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e Stark *Orchard Planting* *Book*

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By
William H. Stark

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Preface

Most failures in fruit growing are directly traceable to mistakes made when the trees were planted.

This little booklet has been prepared to meet a demand for trustworthy information, which, when followed, will largely eliminate such mistakes.

The sum total of horticultural knowledge is the result of the work and experience of the present as well as of all past generations. The contents of this booklet is not the result of my own experience alone. It is a collection of the knowledge and experience of many men. Each of these men have spent a large part of their lives working with trees. Many have had scientific training. All are rich in that greatest of all knowledge—practical experience.

One man by working hard may add a small item of knowledge to the vast amount we already have. However, the commercial orchardist wishes first of all, to succeed financially. He does not care to try experiments in a large way. Hence, in offering this book I do so feeling it is a safe guide—one that may be followed without misgivings as to final results, for it is based on the knowledge of others, verified by personal experience.

In so far as it is practicable to set down fixed rules covering the planting of trees and their care for the first few years, such rules have been given in the following pages. However, the reader need know but little of the science of tree growing to realize that conditions of soil, climate and other elements vary. Seasons also vary from year to year. Such variations require thought and consideration in the practical application of these rules.

William H. Stark

Louisiana, Missouri

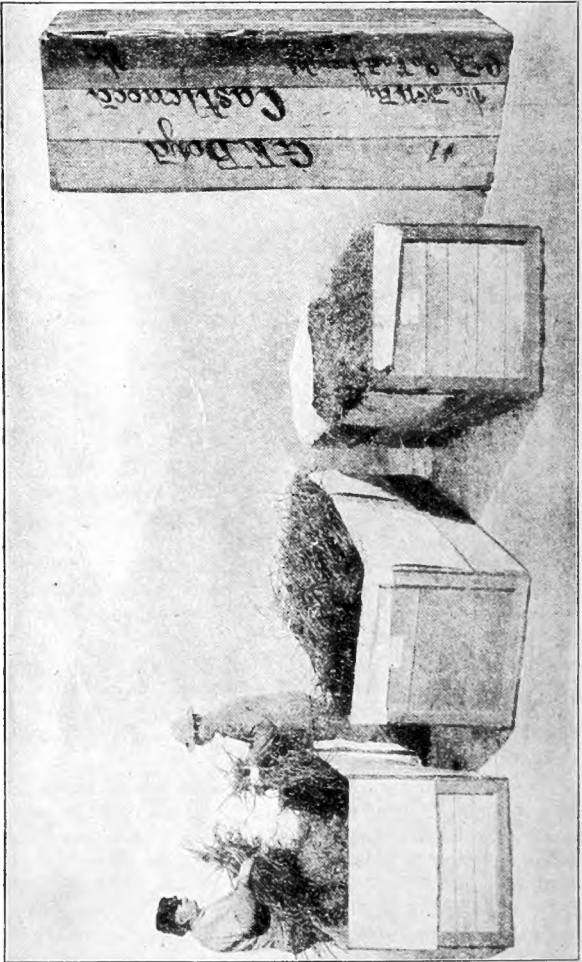
Figure 1

Packing Trees for Shipment

The method of packing here illustrated is world-famous for its thoroughness. Trees packed by this method will go through the severe freezing weather and reach the planter in perfect condition after being on the road for weeks and even months.

On the left a substantial wooden packing case is being filled. The box is first lined with heavy, water-proof paper. This protects the stock from drying out, which really causes most of the damage usually attributed to freezing. A layer of moist packing fibre is then laid on the bottom; then a layer of trees, then a layer of packing fibre, and so on until the box is filled, as shown by the second box.

The third box shows a top layer of packing fibre and the lining paper partly folded over. The upright case shows the finished shipment—top nailed down and secured with metal straps, addressed, and ready to go aboard the cars.



**Stark Method
of Packing**

The Stark System of packing is famous for its thoroughness. Packing cases are especially lined to prevent the contents from drying out; damp fibre and moss are used about the roots and between the layers of trees. This packing, expensive as it is, is done wholly without charge to the customer. This department of our business is without equal among nurserymen. (Figure 1, page 2.)

Mature trees which are handled carefully without exposure and packed in this manner can not only be shipped to any fruit-growing region in America, but to foreign countries as well. Many shipments are annually sent with entire success to Australia, New Zealand, Siberia, India and Alaska. The majority of these are en route many weeks.

**Receipt
of Trees**

Unpack the trees as soon as delivered, unless it is during freezing weather, in which case place the box or package in a cool, dry, frost-proof cellar or building to await the return of milder weather.

If not ready for planting when the stock is received, unpack and heel it in. Stock is often ordered in the fall, even though the planter does not contemplate setting out the trees at that time, and by heeling them in he carries them over and has them ready for late winter or early spring planting.

**Heeling
in Trees**

To heel in trees, dig a trench on a well-drained ridge or other dry ground, $1\frac{1}{2}$ to 2 feet deep, and wide enough to take the roots without crowding. If you dig the trench too deep on low land the roots will become water-soaked and be injured. Use the excavated soil to make a sloping bank on the south side of the trench. Cut the bundles of trees open, shaking out all packing. Place a layer of trees in a sloping position with the roots in the trench (Figure 2, page 4); then work the soil well in among the roots, covering this layer to the very tips with well broken soil.

Be very careful to have plenty of soil shaken in among the roots. Pack this layer firmly, then add a second layer of trees with soil, and so on until all trees are disposed of. Then cover the entire mound with soil, smoothing the sides so as to turn off all water. Also dig small trenches around the base of the mound in order to carry off rain water.

Never expose roots to wind or sun an instant longer than necessary. When unpacking and checking the order or preparing for planting, keep the trees covered with wet moss or an old, well-dampened sack.

It sometimes happens that there has been delay in transportation of weeks and even months. In such cases, the trees should be unpacked and completely buried in damp, moist earth for several days before they are planted. With this treatment they will regain their original plumpness.

Any unusual delay should be reported immediately on receipt of stock.

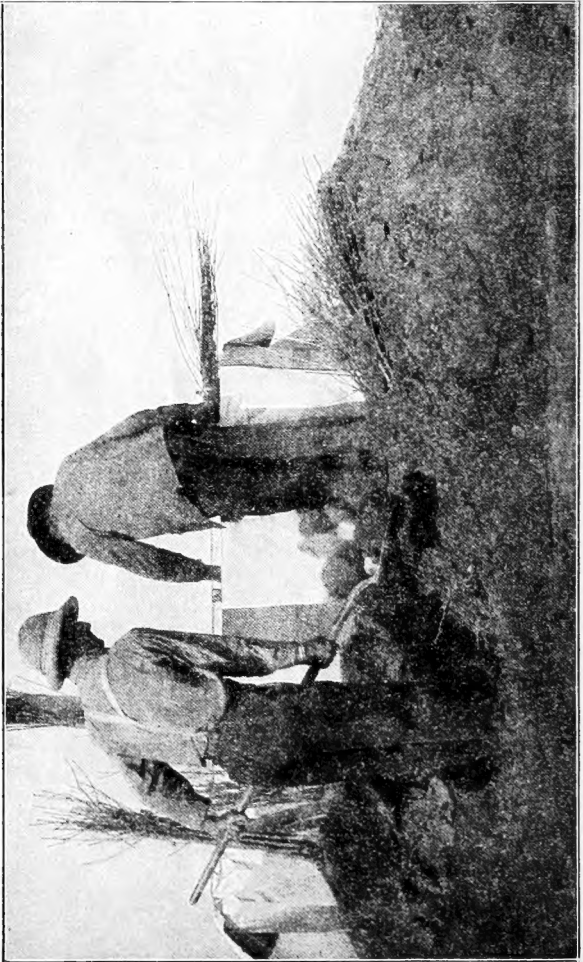
Figure 2

Heeling in Trees for the Winter

This is the method used where trees are delivered in the fall or winter and cannot be planted until spring, owing to danger of injury by freezing to trees which have not had time to become established and hence do not have the resistance to cold that they will have after they have made a season's growth. Northern planters often do this in order to have trees on hand and ready for planting immediately at the opening of their spring season.

In the illustration, one layer of trees is nearly covered and a second one nearly so. When finished the trees should be completely buried and the dirt pressed down firmly so that it will turn water. Note that the roots of the bundle of trees leaning against the box have been covered with a damp sack until they can be heeled in. Never expose roots to sun or wind or let them dry out.

Where the trees are heeled in temporarily and there is no danger of freezing or drying, only the roots need be buried.



UNITED STATES DEPT. OF AGRICULTURE
Bureau of Plant Industry
Washington, D. C.

William Stark,
Louisiana, Mo.

Season of
Planting

"Dear Sir: Wherever the hardiness of the tree is absolutely beyond question, fall planting is advantageous for many reasons.

"In our Southern states fall planting goes on clear through the winter, even merging into spring planting.

"Fall planting is advantageous in permitting the fruit grower to get ahead with his work.

"If the ground is too wet and soggy, so that it will bake in the spring, or if it is a pasty clay, so that the trees will heave from the frost, it is objectionable.

"If the ground is unreasonably dry, either from its sandy or shaly texture, or from lack of rain, fall planting is dangerous. This is particularly true in the North, where young nursery stock might be more or less tender during severe winters. Under these conditions, trees may be dried out and killed by freezing before they are able to draw the soil moisture."

Yours very truly,
M. B. WAITE, Pathologist in Charge.

DEPARTMENT OF AGRICULTURE
Oregon Agricultural College and Experiment Station

William Stark, Corvallis, Oregon.
Louisiana, Mo.

Dear Sir:

"In reply to your recent letter concerning fall planting, I will state that for Western Oregon, including the Willamette Valley, Umpqua Valley and the Coast Counties, also Rogue River Valley in Southern Oregon, I would by all means recommend fall planting. For higher altitudes of the state and for those regions that are subject to low temperature in winter, I would recommend spring planting."

Yours sincerely,

C. P. LEWIS.

UNIVERSITY OF CALIFORNIA
College of Agriculture

William Stark, Berkeley, California.
Louisiana, Mo.

Dear Sir:

"Fall planting and spring planting in California are local matters in the different regions of the state. Over the greater area of the state, fall or early winter planting is superior because the young trees speedily make roots and establish themselves, while spring planting is apt to bring the tree into the dry season without having had an opportunity to thus fortify itself."

Very sincerely,

E. J. WICKSON, Dean and Director.

William Stark, Seattle, Washington.
Louisiana, Mo.

Dear Sir:

"Replying to your inquiry relative to fall planting and spring planting, I would say that for mild climates I much prefer fall planting. Where the climate is too rigorous for fall planting, I much prefer to get my trees in the fall and heel them in for spring planting."

Very truly yours,

F. WALDEN, Editor "Ranch."

Preparation of Land A dressing of manure, applied in the fall and then plowed under, makes the best possible preparation for planting an orchard in the spring. The land should be plowed as deeply as possible, but care should be taken never to turn up more than one inch of the subsoil at a plowing. Then at planting time it is sometimes necessary to plow again, but ordinarily heavy discing and preparation, such as should be made for wheat and other crops, is sufficient.

Also see pages 10 and 11 for Mr. Wm. T. Page's experience in preparing arid land for planting.

Drainage Drainage is absolutely necessary. Surplus water must be carried off before fruit growing can be made profitable, and this is just as true of the irrigated sections as anywhere else. Most fruit land is rolling or has sufficient slope to secure adequate natural drainage. If the soil is of such a texture and the slope of the land is not sufficient, it is necessary to resort to artificial drainage, using open ditches, tiling, or some other similar method. Fruit trees will not thrive in land which is water-logged for any length of time. They are injured directly and indirectly by the poisonous condition which accompanies water-logging of the soil.

Orchard Soils

Clay Soil In general there are three types of soils; first, the clay soil, which is the most difficult to prepare. It should be plowed deeply and harrowed thoroughly until in good condition for planting. It does not dry out as quickly as other soils, and is inclined to "bake;" therefore, there is less time for working it. Every opportunity should be taken advantage of to cultivate the clay land, retaining the moisture as well as promoting growth and preventing packing of the soil. Western orchardmen know this; the Eastern man could prevent loss from nine-tenths of our drouths if he would only cultivate the ground thoroughly throughout the season. See page 25 for the Western method, outlined in a letter from Mr. Thos. W. Page.

Loamy Soil Like the clay land, loamy soil should be plowed deeply. It is usually fertile and does not require manuring as often as does the clay or sandy soil. Neither does it require the careful handling as does the clay soil. Trees are apt to grow late in the season on this type of soil, therefore, cultivation should be stopped earlier than it would be in other soils, so that the wood will mature well for winter.

Sandy Soil Sandy soil, while it does not contain as much plant food as the others, responds quickly to fertilizers and cover crops, and under proper management produces highly colored fruit. If the tree does not make a new

growth at the tip of the branch of at least a foot per season, it is a pretty sure sign that the land needs strengthening with manure and cover crops.

The land should be plowed deeply before the orchard is planted. This is preferably done in the fall. In the spring the ground is prepared as it would be for any ordinary cultivated crop.

In the irrigated country the necessary leveling of the ground should be attended to before the orchard is planted so as to facilitate the laying out of irrigation ditches. It is better to cultivate most new, or raw land, a year before planting; crop the land, which does not take water readily, for one year before putting in an orchard, as it then has a chance to become thoroughly moistened, and in some places where the land is inclined to sink practically all the spots have settled that are going to do so. If, for some reason, it is not advisable to wait this extra year, plant the trees and give special attention to irrigating the first year.

There can be no absolute figures given on planting distance as it varies with the kind and fertility of the soil and the variety of trees as well as the system of pruning to be followed. As a rule, 30 feet is a good distance for apple, though such varieties as Wagener, Rome Beauty, Wealthy and Duchess can be planted as close as 24 feet. Some growers prefer planting them even closer and keeping them pruned within bounds as far as possible, as they find it more satisfactory to spray and gather from the smaller trees.

Proper Distance Between Trees and Plants

Apple 24 to 30 ft. each way
Ordinarily we recommend 30 ft. as the most satisfactory, though on very strong land, from 32 to 36 ft. is better.

Apricot 16 to 20 ft. each way

Asparagus, 1 to 2 ft. bet. plants, in rows 3 to 3½ ft. apart

Blackberries, 3 to 5 ft. bet. plants, in rows 4 to 6 ft. apart

Catalpa, Black Locust, etc., for posts

and timber 8 to 10 ft. each way

Cherry, Sour Sorts..... 16 to 20 ft. each way

Cherry, Sweet Sorts..... 20 to 30 ft. each way

Currant..... 4 ft. between plants, in rows 5 ft. apart

Gooseberries 4 ft. between plants, in rows 5 ft. apart

Grape 8 to 10 ft. each way

Many vineyardists plant grape vines 8 ft. apart in the rows, with rows from 10 to 12 ft. apart.

Hedge Plants 1 to 2 ft. apart

Mulberries 25 to 30 ft. each way

Pecan and Walnut..... 35 to 40 ft. each way

Peach 16 to 20 ft. each way

Pear, Dwarf 10 to 15 ft. each way

Pear, Standard 20 to 30 ft. each way

Plum 16 to 20 ft. each way

On good soil, the strong growing Japanese sorts should be planted not less than 20 ft.

Quince 10 to 16 ft. each way

Raspberries, Black... 3 ft. bet. plants, in rows 6 ft. apart

Some prefer Black Raspberries 6x6 ft.

Raspberries, red, 3 ft. bet. plants, in rows 4 to 5 ft. apart

Rhubarb..... 3 ft. between plants, in rows 4 ft. apart

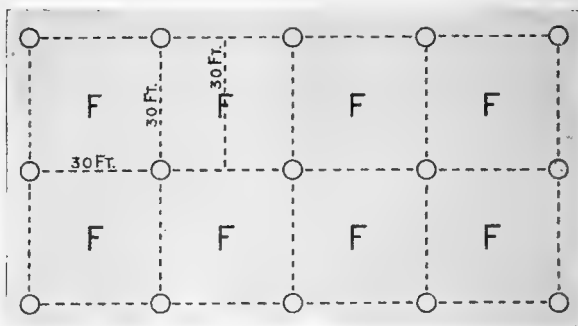


Figure 3

Square or Check Method

This is the usual plan followed in the past. Trees are equal distance apart and the rows equal distance apart. The permanent trees can be thinned out by removing alternate rows.

The locations of filler trees, should they be planted, are indicated by the letter "F."

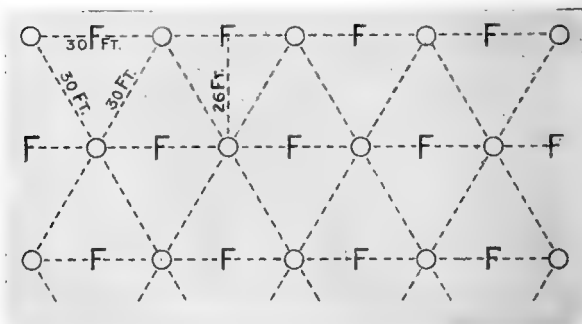


Figure 4

Triangular or Hexagonal Method

Note that the small circles which represent the location of the permanent trees are equally distant from each other. Also that the circles of one row are opposite the open spaces of the other rows. In this figure the circles are represented as being 30 feet apart. Especially note, however, that the top row of circles is only 26 feet from the row below it. It is by planting in this way that it is made possible to get 15% more trees to the acre than in the square or check method.

The fillers, if any are planted, should be set at points marked "F." Note that the triangular method permits cultivation or irrigation in three different directions.

When planting by the square (Figure 3) or the rectangular method (Figure 4), the number of trees or plants per acre can be easily determined. First, multiply the sides of the square or rectangle together, and divide 43,650 (the number of square feet in an acre) by the product. When planting by the triangular system, add 15 per cent more to the num-

ber of trees required to set out the same area as the square or rectangular method. That is, if planting by the square method, 100 trees are necessary, add 15 per cent more to get the number for the triangular plan.

Example:—To determine the number of trees, planted, 30x30, required to set ten acres:

$$30 \times 30 = 900$$

$$43,560 \div 900 = 49 \text{—trees per acre.}$$

$49 \times 10 = 490$ —trees to plant 10 acres on square method.

$490 + 15\% = 563$ —trees to plant 10 acres on triangular method.

Fillers in the Orchard

There are certain varieties of apple which come into bearing young, and for this reason they are especially adapted as temporary fillers in an orchard. This does not mean that they are not long-lived, for they are equally suitable as permanent trees. Stark King David is one of the best; also Jonathan, Wagener, Grimes Golden, Liveland Raspberry, Wealthy, Duchess, Wilson Red June and Early Melon.

Cherries are especially adapted as fillers. They are hardy, bear large crops regularly, bring good prices on the local market and come into bearing young. They will yield profitable crops before it is necessary to cut them out in order to make more room for the permanent apple trees. It costs no more to cultivate an orchard with fillers than without. The Montmorency makes a splendid filler, Royal Duke is also fine, especially on dry land and in the West, and has straight, upright-growing branches, and for this reason is especially adapted as a filler, as well as a roadside tree.

J. H. Hale, the Peach King of Connecticut and Georgia fame, has paid for a number of his large apple orchards by planting peach as a filler, and finds it very profitable.

Fillers in the Apple Orchard How to make the young orchard pay for itself before the trees come into bearing is a problem that every fruit grower must face. And in every good farming community the high price of land forces this further question: "How can I get the most from a small space?"

"I have made \$340 an acre at Orchard Farm, Ghent, N. Y., from four crops of fruit on the same ground. The apple trees, planted forty feet apart, were not in bearing. Between them peaches were interplanted twenty feet apart, currants five feet apart, and strawberries in between. The currants paid \$75 to \$100 an acre, peaches \$140, and strawberries \$100.

"The great danger in close planting (even in the plan I advocate), is the almost irresistible temptation to let the 'fillers' fruit 'just once more,' to the detriment of the permanent trees."—From a paper by G. T. Powell.

Laying Out the Orchard The orchard should be carefully staked out before planting time, so that the rows may be true and straight in every direction and from every point.

There are two systems of planting—the old square checked method (Figure 3, page 8) and the new triangular method (Figure 4, page 8). The latter is the plan recommended by Prof. E. J. Wickson. In both methods the trees are equally distant from one another, but in the triangular method the trees in the center row are opposite the open spaces in the top and bottom rows, and because of this the center row can be planted closer to the top and bottom rows, and still the trees will be the required distance apart. This method also permits cultivation in three directions instead of two, as in the old way. Lastly, it accommodates a greater number of trees to the acre, which is explained in the following table:

Old or Square Method

	Per acre
Trees planted 30 feet apart each way.....	49 trees
Trees planted 24 feet apart each way.....	75 trees
Trees planted 20 feet apart each way.....	108 trees

New or Triangular Method

	Per acre
Trees planted 30 feet apart each way.....	58 trees
Trees planted 24 feet apart each way.....	90 trees
Trees planted 20 feet apart each way.....	128 trees

William Stark,
Louisiana, Mo.

Columbia, Mo.

Depth of Planting

Dear Sir:

"Ordinarily, trees should not be set deeper than they were in the nursery row. Many growers set them deep with the idea that they will stand more firmly, just as a deeply set fence post will stand more firmly. As a matter of fact, the tree must depend upon its roots making growth to hold it upright. Roots will start much more quickly and abundantly if the root is near the warm surface of the soil * * *."—J. C. Whitten, Prof. of Horticulture.

In irrigated sections of the West, or when planting on thin, sandy soil, which dries out quickly, plant two to three inches deeper than the trees stood in the nursery row. Dwarf pear are an exception and should be planted four to five inches deeper than they stood in the nursery row.

Planting 20,000 Trees in An Irrigated Country When Irrigation Supply Was Cut Off

"* * * Our irrigation system was not working until July 1st. Being accustomed to irrigation in different parts of the country, I commenced to look around to see how I was going to come out. I prepared for the worst right at the start.

"I hired a steam plow to break up the land six inches deep, and as the steam plow made its first furrows across the field, I started four cut-away harrows right after it. The ground had considerable moisture in it at that time. I chopped it up, some of it as much as five times. Of course, this was a raw place, covered with buffalo sod and not a stick of timber of any kind on it. I had fences

to build, also houses, barns, corrals, and get the orchard ready. I did all of this with hired teams. When the plowing was done, the harrowing was done also.

"I set a stake where I wanted every tree. When this was done, I sent a message to you to ship the trees, and went out and bought four head of the best horses that money would buy. I also bought two wagons with large water tanks equipped with Meyers pumps and with all the hose connections to handle water rapidly. I put 30 men to digging holes; two tank wagons followed them, putting about four gallons of water in the bottom of every hole. By that time our Montmorency King cherries had landed in Pueblo. I hired a transfer outfit to deliver them, using our own teams to haul water to put in the trench I had prepared for the trees.

"The trees arrived late in the evening. I tore a hole in each box and put water in, then covered the boxes with canvas to protect them from frost. The next morning I heeled the trees in, tramped the dirt good and tight around them with lots of mud. The next day I started 18 men to planting. I picked out the best and most careful men as trampers; filled the holes with dirt, at this time, just full enough to cover all the roots of the trees; then put in about five gallons of water to each tree. After the water had settled, the holes were carefully filled and firmly tramped. By this time all the holes on the entire place were dug and I put the two teams to hauling water and putting it into the apple tree holes. By the time the apple trees arrived here I had between four and five gallons of water in the bottom of every hole.

"We received the apple trees early in the morning. I did just exactly with the apple trees as I did with the cherries. I also had a team and wagon with a grout barrel, and had a man in the wagon to grout the trees and see to it that no planter had over two trees in the air at one time.

"This treatment and the careful attention the trees had generally, is the cause of our success. I lost no Jonathan and very few of any other variety."—Wm. T. Page, Wilson, Colorado.

Digging the Holes

The hole for the tree should be large enough to let all roots rest naturally without crowding. A common practice is to plow both ways, enlarging the furrows with a shovel and planting the

trees at the intersection of the furrows. Others plow just one way and mark the points where the trees are to go along the furrows. Whichever method you use, be very careful to have the trees lined out neatly and accurately, not only for appearance sake, but to make easier all orchard operations. Orchardists sometimes plant the trees slightly leaning in the direction of the prevailing wind, or towards the southwest, so that the shade will protect the trunks from sun-scald. This is sometimes helpful, but if the right side of a tree is planted toward the prevailing winds, or the southwest, leaning will usually be unnecessary. The method of determining the right side is described as follows:

William Stark,
Louisiana, Mo.

Columbia, Missouri.

Dear Sir:

"No matter how straight or symmetrical the fruit tree, it will have a heavy side and a light side. The annual layer is thicker on one side of the tree than on the opposite side, so that the pith of the tree is not at the center of the trunk, but rather toward one side. When the tree is taken up to be planted, it may be balanced across the left hand. As it takes its position of balance, the side

next the hand should be planted toward the southwest or the 2 o'clock sun in the afternoon. Set in this way, it will be found that the tree will bend very easily toward the southwest, but will bend much less readily in the opposite direction. Planting this side toward the southwest, or the side toward which the main limbs generally tend to bend, enables the tree much better to stand up against the wind and the blistering sunlight."

Very truly,

J. C. WHITTEN, Prof. of Horticulture.

Dynamiting A small charge of dynamite is exploded in the ground where the tree is to be planted. This is especially advantageous where there is a "hard pan," or an impervious clay, or gravel sub-soil. It loosens the soil for a number of feet and the roots of the young trees have a greater area of soil in which to feed.

It is to the impervious sub-soil what cultivation is to the top soil. The entire field is sometimes dynamited in special cases. The powder companies will give detailed information for doing the work. I will be glad to give the names of powder manufacturers on application.

Mr. William Stark,
Louisiana, Mo.

Dear Sir:

The greatest success in labor-saving devices we have had on our orchard has been digging the holes with dynamite. Last spring we set some nice little yearling apple trees from Stark Bro's Nursery. This fall it was found necessary to move some of them and their root growth was wonderful, one of them having a strong root growing straight down at least 3½ feet long, and many others fully two feet, with lots of small growth. One set in a hand-dug hole had a nice bunch of roots, but they were none of them a foot long. This ground is a beautiful loam, with a little stone in it, and runs from 5 to 6 feet in depth. These dynamite planted trees are very fine and of course they had the advantage of being Stark trees and first-class stock.

Yours very truly,

ESTELLE M. RAWLEY, Josephine County, Oregon.

**Protect Roots
From all
Exposure**

In handling the trees always remember to protect the roots from exposure, keeping them covered with moist packing or damp sacks.

Many orchardists place a barrel half full of water on a wagon and haul this through the orchard, taking the trees from the barrel as they are planted. Others dip the trees in water and place them in the wagon and cover them up to prevent the water from drying before the trees are set out.

When the weather is hot and the buds swollen, special care should be taken to prevent water getting on the enlarged tender buds.

William Stark,
Louisiana, Mo.

Grand Valley, Colo.

Dear Sir:

"At Morrisania we use a tank in which to place roots of fruit trees to be planted. This tank is mounted on a flat-bottomed wagon and about two feet of water is placed in the same, and as an additional protection we use about half a gallon of Black Leaf tobacco extract to a barrel of water and in this mixture the roots are kept immersed until they are planted. One man rides on the

wagon and drives, and he takes the trees from the tank, trims the roots and hands to the planters. One good man can keep two good planters busy."—James M. Irvine, Editor, *The Fruit-Grower*.

William Stark, Columbia, Mo.
Louisiana, Mo.

Root Pruning

Dear Sir:

"* * * I believe that you would get better results by trimming the small fibrous roots to short stubs. For two or three years, we replanted hundreds of trees in the same holes where trees had died out in the orchard from root rot. We soon found, however, that it would not matter very much what variety we planted where a tree had died from root rot, that it was almost sure to live if we pruned off all the dead fibers, cut off any bruised or diseased ends of roots with a smooth cut and got the root system in close capillary contact with the soil when we planted. In this particular spring, every single tree lived where the pruning was done. That was seven years ago, and last year I went over the plot and found that every one of those replanted—about 300 in all—were still living. In replanting we were sure to see to it that the root-rot fungus was always placed back in the hole with the soil so as to be sure to have plenty of infection, and in order to see which of these roots were more resistant. Even the most susceptible ones lived where dead parts of the roots were cut off with a smooth cut and where the soil was gotten well in contact with the root in planting. We had previously made replants for root-rot before we had even gotten in mind pruning off fibrous roots or cutting back old rough wounds where the main roots were cut off in taking them up with the digger. In these cases the majority of the replants lived and yet many of them took root rot. Many of them became infected with it the first year before well established."

Very truly,

J. C. WHITTEN, Prof. of Horticulture.

The above matter, taken from Professor Whitten's letter, should not be confused with the Stringfellow method of planting, which is not to be recommended. The root rot is a disease in certain parts of the South, causing considerable trouble, and very little is known of it, but Professor Whitten in a series of experiments, first demonstrated that by careful pruning and planting of the roots, as described above, young trees can be replanted successfully in the orchard in places from which diseased trees have been removed.

Filling the Hole

The fine top soil should be placed in the hole around the roots, the trees moved slightly so as to settle the soil, leaving no air pockets, and pressed firmly about the roots. When the hole is nearly three-fourths full, water, and then fill in the remainder of the hole with loose soil. In irrigated countries trees should be watered at the time they are set, and again ten to twelve days later.

The number of acres of apple orchard a man can set depends on the condition of the land and other factors. However, Paddock & Whipple give the following report:

"The ground was laid out by plowing furrows both ways as described above—fourteen men were actually engaged in the planting, two were distributing trees from the wagon, six digging the holes and fill-

ing in about the trees, with the other six trimming and placing the trees. These fourteen men set 20 acres per day without difficulty, and set them well.

"Trees should be handled carefully in planting, and the roots should be exposed to the air no longer than necessary. If the force of men is large, the plan of hauling the trees in a wagon, with men to distribute them, is a good one. With the furrow method of planting, the man with the shovel may dig the hole, while the other prunes the roots, and if he is to be trusted, the top."

Where the soil is very dry, fill the hole two-thirds full of earth, packing it thoroughly among the roots as described above, then pouring in four or five gallons of water. Fill in the balance of the hole with loose earth, but do not press down firmly. There will be less evaporation if several inches of loose soil are placed on top than there will be if all of the earth is packed firmly.

Cherry should be given special care in planting, as the tops are not cut back, like they are on other trees. In planting cherry, several gallons or more of water should be poured on the ground about each tree. A teaspoonful of nitrate of soda to each gallon of water helps to start the tree off in good shape. A solution made by soaking a bushel of manure in a barrel of water is better, but takes more time. Also a light dressing of well-rotted manure placed on the ground about each tree is beneficial.

Never put bulky manure or trash in the hole with the tree. It is apt to dry out and cause death of tree. Instead, place the manure or the fertilizer on the surface of ground about the tree, but never in actual contact with the trunk.

Pruning

Pruning at Planting Time

The newly planted tree should be pruned before it starts growth in the spring, and pruning should be given careful attention from then on, but especially while the tree is young. When a young tree is dug a number of the roots are lost and a corresponding amount of the top should be removed in order to maintain an even balance. This does not apply to cherry.

In pruning, you cannot go by an exact rule. Study the nature of the tree. Peach and apple are different. Prune each according to its needs. Also, different varieties require different treatment. Some varieties of apple have low and spreading heads and should be pruned to make them develop an upright growth as much as possible. Others have straight, upright branches, and should be pruned so they will spread more, and be nearer the ideal tree. Then, too, some individual trees have peculiarities of their own and require special treatment and study.

Do not leave the wire label twisted on the tree in such a position that it will cut into it as the tree grows bigger.

High and Low Heads Sun-Scald

"The proper formation of the top is by no means the least important reason for cutting back the branches of newly planted trees. In the first place, the importance of low-headed trees for this climate cannot be too strongly emphasized. Hundreds of trees are dying in all parts of the West because of the exposure of the long trunks to the afternoon sun, either directly or by reflection, from hot, dry soil in summer, or from snow in winter. Young trees are especially liable to injury, which results in early death or a weak, sickly growth, from which they never recover. There is less injury from sun-scald in the humid states, but in those districts many authorities are advocating lower headed trees."

"In addition to forming low heads, there can be no question but that it pays still further to protect the trunks of newly planted trees from injury by sun-scald. Various devices are used, such as wrapping the trunks with burlap, paper, straw, wood veneer, or by shading the trunk on the southwest side with a thin piece of board (*) set upright in the ground. Whitewashing the young trunks to serve the same purpose has come to be extensively used in some sections. Whatever method is adopted it should be employed soon after the trees are planted and continued in good condition through the second winter, or until the shade of the trees becomes ample."

"The advantage of the low-headed trees may be stated to be greater ease in picking, thinning, pruning and spraying, and less damage to trees and fruit from winds."
—From Paddock & Whipple's *Fruit Growing in Arid Regions*.

There are two general forms in which a tree may be developed—one is the pyramidal form, with the central leader with small branches around it, which eventually gives a high "two-storied" tree. The other is without a central leader, giving a vase-shaped tree, all branches being about the same size. This is by far the best in most cases, as the tree is not spoiled in case there is injury to any one branch, as would be the case if the central leader were destroyed in the pyramidal tree. Also, it greatly facilitates pruning, spraying, gathering, thinning, and makes it possible to keep the head open, thus allowing abundant sunshine and free circulation of air.

William Stark, Columbia, Mo.
Louisiana, Mo.

Dear Sir:

One-Year-Old vs. Two-Year-Old Apple Trees for Planting

"Some years ago the Experiment Station sent out 2,500 circular letters to Missouri orchardists asking for their experiences with regard to planting one-year-old or two-year-old trees. About one-fourth of them said unconditionally they would prefer to plant one-year-old trees. Nearly all of the three-fourths who said they would prefer two-year-olds make this statement conditional. Many of them said they would prefer one-year-old trees, provided they could get large one-year-olds, but would usually prefer to risk the larger two-year-old trees for the reason that they could not always secure large one-year-olds. The sum total of their reports indicated that if the one-year-old trees were large and well grown, they gave results superior to two-year-olds.

*This latter method is the most satisfactory, since it does not make the tree trunk tender by shutting out air.

"In our own experience at the Experiment Station, we prefer one-year-old trees, provided we can get them well grown and four feet or upwards in height.

"If one-year-olds are less than three feet in height, we would prefer two-year-old trees. The one-year-old trees can be headed at any height which the planter desires. They can subsequently be pruned and shaped at the will of the planter, without interfering with a frame-work which has previously been formed in the nursery. They can be handled and planted with much less labor. They occasionally wilt less, and are far less liable to lean or to have roots loosened in wet, windy times, than are the bigger two-year-olds. They can be readily cultivated close the first year without barking limbs already formed.

"Two-year-olds well branched when shipped are likely to have their branches more or less broken in handling, even though the best care is taken in packing, shipping and planting. With one-year-olds there is no such danger. On well-grown one-year-olds a better root system can always be secured in proportion to the tree.

"I believe that apple growers have preferred two-year-olds. It is larger; because under neglect the one-year-old is more likely to be overgrown by weeds or too much shaded by corn or other crops, if the latter are planted too close to the tree. In no case, however, should weeds be allowed to grow close enough to shade one-year-old trees. I do not think a two-year tree should be chosen, simply because it is big enough to better avoid being overtopped by weeds or encroaching crops.

"It is our belief here at the Station that the one-year-old tree is the better, more economical, and the safer tree to plant."—J. C. Whitten, Horticulturist.

A great deal depends upon proper and consistent pruning. Don't let the trees go unattended for several years, and then try to saw them into shape. Do what pruning is necessary each season. Bear in mind that trees in a cool, moist climate require less pruning than do those in a hot, dry climate.

Pruning One-Year Apple The yearling apple tree, as it comes from the nursery, is usually a straight whip, and should be cut back as soon as planted. Allow 14 to 16 inches upon which to develop the head, and 18 to 24 inches for the trunk, depending on how high headed a tree you desire. Make a slightly sloping cut just above a sound bud (Figure 5, page 17). It will be much easier and more profitable to grow the tree and shape it as it is growing than to let it go unpruned and then try to cut or saw it into the proper shape. Pinch off all shoots on the lower part of the trunk as fast as they appear, and do not allow more than four to six shoots to grow on the upper 14 to 16 inches from which the head is to be developed. These should be arranged spirally, as nearly as possible, around the main stem, so as to avoid weak crotches. If the branches grow unevenly, pinch the end of the stronger shoots to check them.

Pruning can be done in winter, but preferably in late winter or early spring. For the first four years or more cut back one-third to one-half of each season's growth, so as to get a low head, then go over the tree three or four times during the first part of the summer and pinch the ends off the tender young shoots that you do not want to grow into permanent branches. Leave these stubs or spurs on the main

branches. These little fruit spurs bear the apples, and the more of them distributed close to the body and main branches of the tree, the larger the load of fruit it can bear. If the young tree is trained in this way until it comes into bearing, comparatively little pruning will be necessary thereafter. When trees are headed low with the main branches covered with fruit spurs their entire length, the fruit thinned so as to stimulate annual bearing, the strength of the tree



Figure 5

Pruning One-Year Apple and Pear

Use a sharp knife making a sloping cut just above a sound bud. Note position and way knife is held, also the way the right foot is placed close to tree when making the cut. As soon as the buds start, any on the lower half of the tree should be rubbed off with a gloved hand. When the shoots on the upper half are several inches long, cut out all but three to six with a sharp knife. Those which remain should be arranged around the tree as nearly like a flight of spiral stairsteps as possible.

will be expended in the production of fruit, rather than surplus wood.



Figure 6

Pruning Two-Year Apple and Pear

The unnecessary branches were first cut out. The five remaining branches were shortened back six to eight inches on this size tree (medium size, 4 to 5 feet). Standing over this particular tree and looking down, the five branches radiate from the central trunk like the five points of a star, but the top one is ten inches or more above the bottom one.

This tree was headed lower than is usually done in the East, but not quite as low as is done in many of the Western orchards, especially in those sections where it is very necessary to have the branches shade the trunk from the hot sun. Note that loose earth has been thrown up around the tree several inches deep. This last several inches should not be tramped down, but left loose to prevent drying out of the soil beneath.

For Fall planting it is often advisable to mound the earth up eight or ten inches. This should be raked down in the spring.

Pruning Two-Year Apple Where pruning for a vase-shaped tree, cut back the central leader, removing all but three to six of the remaining branches, and then shorten these back to within about six to twelve inches of the main stem, depending on the size of the nursery tree which you are planting, making a slightly sloping cut just above a sound bud which is pointing in the direction you want the branch to take. (Figure 6, page 18.)

Pruning the Pear In a general way, the pear is pruned at the planting time, and thereafter in about the same way as the apple, although on very fertile soils it should be pruned a great deal less, so as not to make it develop a large number of water sprouts, as these are easily infected by blight and should be cut or pinched off as fast as they appear. Light pruning does not hurt any variety of pear and is very beneficial to such sorts as Anjou, which is tardy coming into bearing, and the young trees are inclined to drop their fruit after it is "set." Severe pruning in the winter will prevent this, and insure a good crop of fruit. The trees should be cut back each year, and some of the new wood that may have been forced by the pruning should also be cut out. When once the young trees begin to bear, there will be little trouble about shedding.

Pruning Cherry Cherry trees require little or no pruning at planting time, and not a great deal afterwards. Remove any injured or broken branches which cross and interfere. The buds on the old cherry wood are dormant and less apt to grow than those near the tips of the branches, hence if you cut off the tips you remove the most valuable buds. If there are too many branches and some should be removed, cut off the entire branch, but do not shorten it back. In pruning the sweet cherry it is often necessary to cut back the central leader in order to prevent them growing too tall and willowy. Care should be taken, however, not to prune it too severely and thereby stimulate the growth, nor to give it too much water in the irrigated countries, for if this is done, it may go into the winter in an immature condition and be winter killed.

Pruning Peach In planting the peach tree, remove the central leader and all but three to six of the branches, then cut each of these back to the one good bud. Always prune the peach severely; it is a rapid grower. For the first several years cut back half or more of the new growth in order to develop strong, stocky branches. The low-headed peach is considered to be the most profitable and the head is usually kept within a foot or even closer to the ground, so that picking and other operations can be performed without the use of ladders. Keep the head open and without a central

leader, so that there will be a free circulation of air and an abundance of sunshine. Remember in pruning the peach that its bearing habit is peculiar and different from that of most other fruits. The peaches of this year are borne on the growth of last season. If the peach goes unpruned, there is an accumulation of wood which carries the bearing wood farther and farther above the ground. Plums are pruned practically the same as peaches, except that the varieties vary somewhat in rapidity and nature of growth.

Plum Pruning At planting time, the plum should be cut back much the same way as the peach. Subsequent pruning varies with the type of fruit. The *Domestica* type require less pruning than apple trees, while rank growers of our native plums, like Wild Goose Improved and others, which make thick heads, need more branches taken out in order to thin the heads. However, the less of this necessary, the better, as they do not respond to pruning as well as the peach. Rank growers, like the Burbank, require heading in each season.

Grape Pruning After the grape vines are planted, cut back each cane to within several inches of the ground, leaving about two buds on each cane. The shoots which start from these buds may be allowed to grow over the ground the following season. The following winter the vines should be pruned and during the second season it should be tied up to a temporary stake. The trellis, or whatever form of permanent support is intended, should be built the third spring. The kind of pruning given the second spring depends upon what method you expect to follow. If you are training it for an arbor in the garden, all the shoots can be cut off except one, and this tied over the arbor and pinched back occasionally to make it branch. Here the object is to get growth and shade to cover the arbor, as well as fruit.

In planting a commercial vineyard, there are a great number of systems used in pruning the grape; however, practically all of them depend on removing annually most of the wood which bore fruit that season. The grape is a rapid grower and must be pruned heavier than any other fruit, making it possible to control the fruiting most systematically. When once a vineyard is established, it is pruned about the same way each year.

The following is descriptive of one method used extensively in commercial vineyards in the Lake Erie Grape Belt and other Eastern districts:

The spring of the second year after planting, all of the shoots are cut off except one. This is trained to a temporary stake. Two shoots are allowed to grow out from the central stem about two feet above the ground, so that later they can be trained along the bottom wire of the trellis. Two more shoots are

allowed to grow out at about four feet above the ground so that they may be trained in both directions along the top wire of the trellis. The main or central stem is pinched back a little above the two upper shoots, which brings the top of the central trunk about in line with the top of the trellis, four feet above the ground. (The third year after planting, the trellis should be made, two strands of galvanized wire being used, one about two feet above ground and the other four feet above ground, fastened to the posts set between the vines with wire staples. The posts should be doubly braced at each end of the row.) There should be a main central trunk with two canes which run in either direction along the lower trellis, and two canes which run in either direction along the upper trellis. These should be tied along the wire the coming season to prevent their hanging down.

The fourth winter, cut off these two-year-old laterals, except the four young canes growing from them near the main stalk, two starting from the main stalk near the bottom wire, and two near the top wire. (Figure 8, page 22.) Also cut back a young cane to a spur with two or three buds near the base of each of these four yearling canes. The yearling cane will bear the fruit the next year, while this spur will develop a cane which will bear fruit the year after. Where the vine is not making a vigorous growth, the number of these arms can be lessened or the canes can be shortened back to four or eight buds, thus preventing the vines bearing too heavily. If the vineyard is allowed to over-produce one year, it will bear a light crop the next season. After the vine is once established and pruned each spring, it will appear as follows:

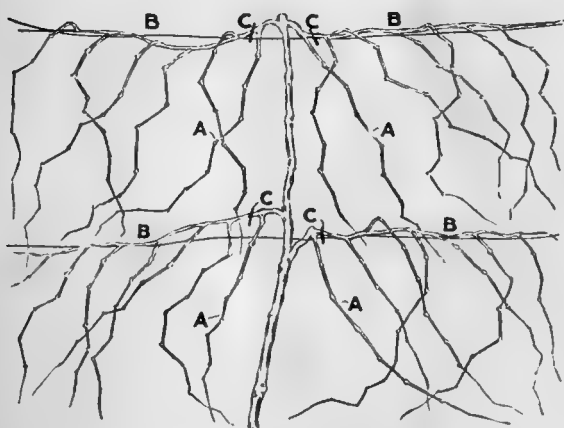


Figure 7

Grape Pruning

The above is a diagrammatical drawing representing a bearing vine in the fall of the year before pruning is begun.

"A" are the four one-year-old canes which are to bear next year's crop.

"B" are the four two-year-old canes, which were tied along the wires the previous spring when they were one year old, and which bore fruit during the summer, and are now of no further use.

"C" are the points where the two-year-old canes will be cut away and entirely removed.



Figure 8

Grape Pruning

The above shows the vine after it has been pruned in the early winter. The one-year canes are stretched along the wire in the spring and tied there before the growth starts. When the laterals from this cane start to grow in the spring they drop on either side of the wire, straddling it (see figure 7), so that no further tying is necessary during the summer.

In addition to the yearling canes which were left on the stub, cut back at C, there is also a short spur where another cane has been cut back, leaving only one bud. A cane will grow from this bud next season and will be trained along the wire two years later.

The lateral stubs left by making cut at C are entirely removed every few years as they get rough, and a new shoot trained out directly from the main trunk.

The size of the crop a vine should bear depends upon its vigor and age; this is regulated by shortening back these yearling canes in the spring (when they are tied up) to 4 to 8 buds. The upper canes are usually left longer than the lower ones.

The main trunk, or arm, as it is sometimes called, is permanently tied to the two wires.

A permanent central stalk or stem reaching from the ground to the top of the trellis. Half way up the stalk there will be two arms, usually about two years old, growing from this side arm there will be a yearling cane which will bear fruit the coming season. (Figure 7, page 21). Also, starting from the same side arm there will be a spur with one bud on it which will develop a cane to bear the crop the following year. Then, four feet from the ground, there are also two yearling canes and two spurs, one of each running in either direction along the top wire.

Pruning Red Raspberry

The canes of the red raspberry grow up from different points along the root. They should be allowed to grow all summer, then in the late winter or early spring cut them back to within two or

three feet of the ground, depending on whether they are a tall or low-growing variety. At this time also remove all canes that bore fruit the previous season. They never bear but once. If there are any small, weakly canes which seem to be more than the roots can nourish, cut these out also. Better have a few vigorous canes than a number of sickly ones.

Pruning Black Raspberry These are very much like the red raspberry, except that all of the new shoots put out from a single crown, instead of from the roots, and will never spread like the red raspberry. The young or black-cap canes require summer pinching. When they are about 1½ feet high, pinch out the young, tender tips in order to make them branch.

Pruning the Blackberry The blackberry spreads from the roots like the red raspberry and does not grow from a single crown, like the black raspberry; however, the young shoots are pinched like those of the black raspberry, in order to make them branch, except that the strong-growing varieties should be allowed to get 2 to 2½ feet high before they are pinched. In pinching the blackberry and raspberry, do not let the branches get high and then cut them back, but pinch the tips while they are young.

Pruning the Currant The currant will continue to bear for some time without any pruning, but this leads to its eventual lack of productiveness. Usually a cane should be cut out as soon as it is about five years old and has borne two or three crops. Allow several young canes to develop each season and cut out several of the old canes. A vigorous bush should not have more than four to eight bearing canes at a time.

Pruning the Gooseberry The gooseberry is pruned very much like currant. However, the canes cannot be allowed to stand as long as they can on the currant. Whenever the bush is not producing well, prune out the old canes, giving the younger canes a better chance. Never allow the bush to become clogged with thorny, weak, useless wood, which saps the vitality of the plant.

Roses The most beautiful of all flowers, the Rose, is usually propagated by one of two methods. First, by growing from cuttings and greenwood tips which gives a plant on its own roots. Second, by budding on manetti or other hardy and vigorous brier stocks. This method gives a stronger growing plant and is necessary for many of the less vigorous varieties.

The objection to this method is that it requires some care and attention in pruning, else the brier stock will put out suckers below the bud and eventually crowd it out. The growth from the bud is less vigorous and sometimes the suckers from the brier

stock are allowed to remain by those who cannot distinguish one from the other. This mistake is unnecessary as the sucker growing from the brier stock is easily recognized for it has seven leaflets instead of five, the cane is nearly covered with small thorns and the sucker coming up from the root is usually several inches distant from the main plant.

When planting budded roses set them so that the point where the bud was inserted in the brier stock is two inches below the surface.

The hardy roses can be planted in the fall—others should not be planted until spring. Cut back canes to 16-18 inches and mound loose earth and trash up around the bush six to ten inches high. (Cover balance with straw if planting in the fall in a locality subject to severe dry freezing weather.) The mound of earth should be placed about the bush whether the planting is done in fall or spring for as much damage is done to the pithy canes of the rose bush at planting time by drying out as is done by freezing during the winter. As soon as the buds start to grow in the spring, rake away the mound of earth and cut back the canes again, leaving two to four buds to each cane. Make this cut just above a sound outside bud so that the new growth will grow outward, making a shapely bush.

Prune roses heavily each spring and give the rose bed several dressings of well rotted manure or other fertilizer each season. The richer the soil of the rose bed the better, and the more abundant will be the bloom.

Cultivation of Orchards

To get the best results, young as well as old orchards should be cultivated. The method used on the young orchard depends on whether crops, such as potatoes, beans, etc., are grown between the rows or not. Such a practice is all right for a short time, where the land is fertile, but should not be continued indefinitely as land should be kept fertile for the trees.

A bearing orchard should be plowed in the spring with a two-horse plow, as close as possible to do so without injuring the roots, and then use a one-horse plow and get in closer. Finally, clear out the ground and get close to the tree with a hoe, and then cultivate every two weeks with a spring tooth or a cut-away harrow. In some parts of the country, where the soil is light, this cultivation with a cut-away harrow is all that is necessary, and with an extension attachment the land can be worked close up to the tree.

In the middle of the summer sow cover crops. Where clover is used, it is all right to allow it to remain on that summer and all the next season, plow-

ing it under the second spring. However, in plowing under this clover and in orchards which have been in sod some time, care must be taken not to injure the roots, as they are near the surface.

Cultivation should cease—as well as irrigation—early enough in the season to allow all of the young wood to ripen thoroughly, so that it will not be soft and tender and subject to injury by freezing.

The following method of cultivation is applicable to other fruits beside the cherry. If more of this intensive cultivation were done in the East, the increased crops would more than pay for it, and nine-tenths of the risks and damage from drouths would be eliminated. This method was successful where the average yearly rainfall was 15 to 18 inches.

William Stark,
Louisiana, Mo.

Dear Sir:

My experience of twenty-two years is that sour cherries (Montmorency, Wragg, etc.) are the most profitable fruit grown in the mountains of eastern Colorado. In the first place, you don't need water to irrigate them. First plow your land deep, using a breaking plow; follow with a stirring sub-soil plow. You can plow 15 or 16 inches deep this way. Then plant good, strong two-year trees in the spring as early as you can, pressing the soil firm to the roots. They will then be ready to start with the vegetation. Cultivate them thoroughly by using the cut-away harrow, following with a good leveler—not a roller. (You can make your own leveler.) The idea is to keep a smooth surface to hold the moisture. When it rains, go over the land just as soon as it begins to dry on top. Don't let it form a crust, for if you do, you will lose the moisture that has fallen. Don't stop cultivating because it doesn't rain; but keep cultivating once a week until September. You will then find you have a good, strong growth on your trees, and the buds will be ripe for fruit. Keep your trees thinned by leaving just enough limbs on the body. Leave the twigs on the limbs. There is where the fruit buds set.

Some people say it costs more to cultivate than to irrigate. I know that is not true. After the trees are planted, one man with three horses and a No. 7 Clark's cut-away harrow can take care of 60 acres, and do it easily. Yours for cherries, THOS. W. PAGE.

Cover Crops in the Orchard

During June and July, depending on the season, sow cover crops. Cover crops may be divided in two groups—those that take free nitrogen from the air, thus adding it to the soil (clover, cowpeas, vetch, etc.) and those using only the nitrogen already in the soil (rye, oats, etc.). The former build up the fertility of the soil, while the latter only catch the fertility already in the soil, and carry it over until the next season, when the tree can use it, thus preventing any wastage. A cover crop on the ground throughout the winter not only prevents washing, which is so disastrous, but holds the winter snows and lessens the depth of alternate freezing and thawing. It also tends to delay growth in the spring until after the killing frosts. In gathering the fruit in the fall, it makes picking and hauling a cheaper and cleaner job.

In California, especially the southern part of the state, it is preferable to sow cover crops in September, where it is possible to get enough moisture to germinate, turning them under the coming spring. In California, the burr clovers, lupines, vetch and Canada peas are the most promising cover crops. In Colorado and other irrigated sections where cover crops are to be planted, it is preferable to cultivate intensively the first part of the season and sow the cover crop early so that you will get as much growth as possible, and can be turned under in the fall, so the roots, etc., will not interfere with irrigating the following spring.

Fertilizers for the Orchard

There are ten elements needed for plant growth. As a rule they are all present in the soil, but three of them are often lacking in sufficient quantities, and by fertilizing we mean supplying these three elements, namely, nitrogen, phosphate and potash. Nitrogen can be added to the soil by means of cover crops which take it indirectly from the air. It is also present in dried blood, manure and practically all organic matter. Cover crops and stable manure are as a rule the more economical means of supplying this to the orchard.

Phosphate can be supplied in bone phosphate—it is also present to a limited extent in manure. Where phosphate alone is needed, buy the ground rock phosphate which is the most economical form. It will give you best results if mixed with manure and applied at the rate of 200 to 500 pounds of ground rock phosphate to the acre.

Potash is present in wood ashes as is also phosphate and where ashes are available they should be used. Potash is also bought from Germany. The 80 per cent grade is more economical than "Kainit," which usually contains about 12 per cent potash.

The so-called complete fertilizers may be had on the market. The per cent of fertilizing element which they contain is usually designated as follows: 5—8—3; the 5 refers to 5 per cent nitrogen, the 8 to 8 per cent phosphate, and the 3 to 3 per cent potash. Their value depends on the pounds of the actual element which they contain.

Some Reasons Why Trees Do Not Bear

Pollination Many varieties of apple, pear, plum, etc., are more or less self-sterile. A variety that is self-sterile is one whose pollen does not fertilize its own blossom. The yellow pollen grains of the blossom are necessary in order to make it set fruit. If the blossom of a self-

sterile variety were protected from wind and insects by a paper bag so that no pollen from another variety could get it, it would fail to develop. While a variety may be absolutely self-sterile, its pollen is all right for fertilizing the blossoms of another variety. Two such self-sterile varieties may be planted together—if dependent on their own pollen they would not set any fruit, but by the interchanging of pollen both produce full crops.

There are comparatively few varieties known to be absolutely self-sterile, but there are a great many which have a tendency towards self-sterility, and others which are usually self-fertile. Both classes vary with external conditions. For example, Kieffer pear is self-fertile in the South, and self-sterile in the North. It is better that fruits should be crossed, and in some cases nature makes self-pollination impossible by the ripening of the pollen before the ovary is mature and ready to receive it. Cross pollination makes large and more uniform fruit. It has been found by practical experience that some combinations of pollen are especially good:

Plum:	Satsuma with Abundance;
Coe Golden Drop with	Minor with DeSoto;
French Prune;	Wild Goose with DeSoto;
Green Gage with Italian	Burbank with Red June;
Prune;	Newman with Minor.

Pear: Kieffer with Garber.

There are doubtless a great many combinations which are especially favorable. Generally speaking, any variety which is prolific and the blossoms of which are supplied with lots of pollen, makes a very good pollenizer if it comes in bloom at the same time as varieties which are weak in pollen. Most of the benefit comes from the abundance and vigor of the pollen which seldom has any direct effect upon the quality of the fruit.

However, there are a number of exceptions. Such varieties as Bartlett and Clapp will produce larger and more uniform fruit when fertilized with the pollen grains from the Kieffer pear than if fertilized with some of their own pollen.

A tree which is of weakened vitality through lack of cultivation has a tendency to become more or less self-sterile, and if it grows still weaker the blossoms may even fail to set fruit with fresh pollen from another variety. This is very often the case, and the soil should be constantly enriched by a system of cover crops and manuring. On the other hand a tree growing too vigorously may have blossoms, but fail to set fruit, even though it may have a great many blossoms. However, this is seldom the case, and when it occurs it is in young orchards which are longer than necessary coming into bearing. The growth may be checked by allowing the orchard to remain in sod

for a year or so. Generally, the best method is to plow in the spring, cultivate the first half of the summer, and then sow a cover crop, which prevents loss of any plant food, also checks the growth, ripening the trees so that they will stand severe winter weather.

The importance of such insects as bees cannot be too strongly emphasized. In many regions there are sufficient honey-bees and bumble-bees to produce thorough cross pollination, but in large orchards or sections where there are many orchards, every grower should keep one or more stands of bees.

Very little pollination is due to the wind. Most of it is carried by insects, and in order to secure thorough pollination, alternate varieties should be planted every third or fourth row. If the orchard has already been planted, a number of top grafts of other varieties can be set in every third or fourth row.

Trees are sometimes supposed to be self-sterile when the lack of fruitfulness is really due to some other cause. Blossoms may appear perfectly normal but on close examination it will be seen that the vital parts have been injured by frosts; a drying wind will sometimes damage them to such an extent that proper fecundation is prevented. Where the growth is too rapid trees often fail to form fruit buds. "To make trees bear when tardy coming into fruiting, in June when sap is in its highest flow, take out strips of bark, one to two inches wide, pointed at the ends, extending from the ground almost to branches. Always leave intact around entire trunk of tree, alternating strips of bark about the width of the strips taken off. New bark will form astonishingly quickly without injury to the tree, yet a check will be given that will cause formation of bloom buds. This plan is better than root-pruning or girdling; the latter is dangerous."

Another method is summer pruning, when the trees are in full leaf. Take out only the smaller branches in this summer work. Do the heavy pruning when trees are dormant. We have a 160-acre orchard in the southwestern part of Missouri. One 40-acre block was pruned during June, July and August, which was reported on as follows by the foreman:

"Pruning. Trees pruned summer 1909 show at least 20 per cent better bloom than those not pruned, and I believe 30 per cent better on Black Ben and Senator."

This is particularly true of those pruned in June and July.

Borers

White Lead for Borers

This subject belongs to the *Spray Book*, but is mentioned here as borers in some localities cause a great deal of trouble.

William Stark,
Louisiana, Mo.

Dear Sir:

In my experience the use of white lead, as directed in my former bulletin, is a very good preventive from injury by borers, mice and rabbits. However, care must be taken to see that the borers are removed, the wound cleaned carefully and the paint applied certainly for two inches below the soil and above the soil anywhere from fifteen to eighteen inches, according to circumstances. It must not be applied over buds that one wishes to have push out and make growth, but it will not injure apples or peaches; however, I do not like its effect on cherries. On peach trees, also, the protection is not so effective as on apple, because the rapid increase of the trunk breaks the coating of paint.—Prof. Wm. B. Alwood.

Be very careful in applying paint. Use nothing but pure White Lead and pure raw (not boiled) linseed oil. Mix thoroughly at the rate of $2\frac{1}{2}$ gallons of oil to 100 pounds of lead. Paint the trees in the fall or spring, while they are dormant. Apply the coat as thickly as possible, but do not let a great deal run down on the roots. Again, do not use House Paint, or paint with a drier in it. It will injure, possibly kill, the trees.

Special Information

The contents of the preceding pages will, I believe, answer the greater majority of questions which come up at planting time. However, there are often special conditions in many tree-planters' undertakings requiring special information.

If the reader has problems, in solving which a need is felt of exact information, I shall be glad to help. When writing, give as complete and detailed a description of conditions as possible. No charge will be made for this service unless the orchardist desires that a special trip be made to his place for personal inspection.

Address letters for information to

William H. Stark

Louisiana, Missouri

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