation from so many points will result in disastrous drying of the whole tree. This can be avoided by cutting back the top to correspond with the roots, thus reducing evaporation to the point where they can supply the loss. In the case of the yearling whip it is sufficient to cut it off at the height at which it is intended the leader shall start out—say about three feet. Always cut to a bud, making a sloping cut which leaves not more than a quarter of an inch projecting beyond the bud. The following summer all the buds along the side will develop branches, and all the lower ones and those not intended to form the main framework of the tree must be pinched off when they reach a length of about six inches, otherwise the lower branches may grow the faster and make a shrub of your tree. At the pruning of the following winter the pinched branches are entirely removed.

Two year old trees will have numerous side branches, and require a little more attention at the first pruning. The lower limbs are generally trimmed off by the nurseryman as in Fig. 9, so the height of the head is already practically fixed for you, and what remains to be done is to choose from three to five limbs to form the main framework of the tree. These should come out from the trunk in different directions, distributed as evenly as possible, as shown in Fig. 11; and no two branches should come out opposite each other, or a weak crotch will be formed which will be apt to break under a heavy load of fruit. Now cut off the center shoot or leader just above the uppermost limb chosen, remove limbs not



FIG. 15. TWO-YEAR-OLD STRINGFELLOW TREES.

wanted, and shorten back the others to about one foot in length. Fig. 10 shows how it should look.

A very severe kind of root and top pruning, known as the Stringfellow method, is sometimes advocated. The chief advantage claimed is that the roots grow straighter downward than with the ordinary trees, giving greater security against drought and high winds. The labor of setting is also much reduced, as a small hole will accommodate the stubbed roots, and it is an easy matter to pack the earth around them. The tree is in fact reduced to a cutting, as Fig. 12 shows, and cuttings of woody plants are not apt to do especially well out of doors in this country. To grow a cutting successfully the soil should be as warm or warmer than the air, to stimulate the formation of roots before the top starts to grow; if the latter starts first, the demand for sap and rapid evaporation will quickly exhaust the juices of the stem, and it dies. In the sandy soils in Texas in which Mr. Stringfellow planted his trees he had a natural propagating bed, a very warm soil and all the conditions to make cuttings do well; but with the cool soil and cold nights of most parts of this state nothing like the same success can be hoped for. But the method is by no means an absolute failure even here, for some thirty or forty trees planted some two years ago by Professor Huntlev, then Horticulturist of this Station, are now growing thriftily. I understand, however, that there were a considerable number of failures, so that it would be very unsafe for a grower to plant a whole orchard with these cuttings; and as to the formation of a new tap root, or several strong downward tending roots, the illustration (Fig. 15) will show the fallacy of this idea. These trees were lifted with especial care to preserve all the main roots, and give an accurate idea of the root development of a Stringfellow tree, at least under our conditions of soil and climate. A comparison of these with the roots in

Figs. 2, 3 and 9 will show how little the roots of Stringfellow trees differ from others in direction of growth. The Stringfellow trees grew two seasons, and were presumably two years old when planted.

### Wind Breaks

In particularly exposed situations wind breaks are of great value both to keep the limbs from being warped out of shape or broken, and to prevent the fruit from whipping off. The Lombardy Poplar is perhaps the best for this purpose, as it grows very fast and tall, and rarely breaks, even in the strongest gales. It is a voracious feeder, however, and will dry out the ground badly for forty or fifty feet on each side the row, though this distance can be much lessened in irrigated sections by running ditches either side of the row. The trees should be set about eight feet apart, and allowed to branch from the ground.

### Rabbits, Gophers and Mice

In some parts of the state hundreds of young trees are girdled every winter by jack rabbits. The rabbits are so numerous that shooting is a hopelessly slow method, and makes no apparent reduction in their ranks. In the weekly or bi-weekly drives organized near Idaho Falls last winter it was common to destroy several thousand in a single day, and this is perhaps the most hopeful method of exterminating them; but meanwhile the annual damage is great, and some means for lessening it imperative. Almost every kind of sickening, repellant substance, and various mixtures of them, have been applied to the trunks and lower limbs to keep off these pests; but I have heard a man of wide experience say that neither blood, tar, nightsoil or anything else except a rabbit-tight fence will stop them if they are thoroughly

hungry. In a region like that around Iona, however, where it is common to have several feet of snow every winter, the fences would have to be of inordinate height to prevent the rabbits, after the snows had drifted up against them, from bounding lightly over. Hon. J. E. Steele, of Iona, tells me he has had great success by smearing the trunks of the trees with the carcass of a rabbit. Late in the fall he organizes a rabbit hunt to get the necessary rabbits, and with these in hand proceeds to split each one open along the belly, and rub it, blood and entrails, on the trees, making one rabbit do for about twenty-five trees. It is not necessary to cover the whole of the bark, for one smell will keep the rabbit away. Mr. Steele says the rabbit tracks on the snow in his orchard last winter were so thick it looked as if a flock of sheep had been through, yet not a tree was touched; while neighboring orchards not so treated suffered severely. Probably a cheaper and more effective remedy cannot be found.

In parts of Kootenai County, and very likely in other parts of the State, the pocket gopher does great injury to young trees by eating off the roots. They can generally be checked by placing a small piece of parsnip, in a cleft of which a small crystal of strychnine has been placed, in the mouth of the burrow. They seem more partial to parsnips than carrots or any other vegetable.

Injuries by field mice, which frequently girdle young trees in winter can be avoided by cleaning up all litter and rubbish about the base of the trees, and tramping down the snow about the trunk after each heavy fall.

### Orchard Record

Slipshod methods in orchard management are not confined merely to the treatment of soil, pruning, spraying, etc., but



include also a thing commonly lost sight of, even by growers who are thorough in other particulars. This is conducting the orchard on a business system. The only way to know exactly what your orchard is doing for you, what trees are your money makers and what are not paying for the ground they occupy, is to keep a record year by year. Just as the dairymen are now awakening to the fact that they cannot realize the profits they ought unless they keep a record of each cow's yield, and so determine which cows are profitable and which are only "star boarders," who eat up all the profits: so the fruit grower should know to a certainty what each variety is doing for him, so that he can promptly dispose of the unprofitable ones, and above all avoid setting out any more of them. The ideal way would be to have a record of the performance of each tree, but of course this is out of the question in a large orchard; but the record of varieties is easily kept and will be found very valuable. When the grower wants to add to his plantation, his record will show him instantly what his most profitable variety heretofore has been, and he takes no chances, makes no guesses, in setting out more. If he wishes to put out new varieties in his later plantings, he will be very safe if he sets several of each kind in a plot by themselves for experiment; and then if he keeps a record like that described below, he may know in a few years just what each will do for him. When he hears of an especially profitable variety which he thinks might succeed with him, let him put one or two in his experimental plot. The Station cannot satisfactorily do this work of testing varieties, conditions vary so greatly even in the radius of a few miles, but each man can in this regard best serve himself. The form in Fig. 16 is a very good one to use, and being only  $4 \times 6\frac{1}{2}$ , may be easily carried in the pocket. One page is devoted to each variety, or all of one variety

# CROP RECORD.

Block No. ....

Variety .....

No. ....

Planted ..... Came into bearing .....

Year	Date Picking	Number Boxes	Date Sold	Price Per Box	Total Received
1904					
1905					
1906					
1907					
1908					
1909					
1910					
1911					
1912					
1913					
1914					
1915					
1916					
1917					
1918					
1919					
1920					
1921					
1922					
1923					
1924					
1925					

Fig. 16. Facsimile page of Crop Record.



planted at the same time, the number of trees of that sort in the block being set down in the blank space opposite "No." A "block" should consist of all the trees planted in the same year, so division into blocks will be necessary only where two or more plantings have been made. Obviously, if no division were made in the latter case, the record would give false conclusions as to the profitableness of the variety, since young trees not yet in bearing or just coming in would be grouped indiscriminately with trees in full bearing. It is hoped the Station will be able to supply books neatly bound in limp leather containing about 70 pages printed like Fig. 16, to make room for other tree fruits besides the apple, also some ten pages for summary of yields by years, (Fig. 17) and twenty blank pages for index of trees by number, at a price considerably below one dollar.

A plat should be made of the orchard, say on the scale of 35 or 70 feet to the inch, if your trees are 35 feet apart, and a number assigned to each tree, which is entered in the index of the record. It is a good thing to attach a label bearing its number to each tree. The label shown in Fig. 18 is the one used in the Station orchard. It measures 1x3 inches and is made of galvanized iron about the thickness of a copper cent.

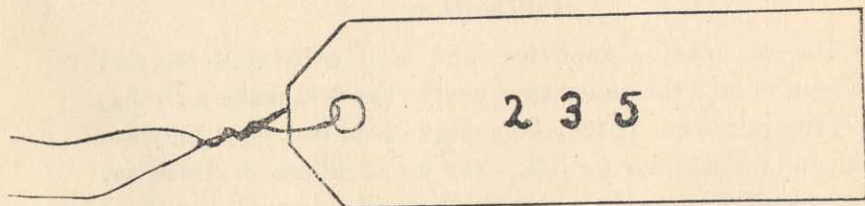


Fig. 18. Galvanized iron label.

The number is stamped upon it with steel die numerals. Any tinner will make and wire them with stove-pipe wire for about 80 cents a hundred, without stamping. If steel dies are not accessible, the tag may be made of sheet lead, and

marked with a steel point, but of course the cost will be greater; or it may be made of zinc, and written upon with a course stub pen and ink prepared as follows: Two parts by weight of acetate of copper, two of sal-ammoniac, one of lamp black and thirty parts of soft water; mix the ingredients with a little of the water, then add the rest, and keep in a tightly corked bottle, shaking frequently when in use.

With trees thus marked it is an easy matter to set down the numbers of those which are especially prolific or otherwise desirable, from which to cut scions the following winter. If a man selects the scions for his trees in this way he will have far more uniform and better producing trees than as though he buy them at random from a nurseryman. If he does not care to do his own budding or grafting, let him take his own scions to the nurseryman and have it done for him. Furthermore, when every tree bears a number, it is a simple matter to direct the work in the orchard; if on walking through it the grower sees a tree that has been neglected in spraying, that has a broken or diseased limb that ought to be removed, or needs any other special attention, he can jot down its number and send a man unerringly to it, or go to it himself at any future time without delay.

### Cultivation

The soil must be kept clean and well cultivated the first season to give the young trees every chance to make a strong, vigorous growth. If they do not take hold well then they are apt to be weaklings for life. The use of fillers, or trees set between the rows, has already been deprecated, but there are certain crops which may be grown among the trees for the first two or three seasons without harm. Strawberries is one of the most satisfactory crops for this purpose, as it is short-lived, and need not interfere in the slightest with the

feeding of the trees. Raspberries and the other bush fruits are not so good, as they are too permanent in their nature, develop too wide-spreading a root system, and are harder to plow out. The garden vegetables, except sweet corn and perennials, are well adapted to orchard use. Of course the drying effect of these crops must be taken into account, and when irrigation is not practiced it may be the part of wisdom to dispense with all crops, so that cultivation may be thorough and complete, leaving a dust blanket over the land from one end of the orchard to the other. If after all your care some of the trees fail to push out their leaves, or do so very feebly and much behind the others, as occasionally happens, it shows that the root is not working properly, perhaps because it was allowed to dry out, or pruned too severely, and the only remedy is to prune the top severely, so as to concentrate the sap pressure on just a few buds.

A list of nurserymen in this state is subjoined for the convenience of those who wish to patronize local nurseries.

### Idaho Nurserymen

- Blackfoot: Harris, Whitzel & Co., O. F. Smith  
 Boise: J. M. Campbell, J. M. Casey, F. J. Wood  
 Caldwell: C. P. Hartley  
 Coeur d'Alene: J. A. Waters  
 Moscow: F. L. White  
 Nampa: H. G. Monce, J. W. Pittenger  
 Payette: J. R. Hubbard, J. J. Toole, W. G. Whitney  
 Roswell: H. M. Ruddock