

SUCCESSFUL
FRUIT CULTURE

SAMUEL T. MAYNARD

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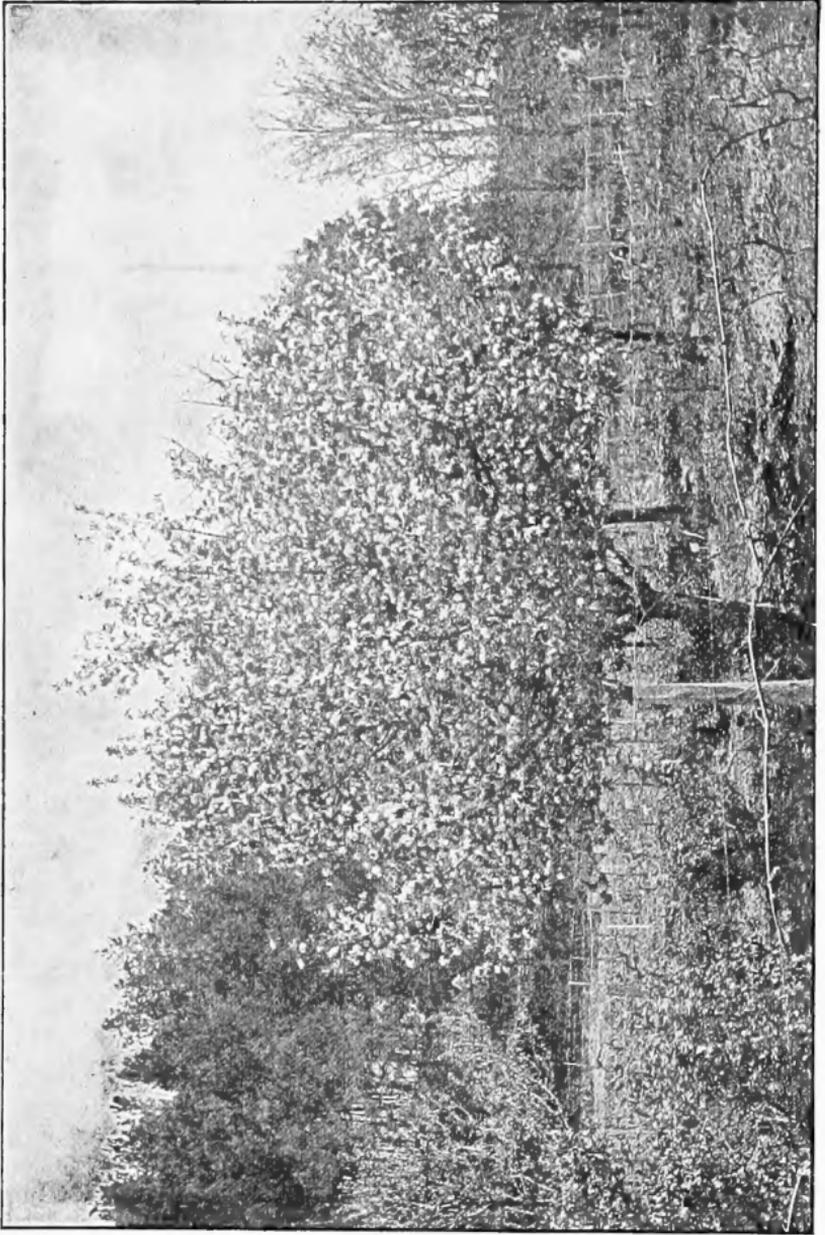
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Perfectly Formed Apple Tree—Sutton

Successful Fruit Culture

A PRACTICAL GUIDE TO THE CULTIVATION
AND PROPAGATION OF FRUITS

By

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Illustrated

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PREFACE

During the past ten or fifteen years great progress has been made in the cultivation and care of our hardy fruits and especially in the varieties grown, the methods of packing, shipping and marketing, and during this time few books have been written which have kept up with this progress. This progress and the knowledge of insect and fungous pests and their destruction has been largely recorded in scientific books and papers from the numerous experiment stations, with little from the practical and practicing fruit growers, and there is a growing need of a condensed work giving, in plain language, a summary of the scientific progress made, together with the practice of the most successful fruit growers in various sections of the country. Especially is this information needed that those just starting out in the business of fruit growing, or the village home owner who wishes to grow a small quantity of fruit for family consumption, may find in a condensed form the information necessary for success. It is, therefore, the aim of the author to make a book that is up to date in every particular and to cover the entire practice of fruit growing from the starting of the seed or cutting to the marketing of the fruit, though in many cases works devoted to special fruits may be more complete. It is written from the standpoint of the practical fruit grower who is striving to make his business profitable by *growing the best fruit possible and at the least cost.*

No attempt is made to describe a large number of varieties, nor many of the numerous methods of training, pruning, cultivating, etc., but to give in plain,

practical language descriptions of such varieties as are most in demand in our markets, and the methods practiced by the most successful cultivators of many sections of the country; to deal with principles first and with the practice afterward, for the practice to be successful must be based upon correct principles, while the practice will always be varied by the progressive fruit grower according to his immediate conditions and environment. The foundation principles of plant growth and nourishment, however, must always remain the same.

No one can foresee what results the changing conditions from year to year of our own country or of those of other countries of the world may bring about in our methods of fruit growing, and the progressive fruit grower must be ready to adapt himself to these conditions or be left behind in the march of competition. The Northern States cannot expect to compete successfully with the more southern of our own States in growing our native fruits out of season, but each section can produce them to such a degree of perfection and put them into the hands of the consumer in such a fresh and attractive condition that there need be little desire on the part of dealers or consumers in any community to send beyond their own limits for their supply of fresh fruit in its season.

We should also make an effort to supply any demand that may come from less favored countries, and, properly managed, this demand for our native fruits should assume very large proportions, but the main effort of the fruit growers, for whom this book is written, should be to supply their own sections with fruit in such an abundance and perfection and at such prices that the inferior products of other sections and other countries cannot secure our markets against the home supply.

S. T. MAYNARD.

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INTRODUCTION

The importance of the fruit industry to the people of the United States presents several phases, among which are the value of fruit as a promoter of health, its value as a luxury and its importance as a money crop.

AS A PROMOTER OF HEALTH

In this way I consider fruit as of by far greater value to man than in any other. Our country is in a remarkably prosperous condition and our people can very easily obtain the food materials necessary to the formation of muscle, bone and fat, and it has been the tendency of a large majority of them to be satisfied with meat, bread, pastry and numerous condiments without an adequate supply of vegetables and fruit.

Fruit is generally looked upon as a luxury, but when properly considered it is a necessity, an aid to the proper utilization of the heavier food materials and for invigorating the various organs of the body so that they may best meet the demands made upon them and properly store up materials for repairing all wastes resulting from bodily efforts.

That fresh, ripe fruit, in moderate quantities, does enable the system to utilize other food materials taken into it for nourishment, and causes all of the organs to act with more vigor, needs no extended discussion here. Our people should use more fruit, and they would find it profitable to do so, from many points of view, and much cheaper than doctor's bills.

AS A LUXURY

From the above point of view fruit is an indispensable article of food. Fresh ripe fruit is always acceptable with meals, or for the midday lunch it is far more refreshing than any fermented beverage and more nutritious than the choicest pastry or confectionery. What a variety of delicious dishes can be prepared from fresh fruit or from the dried or canned product that keeps in a perfect condition so long after its natural season. What fond recollections often in later years linger around the old home where an abundance of fruit was the lot of youth now grown gray in the service of mankind. What a source of pleasure and refreshment to the laboring mechanic or tiller of the soil after a long day's toil in the summer or autumn or during the cold days of winter, and yet how few of our laboring people can enjoy more than a small fraction of the fruit needed for health and enjoyment.

AS A MONEY CROP

Some idea of the importance of the fruit crops of the United States may be obtained when we consider the extent of land occupied by some of our fruits, although accurate statistics are not available for all kinds of fruits, and the immense quantity of fruit produced for our own consumption and for shipping to other countries. The census of 1900 gives the number of apple trees of bearing age in the United States, 201,794,764, and the crop of apples produced 175,397,626 bushels; the number of peach trees 99,919,428, with a crop of 15,433,601 bushels; the number of grapevines over 200,000,000, while the grape crop was over 1,200,000,000 pounds.

Statistics of acreage and products of the other hardy fruits to be found are so unsatisfactory that they

are not given, but we know that in many localities the number of bushels of small fruits far exceeds the yield of the large fruits, and that they are more or less grown for home consumption on at least a majority of the farm homes of the country, and in most of the home gardens in villages where there is sufficient land.

In the extreme Southern States and on the Pacific slope we find large areas planted with oranges, lemons, pineapples, raisin grapes, prunes, and it is claimed that in Florida and California there are orange trees enough planted to produce more than 10,000,000 boxes of fruit annually, while on the Pacific slope so many prunes are produced (600,000,000 pounds reported as the crop of 1904) and those of such fine quality as to reduce the importation of prunes from Southern Europe to a mere nominal quantity. Within the past few years the planting of fruit trees and vines has increased very rapidly in all sections of the country, except possibly in New England, so that we have some of the largest orchards in the world in our midst.

In Missouri, Kansas and some of the other Middle Western States; may be found apple orchards of thousands of acres in extent; on the Pacific slope the prune growing industry is assuming immense proportions, and it is said that the grape growing section or belt between Lake Erie on the north and Lake Chautauqua on the south is the largest in the world. Yet, notwithstanding this immense increase in planting, the demand for our fruit products keeps pace with the supply, prices are sustained, our people are not supplied with nearly the quantity of fresh fruit that they need for health and comfort, and with our rapid growth in wealth and population we must expect equally rapid increase in the demand for choice fruit.

Foreign markets, too, are demanding the products of our orchards and if properly managed this demand

should be sufficient to largely take the surplus that our own population does not consume. In a single year we exported over 3,395,000 barrels of apples to Europe (largely, or almost wholly to England), and a demand for other fruits in large quantities will no doubt arise whenever we can deliver them to these markets in a satisfactory condition. The great progress being made in methods of preservation and shipping fresh fruits will, no doubt, soon solve this important problem, when we can hope to ship successfully to European markets our oranges, grapes, pears, plums and even peaches.

Within the past few years a large demand has arisen for our evaporated fruits in foreign markets, and the fact that in this condition these products can be kept for an almost indefinite time, occupy the least possible space and can be shipped to the remotest markets of the world must lead in the future to their large consumption. In 1897 30,883,921 pounds of evaporated apple was exported from the United States to foreign countries.

The business of utilizing the products of our orchards and gardens by evaporation and canning, while in its infancy, has reached large proportions, especially in seasons of abundance, where the supply can thus be carried over to seasons of scarcity, but is destined to become a far greater factor in the future of fruit growing. The immense wastes of our orchards during the summer and autumn, when fruit perishes very quickly, may be in this way saved. It is said that over 600 carloads of evaporated apple were shipped from one county in New York State in the season of 1894, and other sections are rapidly increasing in this method of utilizing the poorer grades of apples. The city of Boston in one season consumed over 1,000,000 pounds of evaporated apple and more than the same number of gallons of canned apple. The surplus and

especially the more perishable grades of all kinds of fruits may be utilized, either in the canned or evaporated condition, which must be kept out of the markets, or low prices of all grades will rule.

THE COST OF PRODUCTION

The cost of production of any article, whether it be from the factory or a crop grown in the field, is a very important factor, and while, with the products of the factory, the cost of production has been wonderfully reduced, the cost of the fruit crop or other farm and garden crops has not been materially reduced, owing to the high price of labor and the difficulty of applying labor saving machinery. It may be said in this connection, however, that the price of farm and garden crops, and especially the fruit crops, has not been reduced very materially, and to the intelligent fruit grower, who applies good business principles to his work, who uses the best labor saving devices for reducing the cost and improvement of his product and who looks to the details of the production and the sale of his crops as closely as does the successful merchant or manufacturer, there is almost a certain promise of financial success.

FUTURE PROSPECTS OF SUCCESS IN FRUIT GROWING

The rapid increase of the country in population and wealth must lead to a proportionate increase in the demand for native fruit, provided the growers are wise and produce attractive fruit of fine quality. Good fruit of any kind, well grown, and put up in an attractive manner, will increase the demand and price for that kind of fruit, while poor fruit will not only decrease the demand and also the price of that particular grade, but more or less of all other grades.

We may give this, therefore, as a rule or axiom in fruit growing: "*That the more choice fruit of any kind the people have, the more they want, while the more poor fruit put upon the market the less the demand.*" Of course the prices, other things being equal, will depend largely upon the supply and demand, yet the sales are more or less well founded upon the above facts. The problem, then, that confronts the fruit grower of to-day is "*how to grow good fruit, how to grow it cheaply, how to attract buyers, and how to utilize all of the products.*" In the future chapters of this book it will be my aim to keep these points always in mind, to present the latest and most practical thoughts, and to show what methods progressive and successful fruit growers are following, what varieties they are growing and how they conduct their business.

II

THE APPLE

THE COMMON APPLE (*Pyrus malus*)

THE SIBERIAN APPLE (*Pyrus baccata*)

The apple is at once the most important and the most widely disseminated of all the large fruits, being found more or less in all the temperate regions wherever civilization exists. Its fruit may be had in a fresh condition, without special preserving applications, from August to June, and by the aid of modern cold storage rooms the year around. Its hardiness, its productiveness, the ease with which it is grown, the great variety of uses made of it, and its nutritive value, leave it without a peer.

In its original wild form the fruit of the common apple, *Pyrus malus*, is small in size, often very acid or bitter and indigestible, and growing on thorny, irregular trees. By favorable natural conditions, or by cultivation, it has been improved until we have the large, vigorous, upright tree, entirely free from thorns and producing large, delicious and easily digested fruit. The Siberian apple (*Pyrus baccata*) has contributed something to the cultivated varieties, as the common, yellow and Red Siberian crab, and the numerous hybrids with *P. malus*, the Oldenburg, Gravenstein, Red Astrachan, etc., and the Russian varieties that have in the past few years been introduced in the hope that they might prove hardier in the extreme North than the old varieties. Most of the valuable varieties, however, that are largely grown, are supposed to be pure seedlings from the first species.

The climate and soil of the Northern United States and of Canada are peculiarly well adapted to the growth of the apple, and no country in the world can produce apples of so fine quality, so brilliantly colored, or that will keep so long. Our fruit has almost a world-wide reputation, and European and other countries ought in the future to consume more and more of it, both in a fresh or in some preserved condition. It is a fruit that yields heavy crops, as many as twenty barrels having been obtained from a single tree, and five hundred barrels have been produced on an orchard of two acres. Such crops, however, cannot be grown except under the most favorable condition of soil and skillful care.

THE SOIL

The land best suited to the growth of the apple is a deep, moist loam, but it will produce some fruit upon almost any soil, except one that is very wet or composed largely of sand. As with all other crops the margin for a profit is small and one about to start into apple growing for profit should carefully investigate the condition of soil, and not invest largely until well satisfied that the land selected is naturally adapted to the growth of this fruit.

The slope and exposure of the land are of considerable importance. High land is generally better than that situated in the valleys, though the soil often is not of as good quality, but there is a good circulation of air about the trees on the high land, and fungous diseases are not so troublesome, and late frosts in the spring and early frosts in the fall are not liable to cut off the crop. There is little choice as to the exposure unless in a given locality there is more danger of high winds, when the trees are loaded with fruit, from one direction than another. Sloping land is much more difficult to cultivate than level land and much of the

plant food applied is likely to be washed to the foot of the slope, leaving the tops of hills with a small supply unless a soil cover crop is kept on the land.

TREES FOR AN ORCHARD

The best stock for planting is vigorous trees that have reached a medium to large size in two years from the bud or root graft, while an older tree is not so desirable, on account of the number of roots that must necessarily be destroyed in transplanting. A three or four-year-old tree has more vitality and will stand more ill treatment and exposure than a younger one, yet the young tree, if properly planted and cared for, will start into growth more vigorously and in the end make the better tree. The fibrous roots of the young tree will be found not far from the trunk, while those on the older tree will each year be extending outward, and as the distance from the tree that the spade is inserted in digging is the same in both cases, the fibers of the older tree will be the most injured. A very good plan, followed by some orchardists who are obliged to purchase trees grown at a long distance from home, is to buy strong one-year-old trees and plant them in good soil in their home nursery, where they grow for one or two years, and then dig and transplant them to the orchard with little or no exposure of the roots to the sun and drying air.

If the planter has the necessary skill to grow trees to the proper form after they are planted in the orchard, it would be much safer to set out stocky, low-branched trees, as tall, slim ones are liable to be injured by the hot sun striking on the long, slender trunk after being removed from the shelter of the nursery and require considerable time and skill to train the head to the proper form.

WHERE TO OBTAIN TREES

If the orchardist or planter is not skilled in the art of growing trees in the nursery—and some do not have this skill—it will be best to buy trees of reliable and long-established nurseries as near home as possible. If possible, the stock should be seen in the nursery, especially if large numbers are to be planted, and full understanding be had as to how and when the trees are to be delivered. We would not advise the purchase of trees from irresponsible nursery agents, for, while there are honest nursery agents, these men, as a class, are generally looked upon as unprincipled, often because of the difficulty in coming at a clear understanding between the agent and purchaser, which largely arises from the fact that the agent does not show his goods nor sell by a sample even, but secures his orders from gaudy colored plates that are generally the most horrible exaggerations. In many cases the agent is almost entirely ignorant of the varieties of the trees or plants he sells and will tell almost any story in order to sell his goods. For the above reasons it is best to send orders directly to reliable nurseries, where one will be sure to receive courteous treatment, and orders be filled in the best possible manner. The man who can care for an orchard with success, who can grow young trees after they have been set in the orchard, can grow young trees for planting, and it is often a greater advantage to have a small nursery in connection with all large orchards, though as a rule the trained nurseryman can grow trees cheaper and better than the customer.

PREPARATION OF THE LAND

If the land is free from stones, so that it can be easily plowed, it will pay to work it fifteen inches deep by following the ordinary plow with the sole or trench

plow. (Figure 2.) This loosens the subsoil without bringing it to the surface, so that the roots can penetrate more deeply and make a light soil more retentive of moisture, and surface-drains a heavy soil, for a time at least. If the land is not naturally in condition to produce a vigorous growth of trees, and one season's delay is possible before planting, it can be very cheaply enriched with green manure crops, like soy beans, cow-peas, oats and peas, and barley and peas, or even rye. Something like the following routine is suggested. In the early spring sow oats and peas and when in blossom

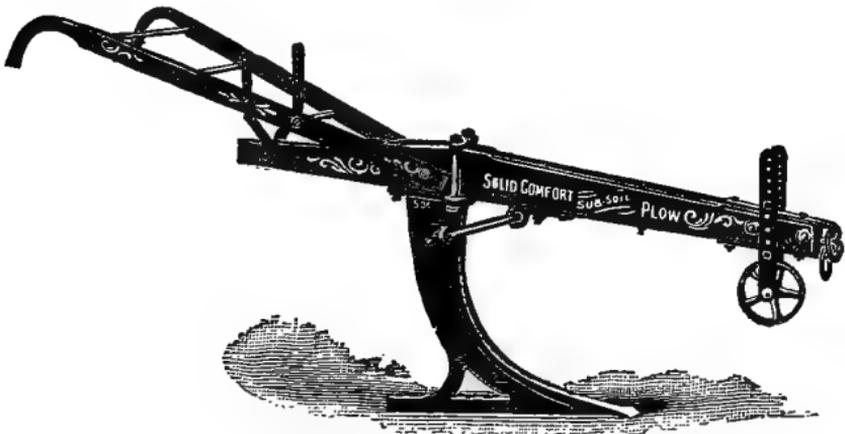


Fig. 2—Sole or Trench Plow

plow under. About the middle of August sow peas and barley, which may be allowed to remain on the land until the following spring, when it is plowed under and the trees planted. Another plan would be to drill in soy beans the last of May, to be plowed under about the same time as the peas and oats, this to be followed by peas and barley. This will give a larger amount of green manure and probably enrich the land more than the first.

If preparation of the land begins early in the fall and the trees are not to be planted for a year, rye

may be sown in September, to be turned under in June, and followed by the soy beans and then by peas and barley.

Should the land be very much exhausted, a light dressing of fertilizer may be necessary with the first crop. With land that cannot be fitted by plowing, it can only be properly fitted by digging large holes in which to plant the trees; the larger the space worked the better the trees will grow.

DISTANCE FOR PLANTING

Trees that grow only to medium size, like the Fameuse, Ben Davis, Wealthy, Sutton and others, on poor soil, may be planted as near as 25x25 or 30x30 feet, but trees of a larger growth, like the Baldwin, Gravenstein, King, etc., and on strong soil, should be planted not less than 40x40 feet. Double thick planting is largely practiced, i. e., 12 1-2x12 1-2, 15x15 and 20x20 feet, and this method has many advantages. In the first place, the cost of trees is a very small item in the expense of planting an orchard, while the crop produced from the trees, up to the twelfth year, when they begin to touch branches, will often be a large item in paying the expense of the whole. The great danger in this method lies in the reluctance with which the temporary trees will be removed when they begin to encroach upon the permanent ones. The varieties used between the permanent trees, called fillers, are often early maturing, that do not grow to a large size, such as the Wealthy, Ben Davis, Hubbardston, etc. By *heading back* the fillers as they encroach upon the permanent trees, they may be kept in condition for bearing fruit for twenty years or more. But this work *must* be begun as soon as the branches begin to touch or all will be permanently injured. Figure 3 shows the result of close planting where the fillers have not been removed,

and Figure 4 shows a perfect low-headed tree with fillers removed.

LAYING OUT AN ORCHARD

In planting an orchard, whether the land is to be cultivated or not, it is advisable to have the trees in straight rows and equal distances, not only for beauty



Fig. 3—Result of Close Planting

but also for convenience in working among them. Perhaps the best way to do this is to use a long, hard-twisted cord or a wire with marks attached at proper intervals upon it. The wire, about No. 14 or 16, galvanized, with drops of solder at intervals of five, ten or twenty feet, is much better than the cord, as it is not affected by wet or dryness, and will not stretch. The



Fig. 4—A Perfect Low-Headed Tree

cord or wire should be stretched along two opposite sides of the land and stakes put at the proper distance. Then stretch it from the other two sides, putting a stake at every mark. All measurements must be made horizontally, or on the level, if the land is sloping, otherwise the trees will be of unequal distance. If the distance of twenty or forty feet be laid off on a sloping surface, it will be found that the space between these will be less than between those laid out horizontally.

To lay out an orchard so that the stakes shall be exactly in line is a simple matter, but after digging the holes it is difficult to put the trees all exactly where the stakes stood unless the planting board, Figure 5, is



Fig. 5--Planting Board

used. This consists of any straight-edged board with a notch in the center and one at each end equal distances from the center. It should be long enough to reach across the hole and should be placed on the same side of the stakes for every hole. Before digging the holes for the trees, the planting board is placed with its center notch against the stake, which is then pulled out and put at one of the end notches and another stake put at the remaining end notch. The board can now be removed, the hole dug, taking care not to disturb the stakes or cover them with soil, and when ready to plant the tree, the planting board is placed against the stakes and the tree against the center notch, as shown in Figure 6, which will bring it just where the stake stood.

DIGGING THE HOLES

If many trees are to be planted, and it is dry and windy, it is better to dig as many holes during the middle of the day as can be filled with trees during

the last two hours of the afternoon and the first two hours of the morning, as the roots will be much less liable to injury at this time than if planted in the hot sun in the middle of the day.

If the land has been deeply plowed, the holes need be only large enough to allow the spreading of the roots in their natural position; the size must depend upon the size of the trees planted.

If the trees are to be planted in turf, the holes should be three or four feet across, with the subsoil well loosened. The surface soil should be thrown in a pile by itself, to be used for filling in about the roots, and the subsoil in another pile, to be spread upon the surface after the trees have been planted.



Fig. 6—Planting the Tree

If the soil is poor, it is necessary that some well-rotted manure, or fertilizer, be put with the soil used for filling in about the roots. This should be thoroughly mixed with the soil, or injury instead of benefit will

result. If coarse unfermented manure only is available, it should not be used until the roots have first been covered with two or three inches of soil, when it may be mixed with the remaining soil or be spread on the surface after the hole has been filled. The amount to be used must be varied according to the condition of the soil; from one to two shovelfuls of fine manure, or two to four handfuls of fine ground bone, or one to two handfuls of fine ground bone and potash well mixed with the soil.

Proper fertilizing of the land is one of the most important conditions of success in fruit culture. Many people will blame the nurserymen because the trees

they buy and plant do not grow when there is little or no plant food in the soil to sustain them. One has as good a right to expect a crop of corn from land with no fertilizer as a good growth of trees under similar conditions. If some of the people who fail in tree planting from this cause, could see the amount of manure or fertilizers used by nurserymen and successful orchardists, they would cease to wonder why their trees do no better, and put the blame where it belongs. On land that is naturally rich and moist, however, fruit trees, especially the apple and peach, will need little or no manure or fertilizer until fruiting, if the land is kept frequently cultivated.

PREPARING THE TREES FOR PLANTING

It matters not how carefully trees may be dug from the nursery, more or less of the fine roots and all of the root-hairs will be injured, and, as generally received from the nurseries, there is little to the trees but a few stubs of roots and the top, with its numerous branches and buds to be supplied with moisture and food from this small amount of roots. The consequence is that none of the branches makes much growth, or the evaporation is so great from the large amount of the surface of the branches and numerous buds that the moisture is dried out faster than it is supplied by the scanty roots, and the tree dies. To remedy this condition, the top must be reduced in proportion to the injury to the roots, as shown in Figure 7, *b b b b*. The older and larger the



Fig. 7.—Tree Properly Headed Up at Planting

tree, the more severely must it be pruned. The larger roots wherever injured should be cut off smooth, as decay is more certain to spread from a torn than from a smoothly cut surface.

ESTABLISHING THE HEAD

In cutting back the tree to obtain a balance between the roots and top, the formation of the head



Fig. 8—Well-Formed Low-Headed Tree, Twelve Years Old

should be kept in mind and all shoots not needed to form the main branches of the head be cut away entirely. The trees as received from the average nursery have the main branches started at from three to four feet from the ground, and if a head started higher

than this is desired the process of "heading up" will require from one to three years, according to the height desired. Figure 7 illustrates this process, in which all the branches, *b b b b*, are cut off close to the trunk, the leader being allowed to grow and to produce a set of branches at the dotted lines, *a*. The increase in the height of the head will not be more than fifteen or eighteen inches each year and to start the main branches



Fig. 9—The Same Tree in Blossom

five feet from the ground may require two or three years after planting. The formation of a cluster of branches at one point on the trunk should be avoided, as in time the tree is sure to split down at the fork. The main branches should start out from opposite sides of the trunk at intervals of from five to ten inches apart.

Orchardists are now training their trees with a head much lower than formerly, because of the many advantages of the low-headed tree. The pruning is more easily done, the trunk is less exposed to the hot sun and drying winds; thinning and spraying can be more easily done, the fruit will be more easily and cheaply gathered and the fruit that falls to the ground will be less injured in the fall, and with modern tools, like the spring-tooth harrow or the cutaway orchard harrow, as good work can be done as if the heads were trained five or six feet high. Figure 8 illustrates a well-formed low-headed tree and Figure 9 shows the same tree in blossom.

TIME FOR PLANTING

The best time for setting out apple trees will depend somewhat on the season. When the trees are

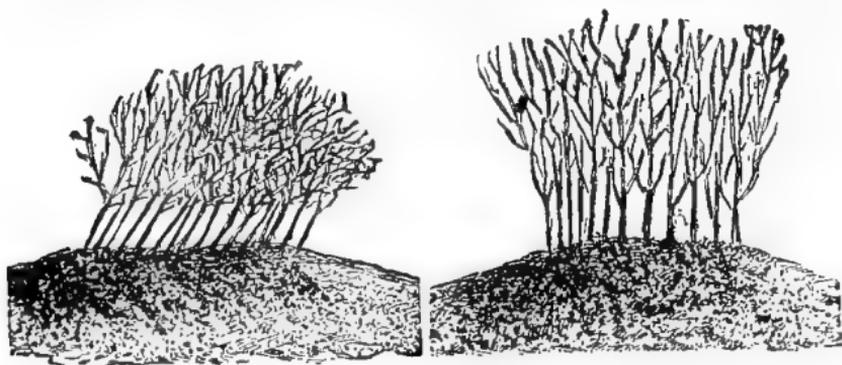


Fig. 10—Two Methods of Healing-In

taken from the home nursery, or can be obtained near home, so that they will be but a few hours out of the ground, and when they ripen their buds by the last of October or early November, the fall is the best time for planting unless on land very much exposed to cold, drying winds. But if the trees grow late in the fall and are purchased from nurseries at a long distance

from where they are to be planted, it would be safer to plant in the spring. It is the practice of many orchardists to purchase trees in the fall, and heel them in, as shown in Figure 10, where they will be protected during the winter and be ready for early planting in the spring. The soil for this purpose should be light and porous and the surface water should be prevented from settling in about the roots.

PLANTING THE TREES

Having the holes dug, the trees pruned and everything in readiness, the most important part of the work is now to be done. Only a few trees should be exposed to the weather at once, unless on a moist, cloudy day. Three men are required to do the work most rapidly and thoroughly; one to put the tree in place, spread out the roots and press the soil in and about the roots; and two with spades, one of whom carries the planting board. Perhaps ten trees are dropped in place, when man No. 1 takes up a tree, while No. 2 fixes the planting board, Figure 5, with the end notches against the two stakes. No. 1 now places the trunk of the tree against the middle notch of the planting board and spreads out the roots in a natural position, while No. 3 is ready to throw in some rich, fine surface soil, working it in about the roots so that it shall be everywhere in contact with them, and after being covered with three inches of soil, pressing the soil down firmly with the foot. As soon as the tree is in its proper place, No. 2 throws his planting board to the next hole, takes up his spade and assists in filling up the hole and leveling off the surface soil about the tree. The soil should be pressed very firmly in contact with the roots, but *that on the surface* should be left as light and loose as possible.

LABELING

All trees should be permanently labeled before planting, and a plan be made of the orchard where every tree is located and name given, so that if a label becomes lost or disfigured, no difficulty will be found in looking up the proper name. The most permanent label, the most easily attached to the tree, and at the same time the cheapest, consists of a triangular zinc strip one-half to three-fourths inch wide at one end, tapering to a point at the other, and five to six inches long, as seen in Figure 11. This should be slightly corroded and the name written with a medium-hard lead pencil. If the zinc is just right and the name is written in a broad hand, it will be distinctly visible for a lifetime. It is fastened to the tree by winding



Fig. 11—Zinc Label

the small end about a small branch, and as the branch grows the label is uncoiled and does not cut into the tree. A very thin label of this form is made of copper, the name being pressed into it by a stylo, or a very hard pencil. The names on the copper label are as permanent as on those of zinc, but are not so legible nor the label so easily obtained.

CULTIVATION

The effect of stirring the soil after planting trees is: first, to prevent the escape of moisture by forming a layer of loose, non-conducting soil on the surface; and second, hastening the preparation of plant food by the

introduction of air. In young orchards it will be found most economical to grow some hoed crop among the trees for a few years; but, as a rule, such crops will not more than pay the cost of cultivation and fertilizers used, while they often fall far short of this, and the owner must take his profit in the increased value of his trees. Any hoed crop may be used that does not require cultivation during August and September, as cultivation during these months often causes a late growth of the trees that are more likely to be injured than if they matured earlier. The corn crop, if of the small stalked kinds and not planted too close to the trees, is also a good crop, but none of the small grains should be used, as they draw so heavily upon the moisture supply in May and June as to seriously check the growth of the trees.

With the use of the modern tools for orchard cultivation, now on the market, the cost of cultivation is much less than it was twenty years ago, and orchards are more and more being cared for by constant cultivation. The advantages of this method are, that the roots are kept deep in the soil and are less liable to injury from the extremes of cold or drouth; less plant food is needed to keep up a vigorous growth, as the latent elements in the soil are made more available by contact with the air; the moisture during dry weather is kept in the soil by the mulch of fine soil produced by frequent cultivation; the greater the drouth the more frequent should be the cultivation. There may be a limit to the number of times one can cultivate with a profit, but twice or three times each week in very dry weather is none too frequent; a more even temperature of soil is produced by cultivation, which results in a steady and healthy growth that is less liable to diseases, most of which only attack trees in a weakened condition.

It is the practice of many orchardists to keep the land in turf for a series of years, then to plow and cultivate for a year or two and reseed, but better results will be obtained by constant cultivation, because the roots are kept well in the ground, while after they have stood in turf for several years they work close to the surface and are seriously torn and cut when the land is plowed again. A heavy mulching of the ground, close to the trunks of the trees, during the summer, has the same effect, but if once begun must be kept up or the trees will be injured by cold or drouth when the mulch decays.

IMPLEMENTS FOR CULTIVATION

The plow is an indispensable implement in the cultivation of the orchard. It is needed for turning

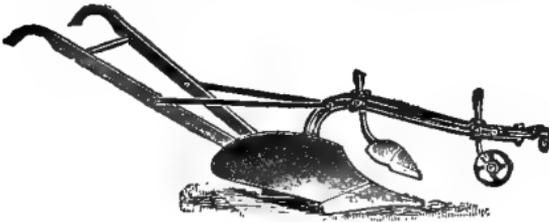


Fig. 12—Low-Hanging Landside Plow

under green manuring or cover crops and where weeds have become too large to be uprooted by the harrow or cultivator. This tool should never be run so deep as to go under the roots, and the furrows should not be turned the same way every time, so as to form ridges along the line of the trees or to draw the soil too much away from the roots. On sloping land, where a ridge is likely to be formed along the line of the trees, it is well to turn the furrows uphill to overcome this tendency. A low-hanging landside plow, like the one shown in Figure 12, will do much better work than will a sidehill plow.

The wheel harrow of the common or cutaway form, Figure 13, is now made with a long arm or spreader by which the shears are carried under the branches

of the tree, while the horses and the driver are in the space outside. The California orchard harrow, Figure 14, will be found to be very serviceable on heavy land.

The *spring-tooth harrow*, of which there are many forms, is one of the best tools for keeping the soil of



Fig. 13—Cutaway Wheel Harrow

an orchard in fine condition and killing weeds, because of the lifting effect of the teeth upon the soil, which leaves the surface more loose and lighter than any other tool. By separating the sections with a spreader, Figure 15, or by hitching

the team to one side, or by a special evener, the teeth are carried well under the branches, and by turning the horses in a circle around the trees, the harrow will be drawn so close up to the

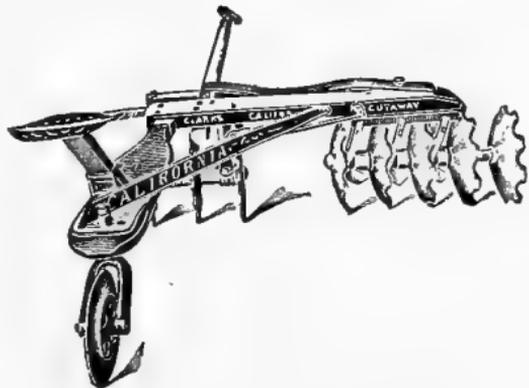


Fig. 14—California Orchard Harrow

trunks that little or no hand cultivating need be done. Handles or a strong rope should be attached to this harrow to assist in guiding it, so as not to come in contact with the trees.

The *smoothing harrow* and weeders can often be used to good advantage after the plow, or the wheel or spring-toothed harrows. Figure 16 shows the grape hoe, with spring-teeth attachment, also a valuable

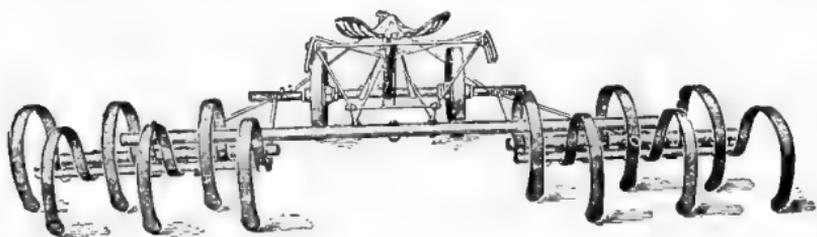


Fig. 15—Spring-Tooth Harrow

tool, working close up to the trees without injury. The weeders, Figure 17, are especially valuable in keeping a fine tilth of the surface soil, as they cover a wide space and can be more easily guided than the smoothing harrow. They must be used frequently in order to keep

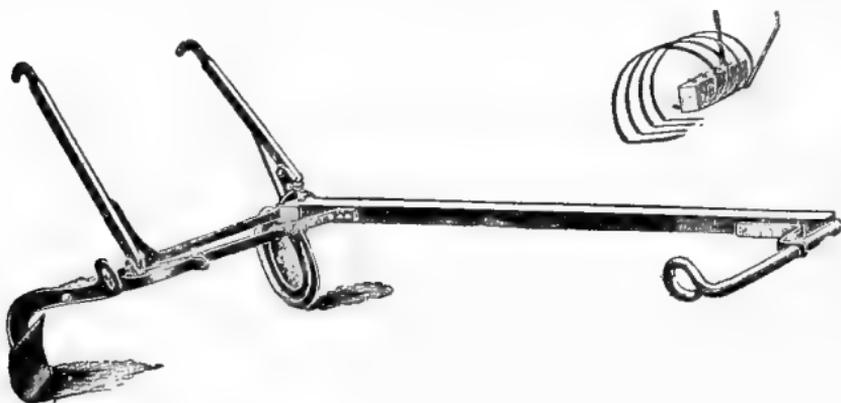


Fig. 16—The Grape Hoe

down weeds. Weeders with straight teeth do better work in orchards than those with curved teeth.

Only the most careful men who are skillful teamsters should be allowed to work in an orchard with

any of the above mentioned tools, for careless or unskilled men will often do more injury in an hour than can be repaired in years of time.

TURF CULTURE

In nearly every apple growing State of the Union there are thousands upon thousands of acres of land too rough and stony to be cultivated and upon which may often be found large apple trees remarkable for their vigor and productiveness. The fruit produced upon such land is noted for its high color, rich flavor and long keeping qualities. Much of this land is almost worthless for any

other purpose than forestry and the production of apples; and if properly planted with apple trees and cared for, it would, in a few years, give a large income for



Fig. 17—A Weeder

the investment. By this method, particular attention should be given to the selection of the land, using good apple land, to the preparation of the soil directly about the tree, and to cutting and utilizing the material, such as sedges, brakes, small brush, etc., that grows upon the land as a mulch, to prevent the escape of moisture and plant food that is being rapidly carried away during the summer by such growths.

The advantages claimed for this system are, that the trees mature their wood earlier in the fall and consequently are less liable to injury than where constantly cultivated. The roots are protected from the

extremes of heat and cold, the cost of land is much less and the fruit is more firm, of better color and quality and will keep longer.

While upon land that can be easily cultivated greater profit will probably be obtained by thorough and clean cultivation, the first cost of land is generally many times greater than that of land equally rich and well located that cannot be cultivated, and there are many notable instances where successful and profitable orchards have been grown under such conditions. In many sections of our country our farmers and fruit growers are land poor, i. e., they have more land than they can care for at a profit with the capital in hand, and the first point they should make, if about to enter into apple growing, is to find land suited to the growth of that fruit. If it can be cultivated easily there will be the most profit if it be *thoroughly* cultivated, but if too rough and rocky for cultivation, profitable crops can still be grown by applying plant food to the trees and keeping the grass, sedges, brakes, etc., cut so that they shall not carry away the moisture or plant food in their growth.

I wish to repeat here, however, what is said on another page, that whatever system is followed, success will be obtained only when an abundance of plant food is provided, and the cheapest and best method of supplying this must be determined by each grower; whether by the use of the cultivator or harrow and a moderate amount of plant food, or by the application of an abundance of plant food and the frequent cutting of the grass or mulch material found growing about the trees. The amount of fertilizers to be used can only be determined by a careful study of the trees, but *enough* must be applied to produce from six to ten inches of new wood each year.

FERTILIZING AND CARE OF ORCHARD

Stable manure may always be used upon fruit trees, if properly applied, but it may do much harm if improperly used. It should be applied sparingly to young trees, unless the land is very poor, or an exhausting crop is to be taken from the land that will feed largely upon the elements that tend to a coarse, woody growth, i. e., the nitrogenous elements. The best time to apply stable manure is in the fall or winter, on land that does not wash badly, or if very sloping it should be put on very early in the spring. Applied at this time the elements of plant food are made available by the action of the frosts and an abundance of moisture in the early season of the growth of the trees, while if applied late in the spring the food is not made available until the middle of the summer and a late, coarse growth is produced that is liable to injury by cold or disease.

When trees reach maturity and are bearing heavy crops of fruit, stable manure may be applied more freely, especially in the spring of the bearing year, for unless an abundance of plant food is supplied trees are often seriously injured by overbearing, particularly should the season prove a dry one. Such trees are in the condition of the overloaded and ill-fed horse or the overworked laborer, they are alike more liable to the attacks of contagious diseases than if more fully nourished. Trees that have been injured by overbearing may be improved very much by the application of nitrogenous manures the non-fruiting year. The effect of such an application at this time is to stimulate the growth of the wood and lessen the development of the fruit buds.

This illustrates a law that we find throughout all life, both animal and plant, that the causes or condi-

tions that increase the vigor of the stock or body decrease the reproductive forces, while with a decrease in the vigor of the body the reproductive forces are increased. Herein is a wise provision of nature for the perpetuation or preservation of species; for when the stock or body is vigorous there is no necessity for immediate provision for the future, but when the stock becomes weak nature makes an unusual effort to perpetuate the species by an increase of the reproductive powers.

One of the greatest difficulties the fruit grower meets in his business is that of obtaining the necessary amount of plant food to produce his crops. This problem is being solved in a measure by the large amount of commercial manures offered in our markets. Stable manure is not a complete fertilizer. It contains a larger per cent of nitrogenous elements than those of the mineral, and to produce a complete growth must be supplemented by adding potash and phosphoric acid. The kind of commercial fertilizer or manure that gives the best results in fruit growing to supplement stable manure or to be used alone, is fine ground fresh bones and potash. The best grades of bone contain sufficient nitrogen for most soils, but are deficient in potash, and if the land is very poor, potash and some other nitrogenous manure should be added, like nitrate of soda, sulphate of ammonia, stable manure, etc.

For an acre of apple trees (forty trees), over ten years of age, the following formula will give good results, varying the quantity according to the condition of the soil, the growth of the trees and whether they are producing a crop of fruit or not the season of application:

250 to 500 pounds fine ground bone
100 to 300 pounds sulphate of potash
50 to 150 pounds nitrate of soda

Hardwood ashes, at the rate of from one to two tons per acre, with the same amount of fine ground bone, as in the above formula, will often give as good results. Another formula that would give good results under most conditions is

400 to 600 pounds South Carolina rock (fine ground)
100 to 300 pounds sulphate of potash
100 to 300 pounds nitrate of soda

An application of air slaked lime at the rate of from one-half to one ton per acre will sometimes produce remarkable results, especially where nitrate of soda is used, or if the soil is well supplied with organic matter.

If the soil be very poor, as indicated by the slow growth of the trees, more nitrate of soda or some stable manure must be used. If the land is rich and the trees are making a large growth of wood, use only bone and potash or wood ashes. The effect of the nitrogenous elements is to increase the leaf action of the plant and to a large development of wood; that of the potash to cause a large development of starch and sugar in the plant and fruit; while the phosphoric acid tends to a large development of the seed or fruit.

As with stable manure, the best time to apply fertilizers is late in the winter or very early spring, before growth begins, except those containing quickly soluble nitrates, as nitrate of soda, sulphate of ammonia, etc., which should be put on just as growth begins in the spring, and in some cases where growth is weak or when a large crop of fruit is to be matured, during the early summer.

The above formulas may be varied by the grower from season to season, but not far from the above amounts will be needed to keep a good growth under average conditions. Bearing trees, to produce a good crop of fruit and not become exhausted, should make a new growth, as previously stated, of from six inches

to one foot on the leading shoots. If they make more than this growth, less fertilizer should be applied, if less growth is made, then apply more fertilizer.

GREEN MANURING OR COVER CROPS

To supply organic matter to the soil, to retain moisture and to gain nitrogen from the air and also to protect the roots from severe cold during the winter or drouth in summer, it is the practice of some orchardists to grow green manuring or cover crops in their orchards. The plants most used for this purpose are rye, oats, barley and the leguminous plants, peas, field beans, soy beans, cowpeas, crimson clover, alsike, the common red clover, etc. For the general purposes of fertilization the leguminous plants are the most valuable, from the fact that they organize nitrogen from the air while other plants only take what nitrogen they find already stored up in the soil.

The value of any green crop for an orchard depends upon the amount and composition of the crop and the time when it makes its growth and can be turned under. If the crop makes its growth during the latter part of May and June, as with rye and spring sown oats, and the clovers, the trees are often seriously injured by loss of plant food and moisture when they most need it, especially in a dry season.

Rye sown the last of August, and *peas* and *oats* sown very early in the spring, will be in condition to turn under by the last of May and, if the season is fairly moist, will prove very satisfactory, but should the season prove a dry one, serious injury may follow. Of the other grain crops,

Barley, sown not later than the middle of August with about equal quantity of *Canada* or *field peas* (one and one-half bushels of each if sown broadcast), makes a good cover crop and utilizes the nitrogen of the soil

and air until late in the season, covers the land during the winter and supplies a large amount of organic matter to be turned under in the spring—April or early May—when we can work the land more easily and profitably than if done later in the season and perhaps with the greatest profit to the trees.

Soy beans and *cowpeas* produce a large amount of organic matter and collect much nitrogen from the atmosphere, but they must be grown during the hot weather of summer, and do not grow and absorb nitrogen from the atmosphere or save that in the soil from being lost after the first frost in the autumn as do peas planted with barley. If the seed is drilled in about the middle of August, the land kept cultivated and the frosts hold off until the middle or last of September, a good quantity of organic matter may be produced by these crops and no injury be done to the trees, but if grown through July and August and the season is dry, the trees would be seriously injured. The cover crops should be allowed to lie on the land during the winter if it is hilly to prevent washing.

All of the *clovers* make their main growth during the months of May and June, and in thin soils are less valuable than crops that make their growth in the fall. But on land not subject to drouth clovers are especially valuable, as they take their nitrogen largely from the air and save such as may be developing in the soil during the fall and early spring that would be lost with a dead crop, like soy beans, cowpeas, or even peas and barley. As some of the nitrogen may be released during the month of May, trees will not be as much injured by the clover crops, however, as they would be with rye or spring sown oats.

Field beans are grown in many orchards as a field crop, and if planted with a machine, and harvested, threshed and cleaned cheaply, will prove profitable, but

frequent cultivation during the early summer must be given, and as ordinarily grown the profit is more likely to come from the increased value of the orchard crop than from the crop of beans. The haulm or stalks of the bean could be spread evenly over the land after the beans are threshed out, and be plowed under, or be worked in with a wheel harrow and add much to its ability to carry out a large crop of fruit. All things considered, the author prefers Canada peas and barley as a cover crop. Figure 18 shows a cover crop of peas and barley in winter with no snow cover on the land.

MULCHING

Without water in the soil, no fertilizer or manure will have much effect upon plant growth; and upon soils that are liable to injury from drouth, mulching in some form must be resorted to. In the cultivation of the land, the fine, loose layer of soil on top forms a most effectual mulch. This kind of a mulch is much to be preferred with perennial crops like the fruits, to hay, straw or any other mulch of organic matter, because the roots are kept deep in the soil where they are not as liable to injury from drouth or extreme cold in winter.

If a mulch of hay or other organic matter is used, the layer of moist soil is formed just under the mulch, and when this decays, as it will in a year or two, it leaves the roots of the trees so near the surface as to be seriously injured by the first dry season or a very severe winter. This kind of a mulch is often employed while the fruit is ripening, with such varieties as the Gravenstein, Williams and others that do not color until nearly ripe, the falling fruit being gathered each morning. This is the practice of Mr. Samuel Hartwell of Lincoln, Mass., on his Gravenstein farm, where 2000 bushels of

this variety have been harvested in this way in one season, bringing the highest prices in the Boston markets. Unless the mulch is to be kept up the hay should be removed from the ground as soon as the crop has been



Fig. 18—Canada Peas and Barley as a Cover Crop

gathered, or a late growth of the trees will result that may cause the winter injury to the bark, so common to this variety.

PRUNING

No one subject connected with fruit growing is more discussed in our agricultural and horticultural papers than that of pruning, and upon none is there

a greater variety of practice and more abuse. An orchard may be ruined at the start with very little pruning if not properly done, or it may be put into condition to produce good results with an equally small amount of pruning if it be rightly done.

The first year after the tree is planted it must have constant care. It is like a child, its first years of training determine its character or form. After the main branches have become fixed, as illustrated in Figure 7, all the pruning the trees require is to give symmetry and regular outline to the head by pinching off the ends of those shoots that tend to outgrow the main branches and to remove such as are likely to be injured by rubbing together, or that are so thick as to interfere with good growth and ease in gathering the fruit.

While young the trees should be allowed to grow with a rather close head, to protect the slender branches from the hot sun and air. When they begin to bear, the weight of fruit will bend down the branches and open the head, so that all the sunlight and air that is needed for the perfection of the foliage and fruit will enter; and a large crop of perfect fruit cannot be borne on a tree without a large amount of foliage. The largest and best fruit is always borne upon those trees that have the largest and most perfect foliage. During the first five years of the tree's life, and perhaps longer, all the pruning needed can be done with the thumb and finger and the pocket knife, but as the trees grow older, unless the work has been very skillfully followed up, more severe pruning may be needed. Figure 8 illustrates a perfect tree, Figure 9 the same in bloom.

The cutting of large branches should be avoided, if possible, for "every blow struck at the tree will certainly, in so much, shorten its life." It is true that severe pruning of the orchard in the winter or early

spring often results in a great increase in the size and quality of the fruit the following season and consequently many growers think they must prune their trees annually. The result of cutting off a large quantity of the branches at one time is to greatly decrease the number of buds, and consequently those remaining having the same amount of the root force the whole tree would have had, will grow more rapidly, the foliage be more vigorous and the fruit larger and better, but if pruning is to be depended upon for an increase in size of fruit, only a few annual prunings could be given the trees before they would be destroyed.

It is generally better to put the labor often expended in pruning into thinning and spraying the fruit when the trees are overloaded, or the cost of this work into fertilizers, by which means a permanently increased vigor of the tree would result and much better fruit would be produced. From this statement I would not have the reader think that no pruning is needed after the trees begin to bear, for constant care is needed and more or less pruning must be done to keep the trees in good condition to produce large crops of good fruit, but many orchards have been ruined in a very short time by pruning. Figure 19 illustrates a tree too severely pruned, yet such is often to be found. In the frontispiece may be seen a tree in perfect condition. The following are some good rules for pruning fruit trees, subject, of course, to slight changes under varying conditions:



Fig. 19—Tree Pruned Too Severely

1. To improve the form of trees that become one-sided from the influence of prevailing winds or other causes, they should be pruned at the ends of the branches,



Fig. 20—Drooping Branches

shortening in those that are outgrowing their neighbors. Cutting off end shoots tends to an increased growth of the lateral branches and a close head; too much heading in may be done, but more orchardists prune too much from the inside and too

little from the outside. Figure 4 shows a perfectly formed tree twenty-five years old. Figure 8 shows a perfectly formed tree twelve years old, pruned; Figure 9 the same in bloom.

2. If we insist on training our trees high enough to enable the team to drive close up to the base, the cutting of large branches from the main trunk is sometimes necessary; but this result may generally be avoided by cutting the drooping ends as in Figure 20, *a a*, at the dotted lines. If large branches must be cut off, the cut should be made at dotted line *b*, Figure 21, and not on line *a*. As has been previously stated, the practice of many of the best orchardists is to train the trees low and depend upon the modern orchard harrows to keep the land cultivated under them.

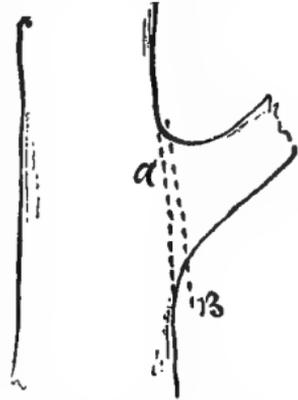


Fig. 21—Manner of Cutting Large Branches

3. To enable the pickers to gather the fruit easily it is the common practice to thin out the inside branches and to cut out all suckers or water sprouts. This may be done to a certain extent, but only upon branches that cross others, as seen in Figure 22, so as to injure one another. All branches that rest on those below them so as to shut out the sunlight too much, and all suckers that grow up into an already close head, should be cut away, and no more. A tree to produce a large crop of apples must have a large full head, and when there is space above the suckers that is not well filled with branches one or more of these sprouts should be allowed to grow, for trees are often more injured by cutting away the shoots and exposing the branches to the hot sun and drying winds



Fig. 22—Crossing Branches, the Dotted Line *a* Showing Where to Cut

than by no pruning. A good time to cut off the surplus suckers is in the early summer, when they may be removed with the thumb and finger or with the pocket knife.

4. The removal of dead branches is always in order, but if the trees have been properly cared for, fertilized, sprayed and not allowed to overbear, these should not appear until the trees are of great age. Dead branches are an indication of neglect or improper conditions of soil, and while pruning away such will not remove the cause, an orchard looks much better where any such blemishes are removed very soon after they appear. The best time to remove dead branches

is while the foliage is upon the trees, as they can be more easily detected at this time.

5. Remove the weaker of two branches that are rubbing together.

6. If one branch rests upon another, the weaker of the two should be removed.

Covering Wounds—All cuts over one-half inch in diameter should be covered with some preservative as

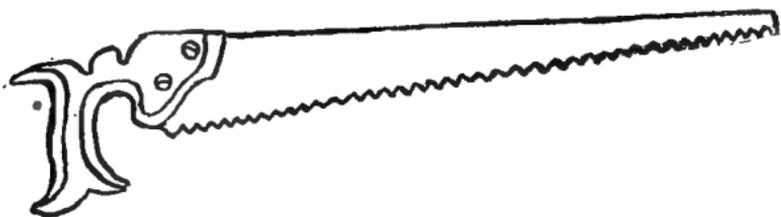


Fig. 23—Pruning Saw

soon as the surface is dry, to prevent the decay of the wood. Among the materials used are linseed oil paint, gas tar, shellac, grafting wax, etc. All are good, but the first two of them being cheap and easily obtained, are perhaps the best preservatives and most commonly used.

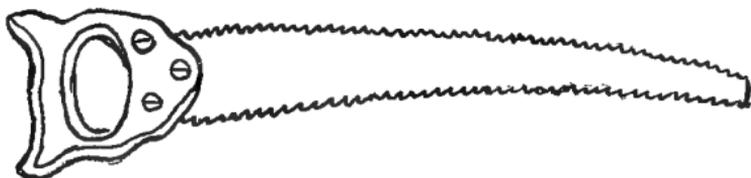


Fig. 24—Paragon Saw

Gas tar should not be used too freely on young trees, nor over more space than the injured part, for if it spreads over the surface it may kill the adjoining tissue and do more harm than good. White lead mixed with linseed oil and colored with a little lampblack, chrome green and brown or red, will make a color almost like the bark of the tree.

Implements for Pruning—For cutting large branches the saw should always be used, as it makes

a wound that can be easily covered.' The axe should never be used for this purpose, as with each blow the wood is split in toward the center and a much larger wound made than when the saw is used. When large branches are cut off, the saw should be placed on the under side and from one-fourth to one-half of the thickness be cut here before the cut is made from the upper side, by which means splitting down or tearing off the bark is prevented.

Many forms of saws are offered, but those with a long, slender blade (Figure 23) are best, as they may be used when two branches come together, or they can be attached to a pole for cutting off small branches or suckers at considerable distance from the ground. The Paragon curved saw, Figure 24, with the teeth on the inner curve facing the handle and those on the outer curve facing the point, is better than the straight form, as no pressing down upon the saw is required,

only pushing or pulling to cause the teeth to cut into the wood. Most of the saws of this kind in the market have six or eight teeth to the inch, which causes them to cut slowly, while if they had five teeth to the inch they would cut much faster.

The *pruning hook* (Figure 25) is a very useful tool, as with it small branches at the ends of the tree can be removed without using the ladder to reach them.

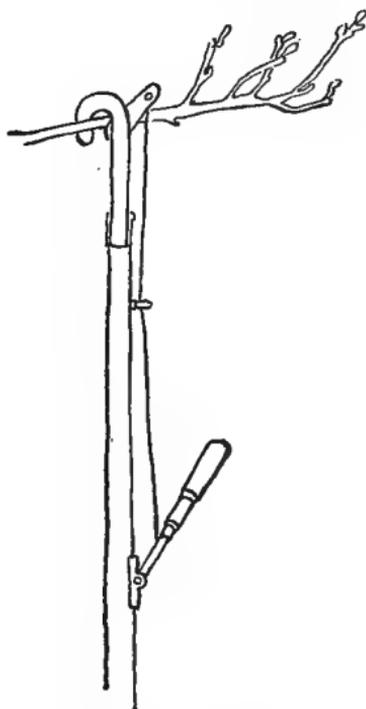


Fig. 25—Pruning Hook

For very heavy work, as cutting off branches one inch or more in diameter, a larger hook may be made by any good blacksmith or machinist with a pole ten to twelve feet in length.

Pruning shears (Figure 26) are indispensable in the care of the orchard, as is also the pruning knife, which should be of good material and be kept where they will not rust; for such tools often rust out more quickly than they wear out.

Time for Pruning—In this work we must keep in mind the rule practiced by most skilled orchardists that

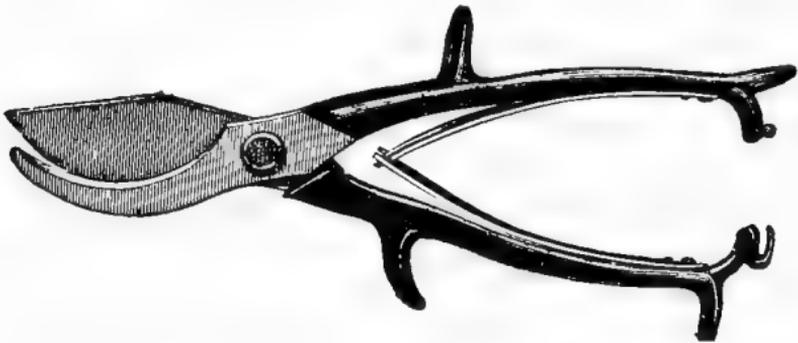


Fig. 26—Pruning Shears

“we prune while the tree is dormant to increase growth, while we prune when the trees are in foliage to reduce growth.” In very few cases, if ever, do we find it necessary to check the growth of our trees, and therefore we would prune only from November to May. If we prune in the early winter the wound remains uncovered and dries in more deeply than if the work is done in March or April, and for this reason the author prefers the latter time.

It is the practice of many orchardists when large branches are to be removed to cut them off, leaving the stubs from four to six inches long, and then in May or June to cut them close to the main branch or trunk, when the wound will heal over more rapidly than at any

other time. This is a very good practice, but it is so difficult to find time during the rush of early summer work that the author prefers to do the work all at once and have it out of the way.

THINNING FRUIT

No grower can expect to produce large and fine fruit, of good color and quality, if his trees are allowed to overbear, as most varieties will surely do if the fruit is not thinned. It seems like a great undertaking to go over large trees, and this is the strongest argument for low-headed trees, but the work can be done very rapidly by help who gain a little skill in the work. All imperfect or wormy fruit is picked and dropped to the ground, and if the tree has set a large quantity of fruit no two apples should be nearer than three inches apart.

The great advantages of thinning are: (1) All worms in the fruit picked off are destroyed. (2) No poor fruit will have to be picked and sorted. (3) The trees will not be as much weakened in maturing one-half or one-third the crop as if it carried the whole. (4) The fruit will be much larger, of better color and quality, and the remaining fruit will grow so much larger that the quantity will be equal to the whole unthinned crop and bring a much larger price.

The cost of thinning must vary very much with the size and the height of the trees, the quantity of fruit set and the skill of the workman. Based upon the cost in several orchards where thinning is practiced, the cost will range from ten cents to one dollar per tree. Even at the latter figure, with large trees of standard varieties, yielding from three to five barrels per tree, the difference in the value will pay for the labor and leave a good margin for profit. The range of prices between fancy apples and the ordinary grades

is often one dollar to three dollars per barrel, which leaves a large margin for profit, while the improved condition of the trees for future crops is no inconsiderable item in favor of thinning the fruit. The time for this work will vary somewhat with different varieties, but it should be done as soon as the imperfect and wormy fruit can be detected. In doing the work great care must be taken that the spurs and leaves are not pulled off, for more injury than good might result if very much of the foliage was removed in the process of thinning.

AGE OF BEARING

The average age at which the apple will begin to bear profitable crops is from ten to twelve years from planting in the orchard, varying somewhat according to the variety, the soil in which the trees are grown and the care given them. With proper treatment good crops of fruit should be realized for at least fifty years, although the average bearing age of the apple orchards of the country is much less.

Odd Year Bearing—In most orchards large crops of fruit are produced only upon alternate years and this bearing year has become more or less fixed upon the even year in most Northern fruit sections. The cause of this condition may be climatic, as a severe late frost or freeze, a long storm while the trees are in bloom. It may be due to overbearing one season, which results in the exhaustion of the tree, requiring one or more years thereafter to develop fruit buds again. Drouth for a succession of seasons may also bring on the same conditions, as may the depredations of canker worms or other insects. In 1884 a severe frost or freeze occurred on the night of May 30 in the western part of Massachusetts, and upon the southern and eastern slopes the young fruit was frozen and the crop destroyed, while

the following season all the trees that lost their fruit in 1884 bore the heaviest crop that was ever known in 1885.

The bearing year may be changed:

1. By removing a part or all of the fruit the bearing year soon after it is set. One operation is often successful if thoroughly done, but sometimes must be repeated. This should be practiced upon young trees until the habit desired has become fixed.

2. By manuring the land the bearing year with bone and potash or bone and wood ashes, which has a tendency to increase the vigor of the trees and to the formation of fruit buds; or by using nitrogenous manures, like stable manure, nitrate of soda, etc., the unfruitful year, which will produce a large growth of wood at the expense of the fruit buds.

3. Seeding the land to grass the bearing year might produce the same result, but there would be danger that the crop of fruit and the crop of grass on the land the same year might result in too great a check upon the growth of the trees.

4. Plowing the orchard the unfruitful year and cultivating thoroughly the bearing year would also tend to produce the desired change.

5. Changing of the bearing year by canker worms destroying the blossoms, by the use of torch to destroy the blossoms, or a frost destroying the fruit after it has set, while they may bring the desired change, cannot be recommended, because of the direct injury to the trees, and in the business of fruit growing it is desirable to economize the strength of the trees as much as possible if continued good results are expected.

REGRAFTING OLD TREES

Upon most of our farms, especially in the older portions of the country, may be found healthy, vigorous

trees that produce only cider apples or fruit that is **not** in demand in the market. These trees often occupy valuable land, or from their producing fruit of no value are not cared for, only serving as a breeding place for the canker worm, tent caterpillar, codlin moth, apple



Fig. 27—Regrafted Tree, Three Years from Grafting

maggot and other injurious insects, and should either be cut down or regrafted with varieties that have some market value. If the trunks of such trees are sound and the growth is fairly vigorous, they may be regrafted at little expense and in from three to five years produce

a large crop of fruit. If the trees are not growing vigorously it will be found profitable to apply some stable manure or commercial fertilizer to them the season before grafting, as cions are much more sure to grow in a vigorous stock than in one that is growing slowly. Figure 27 shows a regrafted tree three years from grafting.

Cleft Grafting—The kind of grafting most practiced in renovating old trees is called cleft grafting, because the cion is inserted in the cleft of the stock. It consists in first cutting off as many branches, from one to two inches in diameter (which are called stocks), as are needed to make a full head, if the whole tree is to be grafted.

This number will vary from ten to perhaps twenty, according to the size of the tree. It is often the practice to graft only a part of the tree the first year, completing the work the second year, by which means the trees do not receive a severe

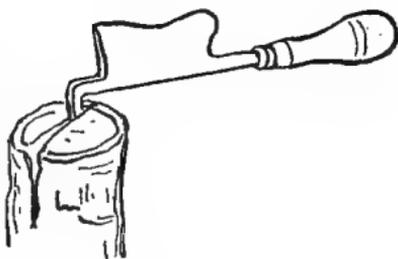


Fig. 28—Grafting Chisel and Wedge

check in growth. After the stocks are cut off with a fine-toothed saw, cutting at a point where the split will be straight grained, they are pared smoothly. Then, beginning with the highest cleft, each stock is split with the blade of the grafting chisel, Figure 28, which should be made with a hook for convenience in hanging it on a branch or on the handle of a basket while working. The blade is now driven out by a blow upon the head of the wedge, and the wedge driven into the cleft to keep it open until the cion is inserted.

The cion, Figure 29, is a piece of firm, mature wood of last season's growth, taken from the outside shoots of vigorous bearing trees, two or three inches long

and containing from two to three buds. The cion is cut wedge shaped, lengthwise, as shown to the left of the figure, with the inner edge thinner than the outer,



Fig. 29—Cion

as seen in cross section. It is a great advantage to have a bud on the outer part of the wedge, as shown at *a*, Figure 30, as a branch formed below the top of the cleft, as at *a*, will make a much stronger union than if it unites only on top, as at *b*. The cion must be cut with a sharp, thin-bladed knife, with one quick, clean stroke on each side. Some practice will be required to make a clean

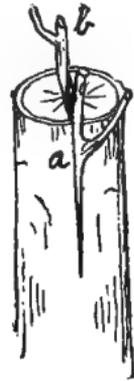


Fig. 30—Bud Below and at Top of Wedge

flat cut on each side that shall press closely to the sides of the cleft in its entire length. The cion is then inserted in the cleft with its cambium layer, or inner bark, in close contact with that of the stock, Figure 31, *a*; the

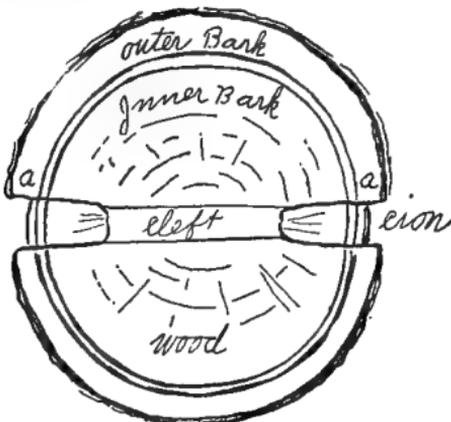


Fig. 31—Horizontal View of Cleft Graft



Fig. 32

thicker part of the cion at *a*, being placed outward, so that when the wedge is withdrawn the pressure of the stock will be such that the cambium layers, where union can only take place, are brought firmly together. Two cions are

inserted for safety, and if both grow one is cut out the following season.

A horizontal view of the completed cleft graft is shown in Figures 31 and 32, while a perspective view is shown in Figure 33. Should



Fig. 33 — Perspective View of Graft

the stock be small, less than an inch in diameter, it should be drawn firmly together with a strong string after the cions have been inserted. In case very large stocks, more than two inches in diameter, must be grafted, it is better either to make two clefts, as in Figure 34, and insert four cions, or to crown graft them by inserting the cions under the



Fig. 34—Four Grafts Inserted

bark after it will peel, and not split the stock.

The many methods of grafting, not described here, may be found fully explained in Fuller's or other books on propagation, to which the reader is referred. The points to be kept distinctly in mind in cleft grafting are:

1. A clean, smooth cut.
2. A perfect union of the inner bark or cambium layers of the stock and cion.
3. Rapid work that the cut parts may not be long exposed to the air.
4. A perfectly air and water tight covering to cover all the cut parts.

After the cions have been put in and the wedge taken out, the whole cut surface must be covered with grafting wax, to exclude both air and moisture.

Grafting Wax—A very good article of grafting wax may be purchased of seedsmen and dealers in nursery-men's supplies, or it may be made as follows:

1. Melt together equal parts of beeswax, rosin and

tallow; or, in place of the tallow, one-fourth as much linseed oil. The mixture should be allowed to become slightly cool, when it may be turned out into water and then "worked" or drawn until it is tough and plastic. If grafting is to be done in cool weather more tallow may be used, or if in hot weather, more rosin is desirable.

2. 1 pound tallow.

1 pound beeswax.

1-4 pound rosin.

3. 1 pound tallow.

2 pounds beeswax.

4 pounds rosin.

Use melted with brush. Luther Burbank's formula.

4. 1 pound tallow.

2 pounds beeswax.

4 pounds rosin.

2 ounces alcohol.

The writer has found a very hard wax, softened with alcohol, Formula 4, so as to be applied with a putty knife, a great convenience. In the Formulas 1 and 2 if double the amount of rosin is used, and when a little cooled, so as not to ignite the alcohol, about an ounce of the latter is added, it will keep the wax plastic and it can be very quickly applied with the putty knife.

The cions should be cut some time before the work of grafting is to be done, some nurserymen preferring to have them cut before freezing much in the early winter, but unless one has a good place to store them more injury may result while being kept than if they remained on the tree. Cions of apples and pears may be cut only a few days before the work is to be done. The best place in which to keep cions is in moist sawdust in an icehouse. It is the practice of some of our best nurserymen to tie them in bundles, wrap them in sawdust covered with burlap, let them

freeze and then put upon the ice. In this way they may be kept dormant as long as is needed for any kind of grafting. In cleft grafting two cions are generally inserted to insure success, one of which is cut away if both grow. Only the branches to be used for clefts are cut off at the time of grafting, many small lateral branches being allowed to grow, for to remove all buds and branches would give the tree too severe a check.

After Care—All suckers that come out near the cions during the summer should be removed, that the force of growth may all go to the cions. If the buds from the cion tend to grow with so great vigor as to be easily broken by the wind, it is well to pinch off the ends before they are thus injured, for by such accidents the work may be put back often more than one year. The best time for grafting the apple and pear is when the buds are beginning to swell rapidly, but unless crown grafting is practiced, the bark should not peel readily when the work is being done.

VARIETIES

At the present time not less than one thousand varieties of apples of some merit are more or less cultivated, many of which may be of considerable value in certain localities. Of the numerous varieties that have been described in more extensive works on fruit culture, probably not more than ten can be said to be thoroughly hardy, productive and profitable in any one section of the country. In the West many varieties succeed that are of no value in the East, and vice versa.

The inexperienced fruit grower must decide what kinds are best for him to plant by consulting his commission men and dealers as to what kinds are in demand at paying prices, and his neighbors and other successful fruit growers as to what kinds are the most productive, most free from insects and that succeed in certain kinds

of soil, exposure or conditions of growth. In every State of the Union the horticulturists of the experiment stations are making tests of varieties and each can advise as to the probable value of any variety within his own State and is ready to assist any and all to the extent of his ability in all of the different problems that often beset the experienced as well as the inexperienced.

It is the experience of almost every orchardist that too many varieties are planted. In different localities different varieties are popular, are known to the consumers, and only those will sell until they become familiar with new or better varieties, yet any of the many good kinds, if of good size and color, are sure to sell well after one or two seasons in the market, and the better the quality the more popular will they become. For this reason it will be safe to plant any of the standard sorts that grow well in a given locality and produce large and fair, well colored fruit.

New Varieties—Few, if any, of the varieties in general cultivation may be called perfect, and it is the part of wisdom for each grower to test, on a limited scale, some of the more promising new kinds or those that have become prominent in other sections or other markets, to determine if some other variety than those already grown may not be more profitable. Each kind, however, is found to succeed better in one locality, or perhaps upon one kind of soil, than another, or may be more profitable from its being well known in certain markets, and one must go slowly and grow the main crop of the "old reliables" until the merits of any new varieties are positively known.

CLASSIFICATION OF VARIETIES

For convenience of description and determination of varieties perhaps the best classification is that adopted by the late J. J. Thomas, in his book entitled *American*

Fruit Culturist, in which all varieties are arranged into three groups, i. e., summer, autumn and winter. Each of these groups is again divided into sweet and sour and these again into those that are striped and not striped, as follows:

Summer	{ Sweet	{ Striped
		{ Not striped
	{ Sour	{ Striped
		{ Not striped
Autumn	{ Sweet	{ Striped
		{ Not striped
	{ Sour	{ Striped
		{ Not striped
Winter	{ Sweet	{ Striped
		{ Not striped
	{ Sour	{ Striped
		{ Not striped

By the above arrangement one may trace the variety to its description and name if too many varieties are not grown in a given locality.

Standard Varieties—In this list I shall only include those varieties that are especially desirable and profitable in many sections of the country and especially in New England and the northern Middle States. For a more extended description of varieties I would refer the reader to that valuable and complete work, Downing's Fruits and Fruit Trees of America, the reports and bulletins of the horticulturists of the numerous experiment stations, the reports of the leading horticultural societies, and especially that of the American Pomological Society, in which the varieties most valuable in each locality are specified.

SUMMER VARIETIES

Red Astrachan—Large, flattened, beautifully colored apple of Russian origin. The flesh is very white,

crisp and tender, but rather acid for table use. The tree is vigorous, upright, with large foliage, hardy and productive. To be most profitable this variety and Early Williams must be allowed to ripen on the tree, and be picked from time to time as it colors, or hay may be spread under the branches for the fruit to drop upon.

Williams—A favorite table apple wherever known. Large, oblong, conical, brilliantly colored when ripened on the tree, but if picked before colored it fails to take on the beautiful colors which make it so attractive in the market. Quality good, of a mild sub-acid flavor.

AUTUMN VARIETIES

Oldenburg—Of Russian origin; fruit large, round, yellow striped with red, of a mild acid flavor and valuable for cooking and table use. Tree productive and comes into bearing early; needs thinning to produce fruit of the best size.

Gravenstein—Perhaps the most valuable of all fall apples, and one that by means of cold storage can be put on the market for two months. It succeeds best on a deep, sandy loam, but on a strong clay or clayey loam soil is liable to be injured by the action of frost upon the bark of the trunk. The tree is remarkable for its vigorous growth and is a good bearer.

Wealthy—No new apple has attracted so much interest as this. It promises to fill a long felt need for a showy apple of good quality for shipping to European markets. It is in perfect condition in September, but will keep for a month or more with ordinary care and much longer in cold storage. Its great beauty, fine texture and fine quality will make a market for it anywhere, and its firmness in texture will insure its exporting in good condition. The fruit is medium to large in size and of the most brilliant color. The

tree is moderately vigorous and begins to bear early and is very productive.

McIntosh—An old variety originating in Canada, but now attracting attention on account of its great beauty and fine quality. It ripens with the Wealthy and Gravenstein. In some localities it is reported to be not very productive, and is often subject to the attack of the apple scab, like its parent, the Fameuse.

Fall Pippin—A large apple, somewhat resembling the Rhode Island Greening; large, with a white, firm flesh, often with some blush on the exposed side. The tree is vigorous and moderately productive; valuable especially for cooking, September to December.

WINTER APPLES

Baldwin—A bright red apple of medium to large size, of fair quality and a good keeper. Tree vigorous, and generally thought to be more productive in the Eastern States than any other variety. In many sections of the country the fruit is badly affected with the "brown" or "dry-rot," which attacks it when it is ripening. When these spots are numerous, the fruit, which looks well on the outside, is of little value and seriously injures the demand for other kinds.

Ben Davis—A large, red-striped apple, that is valuable for its late keeping qualities only, being so poor in quality that few people will buy them a second time. Tree vigorous and very productive.

Fameuse (or Snow Apple)—Fruit of medium size, of deep red color and with a remarkably white flesh; very juicy, crisp and of the finest quality, tree vigorous and productive. It is a very valuable dessert fruit, and when well grown, upon rich soil and the fruit thinned, it is of good size and profitable.

Hubbardston—A large, oblong, conical, early winter apple of fine sub-acid quality. The tree is moder-

ately vigorous and very productive. A valuable dessert fruit.

Washington Royal (Palmer Greening)—An early winter apple of a light green color, often shaded with bright red on the exposed side, changing to a golden yellow when ripe, and is sure to sell when well grown. The tree is of rather slow growth, but under good conditions makes a good size, and is very productive. Time of ripening, from January to March.

Sutton Beauty—This apple is much like the Baldwin in form and color, but a little smaller in size. In quality it is better than the latter and is free from the brown spots under the skin when ripening, so common to the Baldwin. The tree is vigorous, upright and compact in growth, and very productive. It is being largely planted in place of the Baldwin, especially in New England, where it originated.

Rhode Island Greening—Everywhere known as a very good early winter apple, succeeding almost everywhere; excellent both for cooking and for the table. Tree rather spreading in form, vigorous and productive.

King (Tompkins Co. King)—A very large, striped apple of good quality, showy, but coarse and often imperfect. Profitable in New York State and some Western sections, but not in New England.

Roxbury Russet—An acid, round, russet apple, valued especially for its late keeping qualities. Tree vigorous, productive, but requires a rich soil.

Spy (Northern Spy)—In quality one of the best, but succeeds only in certain sections. The tree is vigorous, upright in habit, but comes late into bearing. It makes a very valuable stock upon which to top-graft slow growing kinds.

York Imperial—An apple that is attracting attention for shipping, and in English and other European markets it brings the highest prices. In form it is

round, oblique, of a deep red color and good quality. It is one of the best keepers, and promises to be one of the most profitable varieties.

Newtown Pippin (Albemarle Pippin)—This variety is of only local value, as it succeeds only in a few sections, but where it can be grown it is very profitable. It somewhat resembles the Rhode Island Greening, but is smoother, more beautiful and of better quality. It is well known in European markets, where it brings the highest prices.

SWEET APPLES

Sweet Bough—A large, pale yellow apple, juicy and good; valuable for home consumption. Early sweet apples are not generally in large demand in most markets, but a limited amount will sell at good prices and this is one of the best in its season.

Pumpkin Sweet—A very large apple, oblate in form, with more or less russet over the whole surface. In quality very sweet and cooks well, though the texture is rather coarse. Tree remarkably vigorous and moderately productive. Much subject to the attack of the apple maggot.

Ladies Sweet—One of the best winter sweet apples. It is of medium to large size, roundish-conical in form and nearly covered with red; sweet, crisp, tender and a good keeper; tree moderately vigorous and productive.

Jacob's Sweet—Large, light green, changing to a light yellow and shaded with a bright red on the sunny side. One of the largest and best early winter sweet apples and a fairly good keeper.

ADDITIONAL VARIETIES

Summer—Early Harvest, Alexander, Yellow Transparent, Golden Sweet.

Autumn—Twenty Ounce, Leicester Sweet, Congress, Pomme Royal.

Winter—Fallawater, Grimes Golden, Jonathan, Lady Apple, Danvers Sweet, Wolf River.

GATHERING APPLES

Summer apples should be picked, if for market, as soon as mature but before they become mellow, and be sent to market at once or put in cold storage. Yellow or green varieties require the greatest care in picking and packing and must be handled so that the skin will not be broken or the tissues below the skin injured. For cooking purposes the fruit may all be picked at once, but for table use or to supply fruit stands, some varieties will sell well only when they are allowed to color on the tree.

It is the practice of many growers who supply a local market to spread two or three inches of hay under the tree and allow the fruit to fall as it matures. Such varieties as the Gravenstein, Williams, etc., treated in this way become very beautifully colored and bring better prices than if picked from the tree. The cost of picking is also much less. For long distance shipping, however, this could not be practiced.

As a rule, the sooner after maturing summer and autumn varieties are picked, and in the market, the better and the more profitable they are to the grower. Winter apples should not be picked until fully grown, but should be secured before severe freezing weather takes place, and always before the mellowing process begins, to have them keep well. It is pretty well settled that apples picked early in autumn, i. e., before October 10th, will keep longer than if picked later, though they may not be as large, well colored or of as good quality.

Apples should never be shaken from the tree, as not one in ten thus gathered will fail to receive some

injury. The fruit should be picked by hand into baskets suspended by hooks to the ladder or to a branch near where the ladder is placed, be taken to the ground and carefully placed in piles or in barrels or boxes, to be carried to some cool place for packing. It requires some skill to do so simple a thing as to pick apples properly. If the stem is pulled out, the beauty of the fruit is injured, as well as its keeping qualities. If the apples are pulled off, the spur with its fruit buds is often broken and the crop for the next year destroyed. In picking, the thumb or forefinger is placed against the stem and the apple turned completely over, when, with the pressure of the finger, the stem separates from the tree at the proper place, and neither tree nor fruit is injured.

For picking tender fleshed varieties, like the Palmer Greening, Fameuse, etc., the basket should be lined with burlap, or some other cloth, to prevent bruising. For picking specimens beyond the reach of the ladder, some of the hand pickers are very serviceable. For getting into the tops of large trees long ladders are indispensable, and several lengths should be in readiness, all made of straight grained, light lumber and well seasoned. All ladders should be thoroughly painted and be kept housed when not in use, otherwise they decay very rapidly, and a weak ladder is a dangerous thing to work with. Extension ladders are found very convenient. The common stepladder will be found indispensable, especially for the low branches and low-headed trees. One of the best forms of stepladders is shown in Figure 35. The two main legs of the



Fig. 35—Orchard Stepladder

ladder come together at the top and the third leg is bolted in between them, thus forming a tripod, and if the two main legs are three or more feet apart, it will stand very firmly. This ladder is more cheaply made than the common form of stepladders, occupies less space, and the top being pointed, it can be placed in among the branches much better than the common ladders. The main legs of the six-foot ladder should be two and one-half feet apart, the eight-foot ladder three feet and the ten-foot three and one-half feet apart.

After picking the fruit many growers put it in piles under the trees and sort and pack from the ground. But this is a very slow and hard way of doing the work, for no one can work to advantage in such a position. If the fruit is to be packed in the orchard, a much better way is to put it into a low wagon body that stands just high enough for comfortable working and sort and pack as the fruit is picked, moving the wagon along as the trees are finished. A sorting box or tray is also sometimes used, it being moved along from time to time as is needed. This box should be made with three legs, so as to stand firmly on uneven land and slope to the sorting end from three to four inches, so that the fruit will work toward the sorter.

Some of the largest growers in the country put into barrels as they are picked and take them directly to a cool, open shed or barn, or to a cold storage room. Here they may be kept until all the fruit is safely housed before it is sorted and then be packed. If help is abundant, unless the fruit is to be kept for a late market, it is just as well to pick and pack in the field as it comes from the trees, but if help is not abundant, or if the crop is very large, it is best to get the fruit into a cool place as soon as possible.

One of the best methods is that practiced by the veteran fruit grower of Massachusetts, Dr. Jabez Fisher

of Fitchburg, who uses a bushel box with a corner piece nailed on each corner, as shown in Figure 36. This piece is seven-eighths of an inch thick and allows the air to circulate over the



Fig. 36 — Convenient Bushel Box

fruit enough to carry off the surplus moisture and yet not enough to cause it to wilt. The boxes of fruit are placed in the cold storage room or cellar in piles, as shown in Figure 37, and

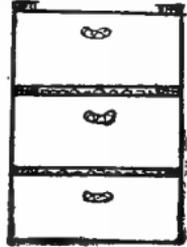


Fig. 37—Boxes in Storage

not disturbed until it is to be sorted for market. Any kind of a box might be used, but the common bushel market box is very convenient to handle, it packs to good advantage and is cheap.

ASSORTING APPLES

A great deal of skill is required to sort apples so that they will give the most satisfaction to the buyer and the best returns to the grower. In connection with many large orchards, or in large apple growing sections, large cold storage buildings are constructed with canning and evaporating appliances, so that all the No. 2's and those often called "cider" apples are worked off and only No. 1 fruit is put into barrels. In sorting fruit, where there is no evaporating or canning plant, the fruit is divided in two grades, No. 1 and No. 2 for packing, and cider apples that are generally sold in bulk. The standard for grading varies very much with different individuals and with different localities, but few packers put up their fruit so as to get the best results. The standard of No. 1 and No. 2 fruit also varies greatly. It does not matter so much as to the size of the fruit as to its perfectness and even grade, yet the larger the fruit, other things being equal, the better will be the price at which it will sell. If we could grade our apples

as oranges are graded, they would, without doubt, bring much higher prices than they now do. But this cannot be done cheaply by hand, and no machine has been found satisfactory.

No. 1 apples should be perfectly smooth, above two and one-half inches in diameter, of good color and free from all blemishes, such as worm holes and other marks that break through the skin. As commonly grown there is but little such fruit to be found, but by spraying and thinning, and more and better fertilization and care, a large per cent of the fruit should be No. 1. No amount of skill or care in sorting will make good fruit; the place to begin is at the roots and follow this up to branch, leaf and fruit with the best modern practice.

PACKAGES AND PACKING

In most parts of the country the barrel is almost wholly used for storing and shipping apples and it has many valuable features. It is cheap and easily obtained; it can be handled by rolling more easily than any other package of its size, but it has many disadvantages also. It contains a larger amount of fruit than most families care to buy at once, and it does not pack to advantage, either in the cellar or in shipping. Many attempts have been made to introduce a more convenient package, but it has not been successful. For local markets, the bushel box is largely in use. It is a cheap package, costing only ten cents or less, and it is the practice in most places to return an empty box when a full one is brought into the market and thus one lot of boxes may be made to last a whole season. The fruit is rather more easily and firmly packed in barrels than in boxes, the round form and bulging sides allowing the fruit to settle together better than when packed in boxes. Only clean barrels of the standard size should be used.

New ones are of course to be preferred, but cost more than second-hand flour barrels. The former can be bought for about thirty to forty cents each, while the latter will cost from ten to twenty cents, according to the quantity purchased. Many growers secure a supply from time to time, as they are ready, from grocers or boarding houses and get them at low prices. The barrels thus obtained will need more or less repairing and should be put into good shape before the crop is ready to harvest. The heads should be looked over and matched up and placed one on top of another in barrels, so as to be ready for use without delay. They are cleaned by washing and drying. First the flour and dirt are brushed out, then a pailful of water poured in and with an old broom the inside washed. This water is then poured into another barrel and thus three or four barrels can be washed with one water.

A layer of choice specimens is first placed on the bottom of the barrel with the stem down, and while finely colored specimens should be used for this they should not be very much better than those of the remaining part of the barrel.

The barrel is then filled up with choice fruit, shaking it from side to side several times as it is being filled. It should be filled two or three inches above the top of the barrel and be made as level as possible. The head is now put on and the screw press, Figure 38, adjusted. This press is much more convenient than that fixed on a platform, as it can be carried from tree to tree. Figure 39 shows a lever press. Sometimes a false head with a lining of canvas or wadding is put on first, to prevent bruising the

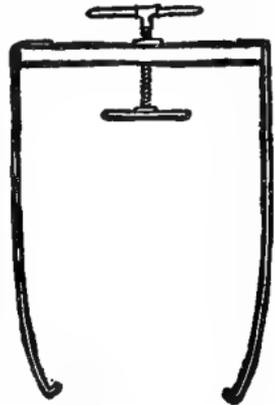


Fig. 38—Screw Press

fruit, as it is pressed in place, and then the permanent head is put on, pressed in place and nailed firmly.



Fig. 39—Lever Press

The head is now further fastened in place by nailing small, round sticks, called "liners," firmly across the ends or the parts of the head. Some packers loosen the hoops before the head is pressed in, while others cut off a strip from one piece of the head and then press it in without starting the hoops. The latter way is the quicker, and if carefully done is just as

well. The corrugated paper board cover should be used where much pressure is required, as for shippers to Europe.

More care must be exercised in filling the barrels for exporting than for home markets. Some of the fruit will be injured in pressing in the head, and the pressure should be only enough to keep the fruit from shaking in transportation. The name of the variety, the quality, and the name of the grower are to be neatly stenciled on the faced end of the barrel, which should be made smooth and clean, if it is not so when the packing begins. It is the practice of many growers to put their name only on the No. 1 fruit, the seconds going to market with only the name of the variety and the grade upon the barrel.

In packing in boxes the bottom of the box is taken off, a head is nailed on with half-inch openings, and the fruit is faced as with the barrel and then filled in the same way, pressing it so that it will not shake in shipping. Many attempts have been made to ship apples in boxes to the English market, but in very few cases have they been successful, the boxes being

packed so closely and solidly in the hold of the vessels as to heat, and if they are shaken about they strike more solidly than when in barrels. Yet because of the ease of handling, the smaller package and the fact that the box contains nearer the amount that is required for immediate consumption, the box will in time be sure to come into more general use.

MARKETING APPLES

In seasons of scarcity the crop of apples is not sufficient to supply the demand for home consumption and in seasons when the crop is large our people could consume it if it were distributed to all parts and economically handled. Every season more or less quantity is shipped to English or other European markets, and when it is of good quality and well packed it often brings paying prices. The first and most important condition of success in shipping apples to foreign markets is good quality, the second is firm fruit, and the third is good packing. Fruit put into either of these markets in the above conditions is sure to sell at paying prices. The quantity shipped from America in the past has varied from 81,552 to 3,395,594 barrels. The conditions of the foreign markets vary much according to the crops at home and the quantity of fruit that is shipped at one time, and another thing that is against English or European trade is the fact that the fruit is sold at once on receipt, no matter how much there may be in the market at the time, there being no facilities for holding it over until the surplus is worked off. When our shippers will have agents at the ports of shipment, with facilities for holding the fruit in case of surplus, prices can be maintained and almost certain profits be realized.

The home market, however, is the one that we must depend upon for the consumption of our apple crop,

for our people do not have all the fruit they should have for health and comfort, and the fruit can be delivered to the home market at a very little cost for transportation and package. There would be also a large saving in that the money now spent for foreign fruit would be kept at home. But this economy may not be needful, as the majority of our people are able to use large quantities of both home and imported fruit; the more fruit our people consume the better health they will possess. For the home market, the same conditions hold as to quality and packing as for foreign markets, but perhaps more emphasis should be placed upon quality, for our people can afford to pay as high prices as any people in the world, and the rule which governs the sale and price of other fruit commodities affects more or less the apple crop also, i. e., that the more good fruit a market has the more it will take at reasonable prices and the tendency will be to an upward price, unless there is an overproduction, and the oversupply must be prevented by finding a market for the surplus in other countries.

Facilities are now such that we can send any product to the remotest part of our country, and the home markets should be investigated before any attempt to supply foreign markets is made. The weather and crop reports made by the government and published in the agricultural papers, are generally accurate and will help the fruit grower to decide where to send his fruit—whether to hold, or to sell from the orchard. Where a fair price is offered, it is generally best to sell directly from the orchard, unless one has good facilities for storing, for there will always be a great deal of waste from keeping and the extra cost of handling is an item that must be carefully considered.

In most sections of the country the apple crop is bought up by dealers and it is important that the

grower know the conditions of the crop, both in this country and abroad, in order to know at what prices to sell or whether to hold. As with most products grown on a small scale, it is best to have the crop sold by co-operative unions, or by commission dealers, unless one has a retail trade where he can deliver directly to his customers, but where the product is large the grower can often do as well to go into the market alone and sell at as high prices as can be obtained by unions or commission men. The most marked tendency of the times is concentration and combination, and all kinds of produce are being put into the hands of large commission houses, where the retail dealer can find just what he wants and in any quantity he may desire. The consumer, too, goes to the large retailer and expects to find anything that may be needed in the way of fruit or vegetables and does not like to wait for the truck peddler to come around. The cost of selling is thus very much reduced, but the profit generally goes into the pockets of the commission men. Until the fruit growers join hands and put their products into a few large sales places and have it all graded in the same way, they cannot expect to control the market as to supply or price.

STORING FRUIT

Every fruit grower should have some place where he can hold his product for a longer or shorter time, in order to keep it from rapid decay in hot weather and to regulate the supply for market. It very often happens that in extremely hot weather small fruits may be cooled off by putting them into a cold storage room for an hour or two, so as to carry to market in good condition, when if such conveniences were not available the lot would be at a total loss. If apples and pears of such varieties as the Gravenstein and

Fameuse and Bartlett and Bosc be kept until the main crop is out of the market, a glut could be prevented and much higher prices be obtained. The increased value of Gravenstein and Fameuse apples and Bartlett or Bosc pears is often as much as one dollar to two dollars per box.

Cold storage houses are constructed on three principles: (1) Those that are cooled off at night by letting in cold air from the outside and shutting out the hot air during the day. (2) Those cooled by means of ice. (3) Those cooled by chemicals. The first and second of these only are adapted to the use of the small grower. The first method is of little use, except for fall and winter fruit, but after the cold nights of September, if the doors and windows are kept open at night and are closed during the daytime, an even, low temperature may be kept up that will retard the ripening of apples and pears, so as to be of great profit to the grower and that without much expense. The walls of such a building must be made with several air spaces on the sides. The roof and the windows must be of several thicknesses and be made to shut tightly. Such a house can be used in warm weather by having an ice chamber large enough to hold sufficient ice to lower the temperature to the required point and then be kept cool by opening only on cold nights. If it is desired to make the temperature very low, ice and salt may be combined to reduce it very quickly. The amount of ice required can only be determined by experiment.

Many cold storage houses are now in use in which the low temperature is obtained by storing ice in the second story, the cold air dropping down into the space occupied by the fruit. In some of these houses the entire space overhead is filled with ice and in others only a large ice box is constructed in the center of the space overhead. In the former case the atmosphere is likely

to be too moist for the best results and a very large amount of ice required—enough to last through the entire summer—while in the latter ice is only put in as it is needed, a quantity being stored the winter before in a convenient place to fill up the ice box at the time needed. Figure 40 illustrates a very satisfactory cold storage house with the ice chamber in the center, *b*, storage space on the first floor, *a*, with space for storing barrels, boxes, etc., in loft. The door and driveway are shown at *d*. Packing and workroom, *c*, is in the L attached, with doors opening into storage room. Those

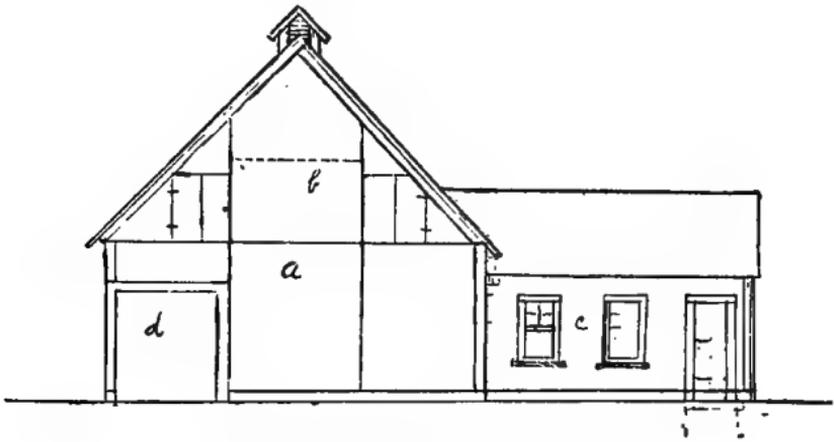


Fig. 40—Fruit Cold Storage House

who have used both kinds of these prefer the small ice chamber, using the salt and ice mixture to lower the temperature quickly when ready to put in the fruit in the fall.

A cellar, if it can be perfectly drained, often makes a very good fruit room, but much attention must be given to ventilation and the condition of the atmosphere as to moisture. In the construction of the walls of a cold storage room, air spaces are generally better than those filled with sawdust, but a wall filled with charcoal dust is much better than either, as it is a perfect non-con-

ductor and will prevent the decay of the woodwork. One thickness of building paper to each sheathing should be used if there are four or more air spaces and two thicknesses if there are less than four air spaces. The best results will not be obtained, however, unless the walls are at least two feet in thickness, and with four or more spaces. All doors and windows must be made with two or more thicknesses, and all joints to fit closely.

The use of chemicals for lowering the temperature can only be profitably employed where large quantities of fruit or other produce are to be stored. Such houses are generally located in large business centers, the produce shipped directly from the grower and is then kept until being sold. As fruit does not generally keep as well after having been in cold storage as when fresh from the grower, this method is not very serviceable, except to the large grower or dealer.

For insects and diseases attacking the apple see Chapters XX and XXI.

III

THE PEAR

(*Pyrus communis*)

The pear, while not generally considered one of the most healthy fruits, is from its peculiar flavor and qualities, known as melting, sugary, buttery, etc., a fruit much liked by most people, and eaten in its fully ripe condition and in moderate quantities is a healthful and delicious fruit. In its natural and unimproved condition, the fruit was hard and composed almost entirely of the gritty wood cells, known to botanists as sclerogenous cells, and a harsh and astringent juice that was anything but digestible, and which led that ancient writer, Pliny, to say, "All varieties whatsoever are poor meat unless baked or boiled." Until fully ripe, most varieties of pears have more or less of the above qualities, and should be eaten with moderation during warm weather unless cooked. For preserves, no fruit is superior to it and it is largely grown in many sections for this purpose alone. Like the apple, it is a native of Middle or Northern Europe. The tree, under the most favorable conditions, grows to a large size, and sometimes reaches a greater age than the apple, but as it is more subject to diseases, few trees reach great age. In value of products, the pear stands fourth on the list of large fruits, though it is losing ground in many places, except where it is grown for canning purposes.

THE ORCHARD

For the best results, strong, rather moist land should be selected, but it is best that it be on an elevation where there will be a good drainage and a free circulation of air during the growing season, under which conditions there will be less danger from fungous diseases. The pear will grow well upon a variety of soils, as with the apple, but much profit cannot be expected unless all conditions are the most favorable.

Trees for Planting—The pear tree is more difficult to grow in the nursery than the apple, and more care must be taken in growing them and in the selection of trees from the nursery. A medium to large No. 1 two-year-old tree is the best for general planting, though most No. 1 trees sold are at least three years old. The preparation of the land, the pruning of the tree, and the planting have already been described for the apple, which should be followed for the treatment of the pear.

Distance for Planting—The trees of most varieties naturally grow in a pyramidal form, and while it sometimes grows to a large size, it is more compact than the apple and requires a less distance. Fifteen by 15, or 20x20 feet, are the distances most generally planted, according to the variety and the method of training. Such varieties as the Seckel, Giffard, Bartlett, and many others, if kept well headed in, will need only the former distance, while the larger growing kinds and those trained with a broad head will need the latter distance.

Pruning—During the first few years of its growth after planting in the orchard, the pear tree has a tendency to growth of only a few central shoots and with little growth of laterals. All of these strong central shoots must be checked by pinching as soon as this tendency is discovered, but one leader or central

shoot being allowed to grow in advance of the others, and this shoot or center should be kept all through the life of the tree, and whenever any laterals grow beyond it they should be checked, thus forcing the growth into the lower branches. If proper attention is given to the training of the tree while young, very little after pruning will be required.

Age of Bearing—The pear tree may be expected to produce paying crops of fruit at an earlier age than the apple, i. e., from five to eight years from planting, according to the variety, and unless attacked by disease may be expected to bear for fifty or more years. Like the apple, it generally produces fruit only in alternate years, unless the land is kept rich, well cultivated and the fruit thinned. The cause of this condition is the same as with the apple and the remedy is the same.

VARIETIES

In form, size and color of the fruit the pear does not vary much from the apple, but in the color of the branches, the appearance of the leaves and its habit of growth, the variations are much greater; so much so in many cases that most varieties may be distinguished by the expert from the appearance of the leaves or twigs alone. Varieties are generally classed as summer, autumn and winter. Of the varieties that will succeed in all localities it will be impossible to give a satisfactory list, and the reader is again referred to his own State experiment station workers, the following lists being given as those in most general cultivation throughout the country and possessing valuable qualities.

SUMMER PEARS

Ansault—A pear of medium size, light greenish-yellow, mostly covered with thin russet, melting, juicy,

and fine grained. Tree a poor grower and must be top-grafted on to make a strong, upright tree. Bears young.

Clapp—While not a variety of much value for general market, from its vigorous growth, its large size and good quality, it is valuable for home use or a local market when properly ripened. The tree is very vigorous in growth, the fruit is of large size and of good quality when picked from the tree as soon as fully grown, but before the wormy specimens turn yellow. In this condition it will color beautifully, will not rot at the core, and be very high flavored. This variety makes a good stock for such varieties as the Ansault, Bosc and other poor growing kinds.

Giffard—Of medium size; in color and form like the Bartlett, but with more blush on the exposed side. Tree rather slender in growth and moderately productive. In quality one of the best of its season.

Margaret—Another pear of medium size and of greenish-yellow color with a brownish-red cheek and covered with greenish dots. Flesh fine, melting, juicy and of first quality. Tree vigorous and productive.

AUTUMN PEARS

Bartlett—Probably the best known pear and largely grown from the Atlantic to the Pacific. It is among the pears what the Baldwin is among the apples, and the Concord is among the grapes. It is too well known to need description. The tree is not very vigorous, but is hardy and productive, and often overbears; a fault that may be very easily remedied by thinning the fruit, and giving an abundance of plant food the bearing year. It ripens in September, but by putting into cold storage as soon as mature, it may be kept from four to six weeks and sold when the market is not well supplied and much better prices be obtained.

Bosc—This is a large, light russet pear, with a large body and a neck that tapers into a very long stem; the flesh is white, juicy, melting and of fine quality. The fruit is very large and heavy and liable to be blown off by heavy winds, and the trees should be trained low to prevent this. It is one of the best fall varieties and always sells at good prices when well grown. In New England it ripens in October, but may be kept in the same way that the Bartlett is carried over a glut and the price very much increased. The tree is rather weak in growth, especially when young, and to get the best results should be top-grafted on some strong growing variety like the Clapp, Flemish Beauty, etc. The Kieffer has been recommended for this purpose but has not been successfully used in the East.

Seckel—A small, light cinnamon colored pear with a blush on the exposed side and of the finest quality. The tree is very stocky and compact and a vigorous grower and regular bearer. The fruit is small, unless very severely thinned, but when well grown always sells at a good price.

Sheldon—A large, round, russet pear of the best quality. The tree is a good grower, productive and hardy. The color is not attractive, but where known, it sells at a good price.

Anjou—A large, oblate-pyriform pear, yellow, with blush on the exposed side. Some seasons this variety ripens to be of good quality, but it is more often of poor quality and unsatisfactory. It comes into bearing late and is not very productive.

Kieffer—There are probably more trees of this variety planted the country over than of any other kind, and it is no doubt a very profitable kind to grow for canning, but the quality is so poor in most places that if sold for table use it will lessen the demand for

this fruit. We would not advise its planting except for canning purposes.

WINTER PEARS

Dana's Hovey—A small pear resembling the Seckel in form and appearance but larger and with less of the brown or russet color. The quality is very much like the latter and the tree is of the same habit of growth. When properly thinned, so as to grow to large size, it sells at the highest price.

Lawrence—Medium in size, resembling the Bartlett in form, but smaller. The tree is compact in growth, very hardy and productive. A good early winter pear.

Additional varieties to be recommended are Worden Seckel, Patrick Barry.

HARVESTING, STORING, MARKETING

Gathering and Ripening—All varieties of pears, with one or two exceptions, are of better quality if picked from the tree before quite ripe, or when the wormy specimens are beginning to mellow, or with some even earlier. Varieties, like the Clapp, that rot at the core as soon as fully matured, need to be picked fully two weeks before they would mellow on the tree. The fruit should be left on the tree until fully grown, but then be gathered as soon as possible and be put into a cool, dark place until it is to be sold. It is the practice of some growers to pick the trees over twice, taking all the largest specimens first, and then allowing the balance to grow for a time. This practice applies to the fall varieties, but winter fruit must be picked before severe freezing weather.

Marketing—For the local market there is nothing better than the bushel box, and even for a long distance it is as good as the barrel. To present the fruit in

the best condition, the bottom of the box is taken off, the cover nailed on and the fruit faced on the cover. When the box is full and the last layer is well leveled off, the bottom is securely nailed on so that when the top is taken off, the fruit presents a regular and even appearance. The corrugated paper board cover is very valuable in preventing injury to the fruit when pressed firmly into the box. A cold storage room is more important in handling pears than with the apple, because of the short time the fruit will keep, and only a few varieties being grown, nearly all of one kind come into the market at once. To prevent a glut much of the crop must be held until the market is cleared and there is a decided demand, when good prices will generally follow. The cold storage house, described under the apple, is equally well adapted to the keeping of pears.

For insects and diseases attacking the pear, see Chapters XX and XXI.

IV

THE PEACH

(*Prunus Persica*)

In relative importance as a money crop and as a home fruit the peach stands next to the apple in the United States and its importance is gaining more and more as we become more skillful in caring for it. Our ideas as to the best part of the country in which this most luscious fruit will grow have undergone a great change in a few years past, for, instead of thinking that it will grow only in certain favored localities, we now find it succeeding in almost every part of the country from Canada to Mexico, and large areas are being planted where it was supposed a few years ago that the peach could not be profitably grown.

The peach is a native of Southern Asia and China, but the trees grow equally well in proper soil in Canada as in Texas, though the fruit buds are not hardy where the temperature remains lower than eighteen below zero for more than a few hours at a time. To grow the trees so that they shall withstand the changes of our climate in the northern parts of the United States, it is necessary to plant on high elevations, in rather light soil and in full exposure to air and sunlight. To reach its greatest perfection the fruit must be ripened on the trees, and with the modern facilities for transportation in refrigerator cars it may be allowed to become nearly ripe and yet be carried a long distance to market. It is best, however, in this business to give the greatest attention to the local market, for the best

prices will be obtained there, the cost of transportation being less, and the fruit will give the best satisfaction because the quality is much better than anything that can be put into the market from a distance.

THE ORCHARD

The peach orchard should be located on high land with a full exposure to the west, northwest or northeast, but not to the south, unless on the top of a hill with full exposure to air. The soil may be a sandy loam, clay loam or even of clay, if it is thoroughly underdrained and is not too much enriched before the trees come into bearing, but the ideal soil is a light one of good strength, with a clay subsoil and with many small stones well mixed in it to give quick drainage and to furnish the mineral food that is needed for fruit of the best quality. Some of the best orchards in the country are growing on very poor soil, and this kind of soil has many advantages. It is cheap, the trees do not make an overgrowth, but sufficient growth can be made by the application of plant food, the buds are hardier, the fruit is of better quality, but the cost of growing is greater than on stronger land.

Distance for Planting—The distance the peach is planted varies with the variety, the soil and the method of pruning from 12x12 feet to 15x15 feet, or even 20x20 feet. In some cases they are planted double thick, one way, i. e., 7 1-2x15, 10x15, or 10x20 feet, and when the trees begin to crowd so as to injure each other, one-half of those in each row are cut out. This is a very satisfactory way if the grower will act promptly and cut out the surplus trees at the proper time.

Trees for Planting—Most growers prefer medium or small trees (No. 2) for orchard planting, because they cost less, the freight charges are less, there are generally more dormant buds on the central shoot and

therefore the head can be more certainly formed just where it is desired. This is shown at Figure 41, *a*, while Figure 42 shows a No. 1 tree. The very small



Fig. 41—No. 2
Peach Tree

trees of any lot, however, are probably those that were budded on the weaker growing seedlings, their growth having been influenced by the stock, and for this reason it would be better to grow trees rather closely and on soil that will produce a rather small growth and select the best of these. To produce such



Fig. 42—No. 1
Peach Tree

trees a limited amount of nitrogen should be used in the fertilizer, with a liberal amount of potash and phosphoric acid, which will tend to give a hardy stock.

Preparation of the tree for planting is a very important matter and there are many different ideas in regard to the best way of doing this. The common practice is to cut off all of the lateral shoots and the main stalk (Figure 43, *a*) to about one, two or three feet in height, according to the height the head is to be formed. Another method practiced by the writer is to cut the top down to about three inches of the point where the bud was inserted and let only one bud grow into a new tree. (Figure 43, *b*.) By this method lateral branches can be formed just where desired along a central shoot, as seen in Figure 42, and will be less likely to break



Fig. 43, *a*, Peach
Tree Trimmed
to Whip



Fig. 43, *b*, Peach
Tree Cut Back
to Stub

down from a weight of fruit than upon a head formed in the ordinary way. But whatever method is practiced, the head should be formed at the earliest possible time and a central growth be developed from which the laterals shall come out on all sides of the tree and at a little distance apart. During the summer only those branches should be allowed to grow that are needed to establish the head and all others be pinched off before they have taken the strength of needed parts of the tree.

At the end of the second season or before the growth of the third begins, the young trees should be put in as perfect form as is possible, as a rule cutting back the young wood about one-half, varying this, however, to *give perfect form to the tree*.

Orchard Care—The planting of the tree and after care is practically the same as for the apple, with slight variations as to pruning and cultivation. The habit of the peach tree is such that the growth is made largely at the ends of the leading branches, so that in a few years, if unpruned, the branches become long and with few laterals, so that when loaded with fruit the trees break very easily. To overcome this habit severe pruning must be practiced. This is done in several ways, some cutting back all of the last season's growth one-half, but if this is done by rule the tree will be irregular in form and too many small shoots will be developed in tufts at the ends of the branches that will require much labor to thin out, or the work will be neglected and poor growth of the tree and fruit also will be the result. In this work it is better to first cut out any large branches that may make the head of the tree too close or give it an imperfect form and then head back some of the strongest shoots, not many, which will tend to increase the growth of the remaining laterals, and the fruit will be so distributed over the tree as not to be easily broken down by weight of fruit or

ice. Figure 44 shows a four-year-old tree at the end of the season, and Figure 45 the same pruned for fifth season's growth. Figure 46 shows an unpruned tree of same age, and Figure 47 a three-year-old peach tree in foliage.

Cultivation—While we often find peach trees of great age growing in the grass without any care, there



Fig. 44—Peach Tree Before Pruning

are few orchards where this method of care has been profitable. It is, with few exceptions, only by constant cultivation and care that we can expect large fruit and an abundance of it, but this work can be so cheaply done with the tools described for the cultivation

of the apple, and when so cultivated so much less fertilizer is needed that it is practiced by most successful peach growers. Cover crops have come to play such an important part in the question of fertilization, of plant food and the prevention of the washing of the soil on



Fig. 45—Peach Tree Pruned

hilly land, that I wish to call attention to this matter as discussed on Pages 32-34.

Mr. A. A. Marshall of Fitchburg, Mass., has an orchard of over 6000 peach trees in the most perfect condition, growing in turf. (Figure 48.) These are of three, four and five years' growth and are in condition to produce a large crop of the largest fruit of fine color and quality. A five-year-old peach orchard in

turf is seen in Figure 49. The grass is cut with a mowing machine as often as the cutter bar will work under it—about three times each season—and allowed to lie on the ground to decay, thus nothing but a crop of fruit is carried from the land and the growth of trees



Fig. 46—Peach Tree Not Headed In

is kept up by the application of bone, potash, phosphoric acid, lime and magnesia, using an amount averaging from twenty to fifty dollars' worth per acre, according to the season and the crop. By this method

cheap land can be utilized, but it must be borne in mind that it will require more plant food to produce a satisfactory growth in turf land than under constant cultivation, and that in time of drouth there is more danger of injury. After trees have become established, however, by close and frequent cutting of the grass there is less danger than to young trees. With skillful man-



Fig. 47—Three-Year-Old Peach Tree in Foliage

agement and good judgment this method can be recommended, but under neglect neither this method nor any other will succeed.

Fertilization—The peach is a fruit that does not require much fertilizer in good, ordinary soil until the trees begin to bear, if the land is frequently cultivated,



Fig. 48.—Four-Year-Old Peach Trees



Fig. 49—Five-Year-Old Peach Orchard in Turt

but when a crop of fruit is set, unless the fruit is thinned severely, a liberal supply must be used to carry the crop through and not weaken the trees. The best fertilizers to use are those rich in potash and phosphoric acid, with only nitrogen enough to make a moderately vigorous growth of wood. These materials may be put on in any forms that are most available, but the quantity must be determined by the grower, who alone knows the condition of his soil and trees, and upon his good judgment will depend his success.

VARIETIES

The number of varieties of peaches has become so large that the beginner finds much difficulty in deciding what kinds to plant, and yet when we come to investigate we find that there are but a comparatively small number of varieties planted by the successful peach growers. The following named varieties are among the best and most largely grown :

White Fleshed—Of the very early varieties of this group, including the Alexander, Early Rivers, Sneed types, none will be found profitable, as they are certain to be attacked by the brown rot nine years out of ten. Those generally found profitable of this group are Mountain Rose, Carman, Champion and Oldmixon.

Yellow Fleshed—Triumph (in a dry season may be of some value), Crawford's Early, Crawford's Late, Elberta and Crosby in Northern localities. This list is purposely made very small for the reason that few varieties will do equally well in distant localities and the grower must study the varieties in his own locality and plant such as have proved the most valuable. The experiment stations are all making comparative tests of the leading varieties that succeed in the different parts of the country and can give the best possible advice as to what will be most profitable.

THINNING THE FRUIT

There is no one thing connected with the growth of the peach of so great importance as thinning. When the fruit buds are not destroyed by the cold or injured by late spring frosts, the trees are generally so loaded with fruit that, if it is all allowed to grow, the trees will be so injured as to be subject to all the diseases that so commonly attack the trees, while the fruit will be of little value in the market. Thinning should be done as soon as it can be determined whether the fruit is perfect or not, the amount of thinning to be done depending upon the size and vigor of the trees, and the quality of fruit desired. If the largest and finest fruit is desired, only a limited number of specimens should be allowed to remain, i. e., thin to from five to six inches apart, while, if the trees are very vigorous and only a medium grade is desired, a distance of from four to five inches may be the rule. The greatest profit will come from the more rigid thinning. It will be found where the trees are well set with fruit that the quantity will be about as great in one case as in the other, while the larger the fruit the higher the price at which it will sell and the less the strain upon the tree. In thinning, all poor or curculio-stung specimens should be picked off, even if the last fruit is removed, for it would be of no value in the market and might be a breeder of insects or fungi.

HARVEST AND MARKETING

Much of the profit of growing this fruit will depend upon the way in which it is harvested and put on the market. To reach its greatest perfection the fruit should be allowed to become nearly ripe, and be picked and taken to the market at once, as it will not keep long after it reaches this stage. It is the practice

of those who grow this fruit for the local market to pick over the trees several times to get the fruit in the best condition. In picking, each specimen is examined on all sides before it is picked and if the green fruit has changed to a cream or light yellow, and the reds are well developed, it is picked. Some depend upon the feeling, pressing the projecting part on one side of the suture in addition to the change of color.

Package—The common peach basket is the poorest package that could be devised for keeping the fruit, as well as for harvesting and marketing. It is of such form that the fruit as it becomes ripe and soft settles

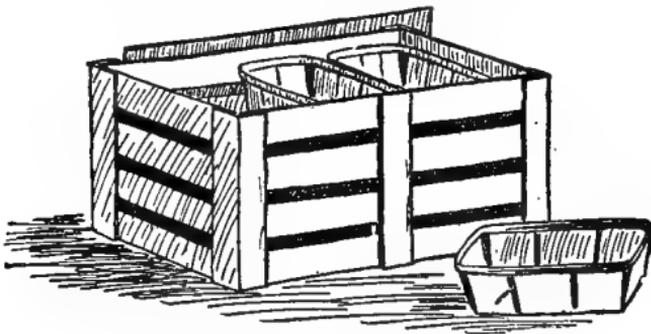


Fig. 50—Georgia Peach Basket and Crate

together and is badly injured in the jar of transportation. It is very difficult to pack in wagons or cars and occupies more space than any other package. The only merit it possesses is its cheapness, and it has been so long in use that it will be a long time before it will be replaced by a more sensible package. One of the best packages in use is the carrier of the Georgia peach growers (Figure 50), which holds six baskets of about three quarts each, or four baskets of four quarts each, making practically about the quantity that is shipped in the standard one-half-bushel peach basket, but its cost is much greater, varying from ten to fifteen cents,

according to the locality and the quantity purchased, while the peach basket may be bought at from three and one-half to four cents by the thousand, or larger lots. For long distance shipment, the carrier has now been generally adopted and it should not be long before all of this crop will be put up in a better package than the common peach basket.

Keeping the Fruit—The practice of not picking this fruit until it is nearly ripe, makes the danger of glutting the market much greater, and consequently produces the necessity of providing some means of holding the crop beyond the natural season. This is done to a limited extent by means of cold storage rooms or refrigerator cars in shipping. While this fruit does not keep in cold storage as well as the apple or pear, it can be kept for a considerable time and for the local markets where large quantities are grown, this is a necessity. The temperature at which it will keep the best is from thirty-two to thirty-four degrees, and with a rather drier atmosphere than for the apple.

For method of propagation, insects and fungous diseases attacking the peach, see Chapters XVIII, XX and XXI.

V

THE APRICOT AND NECTARINE

These two fruits are little known in the North and are seldom seen in our markets except in a dried state. This may be from the fact that as commonly grown the trees are short lived, and the fruit is of rather poor quality.

THE APRICOT

The apricot is thought by some botanical authorities to be a cross or hybrid between the European plum, *Prunus domestica*, and the peach, *Prunus Persica*, and by others to be a distinct species. It matters little to the practical grower which view is correct.

I incline to the latter theory, as its specific features are as marked as many of the most distinct species of other plants, and it is a question at what time all species of plants may have been evolved by the process of hybridization or environment to their present condition. I have never known either the apricot or nectarine to produce plants from seed other than their specific types, though I have grown many seedlings of both.

As grown in the Eastern States the fruit is not of as good quality as that from California, but in a warm soil, rather thin, with a full exposure to the west, the trees grow rapidly, and with proper thinning, pruning and spraying very satisfactory results may be obtained.

The peach stock is most largely used upon which to bud these fruits. The plum stock is recommended for heavy soil, but I know of no case where the apricot

has succeeded on heavy soils, and, therefore, consider the peach the best stock. The greatest obstacle to be overcome is the brown fruit rot or monilia that is so destructive to the early varieties of peaches and most of the European and Japanese plums.

To overcome this pest the trees should be heavily sprayed in March or early April with the standard bordeaux—six pounds copper sulphate, six pounds lime and fifty gallons water—and then again with the same just before the blossoms open. After the petals have fallen spraying with diluted bordeaux (1: 1: 50) at intervals of from two to four weeks, should be kept up until the fruit is nearly full grown. If the fruit begins to rot as it approaches ripening, spraying just after every rain with a solution of copper sulphate, four ounces to fifty gallons, will check it. Thinning the fruit as is done in growing peaches and plums, must be practiced, to help prevent this rotting, strengthen the growth of the tree and improve the size and quality of the fruit.

Sometimes the trees are winterkilled, but when planted in light soil, as previously mentioned, and an abundance of potash and phosphoric acid used, with only enough nitrogenous matter to make a moderate growth, they will make a hard, short-jointed growth that will be seldom injured by the most severe winter weather, and will live as long as peach trees. The pruning required is practically the same that is given the peach by the most successful growers of that fruit. Head in the most rampant shoots so as to encourage a close, short-jointed growth.

The number of varieties that are satisfactory in the East is very small, yet even many of those of poor quality are valuable for canning purposes because of the peculiar flavor and of the ease with which the stone or pit separates from the flesh. Among the best in quality and the most hardy are Early Montgamet, Moorpark

and Peach apricot. Some of the Russian varieties are highly recommended as hardy and productive, but in my experience they are neither as hardy nor of as good quality as those mentioned above.

THE NECTARINE

This fruit is perhaps less known even than the apricot, either in the fresh or dried state. In appearance of tree and habit of growth it is with difficulty distinguished from the peach, being practically a smooth-skinned peach. It is a distinct species, reproducing the type from seed. The tree is about as hardy as the peach and thrives best under the conditions described for the apricot. It is subject to the same insect and fungus pests and spraying must be done with the same material and at the same times as for the peach and apricot.

This fruit and the apricot also are much injured by the plum curculio, and this insect must be kept from injuring the crops by jarring the trees very early in the morning every other day for two weeks and catching on sheets or frames. Or arsenate of lead may be used as the fruit reaches the size of small peas, which is an effectual remedy if all other stone fruit trees in the vicinity are sprayed with some arsenate, and is much cheaper than jarring. If only a few trees are sprayed the insects coming from those near by would be able to lay their eggs before they would eat enough of the poison to destroy them. Among the best varieties are the Boston, Pitmaston and Rivers Orange.

VI

THE PLUM

There is no more delicious or nutritious fruit than the plum, and it is largely planted, but owing to the numerous insect and fungous pests that attack it, the crop of fruit is generally very small. On the Pacific Coast, where no fungous pests develop, on account of the dry atmosphere, this fruit is grown largely and is known as the prune, and prune growing has become an important industry. The term "prune," though commonly applied to the dried fruit, is equally applicable to all the varieties of the European or "domestica" plums. All varieties, however, do not make good dried prunes; those containing about twelve per cent of sugar will make "prunes" that will keep without fermentation, while those containing less sugar will soon ferment. New impetus has been given plum growing in the East by the introduction of the Japanese plums and the many hybrids produced between this and the European and American varieties.

The varieties of plums in cultivation may be grouped into three classes, i. e., European (*Prunus domestica*), Japanese (*Prunus triflora*), and American (*Prunus Americana* and other species).

EUROPEAN PLUMS

The European varieties are represented by the common blue, yellow and red plums of the garden, and produce fruit of the finest quality, but are so subject

to the attack of insects and fungous pests that they cannot be grown except by the best attention and skill. The best soil for the growth of this group is a deep, moist loam, though they will grow under a great variety of conditions. It is of the greatest importance that the trees be planted in full exposure to air and sunlight, which will in a great measure counteract the tendency to rotting of the fruit and the growth of the black knot. It is better to plant on a light soil with such an exposure, than on heavy land if low and in a close, sheltered place.

JAPANESE PLUMS

The Japanese plums are as vigorous in growth as the peach, begin bearing as young and are being planted largely. In quality the fruit is not as good as the European varieties, and it is subject to the same diseases and insects, but owing to the short time it requires to grow the trees to fruiting and their great productiveness, they may perhaps be more profitable than the former, even with the varieties now grown, and if out of the many new varieties now being offered, with great claims for quality, are found those equal to the best of the European, this group may entirely supersede the latter. The soil best suited to the growth of the Japanese plums is about the same as that for the peach, but perhaps a little richer and deeper. Nearly all varieties are subject to the brown rot, the black knot and the shot-hole fungus, and possibly to the disease known as the peach yellows, and it is important that they be planted in full exposure to air and sunlight. This group is largely propagated upon the peach stock, and generally does well on this stock, but whether this, the American or the Myrobalan stocks are the best no one has conclusively proved by careful experiments.

AMERICAN PLUMS

The varieties of the several species of this group are now attracting much attention on account of their great hardiness, productiveness, and freedom from disease and insect attack. The fruit is generally of small or medium size, the skin is thick and the flesh acid and clings very firmly to the pit or stone. When fully ripe and soft, many of the varieties are of good quality. Nearly all of the varieties are valuable for canning. The greatest promise of value in this group lies in the possibilities of crosses or hybrids with the European and Japanese plums, some of which are already being largely planted. These varieties succeed in a variety of soils, but will generally do best in rather moist land with good exposure. Many of the varieties are not self-fertile and require to be planted near others that will fertilize them. This subject is fully discussed in *Plums and Plum Culture*, by Prof. F. A. Waugh.

The varieties of all of the groups differ very much in size and habit of growth, and the distance at which they should be planted is from twelve to twenty feet, according to the kind. Two-year-old trees of the American and European plums and one-year-old of the Japanese are the best for planting.

CULTIVATION

In order to obtain fruit of the largest size and best quality the land must be kept well cultivated or enriched, so as to produce a vigorous growth of foliage and wood. Fertilizers recommended for the apple are equally adapted to the plum.

PRUNING

Most of the varieties of the plum require the same attention as to pruning and training as the pear, hav-

ing the same tendency to produce only a few shoots the first and second years. It is always better to stop these strong, leading shoots during the summer than to let them grow till fall and then cut them off, thus wasting considerable wood growth which, if it had been distributed to the lateral branches, would in a year or two develop into fruit buds. In this work of pruning the aim should be to obtain stocky, low-headed trees that will carry a heavy load of fruit and not break down and be so low that all the work of thinning, spraying and harvesting may be easily and cheaply done.

Age of Bearing—The Japanese varieties may be expected to produce some fruit two years from planting and full crops in three or four years, the European will bear in from four to eight years and the American in about the same time, but all varying much in time, according to the variety.

Thinning the Fruit—All varieties of plums have the tendency to overbear, and it becomes an absolute necessity to thin severely if good fruit is expected and the trees are to be saved from injury by overbearing. When the fruit is from one-fourth to one-half of an inch in diameter all imperfect and insect stung specimens should be picked off, one plum only being allowed to remain on each spur and these *not nearer* than from three to five inches apart, according to the variety and the grade of fruit desired. If the plums are grown for canning purposes more fruit should be allowed to remain (a small plum is generally preferred for this purpose) than if fine table fruit is desired. The fruit generally grows in clusters and care is needed in this work that all of the plums on the spur are not pulled off at the first effort, but by turning each plum carefully backward from the cluster all but one may be removed without injury to the rest. The earlier this work can be done the less will be the strain on

the tree, but it will be more work to detect imperfections while the fruit is small than when it is nearly grown.

VARIETIES

European Varieties—These varieties are classified into green or yellow, red and purple, though the latter classes may run together under different conditions

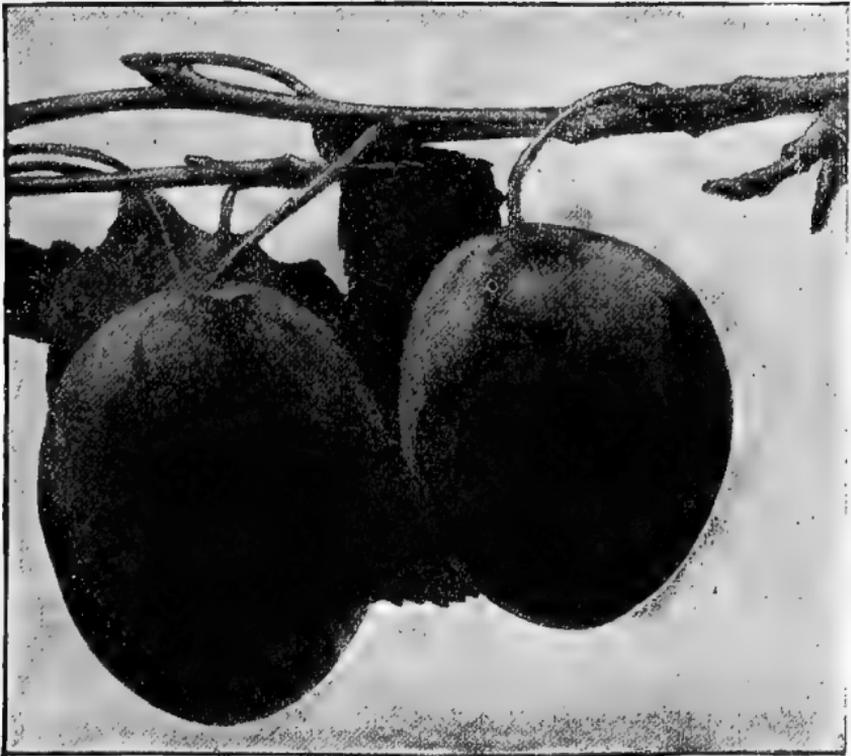


Fig. 51—Fellenberg Plum

of season and crops. Thus if the Lombard is allowed to be overloaded, and the foliage is not in full vigor, the fruit will be red in color, while under the most favorable conditions and a long season, some red varieties will become purple or nearly black. Among the best of this type are:

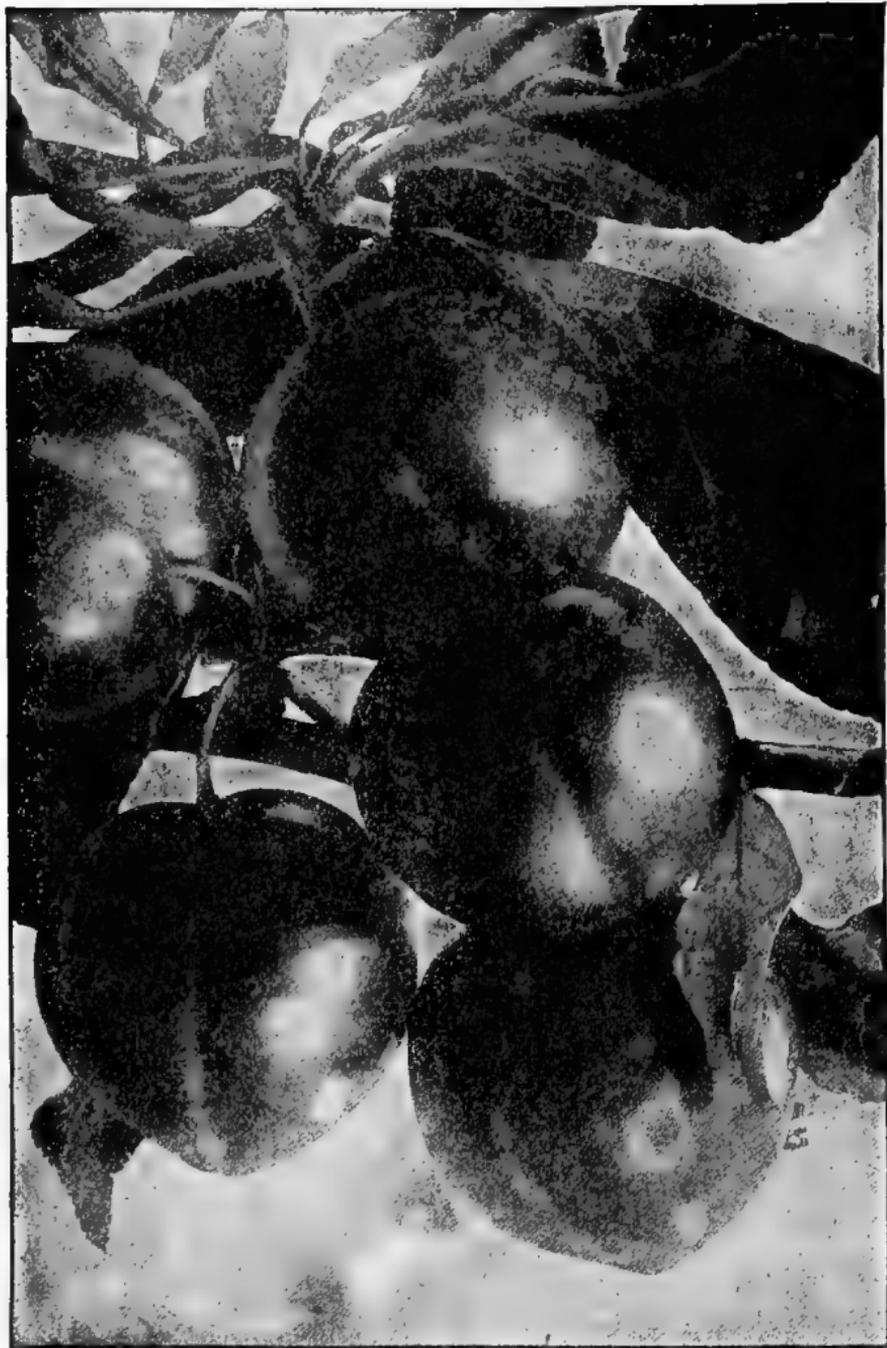


Fig. 52—Satsuma Plum

Green—Green Gage, McLaughlin, Gen. Hand and Washington.

Purple—Bradshaw, Lincoln, Quackenboss, Smith's Orleans, Fellenberg (Figure 51), Kingston.

Red—Pond's Seedling, Victoria.

Japanese Varieties—The varieties of this group vary in color from yellow to very deep shades of crimson. The fruit is of much better quality if allowed to become soft on the tree, or if kept a considerable

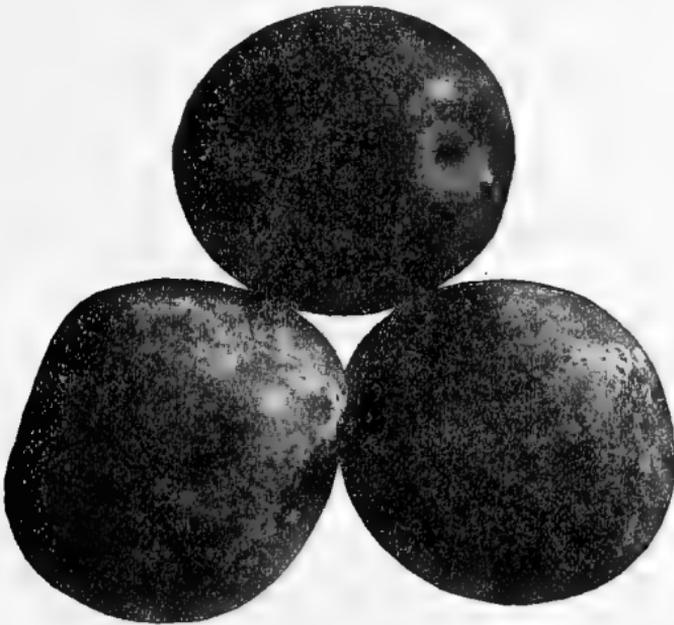


Fig. 53—Hawkeye Plum

time after being picked before it is sold. As with the last group the color of fruit depends much upon the length of the season and the crop on the trees. The following are some of the best: Abundance, Red June, Chabot, Burbank, Satsuma (for canning) (Figure 52), Wickson, October Purple. Many new varieties of great promise have been recently introduced, but their value for any given locality can only be determined by further trial in each locality.

American Varieties—There is more uncertainty in regard to the value of the varieties of this group for market than with the other groups, from the fact that they have no reputation in many of the large markets of the country, and the people must become acquainted with them before they will be in demand. Among the best are the following: Hawkeye (Figure 53), Hammer, Wildgoose, Wolf, Wyant, etc.

For insects and fungous diseases attacking the plum see Chapters XX and XXI.

VII

THE CHERRY

(*Prunus cerasus* and *P. avium*)

In some sections of the country cherry growing has become a very important branch of horticulture, i. e., on the Pacific Coast, where it is grown to ship East and for canning, New York State and some of the Middle Western States, where it is largely grown for the canneries. In the older portions of the country it is very little grown on account of the rotting of the fruit, the black knot, and its attack by the plum curculio, the cherry maggot and the black aphid. In these sections old trees are only found growing in a vigorous condition by the roadside and on the lawn, where the ground is rather rich and well drained and yet where they do not make a vigorous growth. The fruit is one of the most delicious, and where the conditions are favorable for its growth it becomes a profitable crop.

THE ORCHARD

The best soil for the growth of this fruit is one rather light and moderately rich and warm. If the land is very rich or moist, where the trees grow very rapidly, they are soon injured by the winter and after three or four seasons the trunks crack open on the south side, decay soon sets in and in a few years the trees die. The remedy for this condition is first, to plant on light land and fertilize very sparingly and with quickly soluble fertilizers, especially potash and phosphoric acid,

applied in the spring. Growth should be completed by the middle of September, and this will be insured by the sowing of a cover crop about August 10, or by ceasing cultivation by the middle of August. The cherry succeeds well under turf culture.

To prevent the cracking of the trunk on the south side a board or stake should be set up to prevent the sun striking it during the fall, winter and spring. The distance for planting will vary somewhat, according to the variety; those making a large tree should be set twenty to twenty-five feet, while the smaller kinds will need only fifteen to eighteen feet each way. It is the practice of many orchardists to plant 10x10 feet, or 10x20 feet, and when the trees begin to come together, cut out every other one. For directions for preparing the trees for planting, planting and after care, see directions for the apple. The cultivation of the orchard to be followed is also practically the same as for the apple.

Pruning—Very little pruning is required more than to direct the growth, so that there shall be but one leader in case of the sweet cherries, which are naturally pyramidal in form, while the round-headed varieties may have several main branches. Large branches should never be cut away from trees of the stone fruits if it can be avoided.

CLASSIFICATION

The varieties of the sweet cherries (*Prunus avium*) are divided into two groups: The *Heart* cherries, those heart shaped in form, with a very juicy and sweet flesh and the tree of a pyramidal form, illustrated by Gov. Wood and Black Tartarian, and the *Bigarreau* cherries, the fruit of which is also heart shaped, but firm in flesh and the tree rather round and stocky in growth. This group is represented by the Napoleon or Yellow Spanish. Figure 54 illustrates a row of sweet cherries.



Fig. 54—Row of Sweet Cherry Trees



Fig. 55—Sour Cherry Trees

The varieties of sour cherries (*Prunus cerasus*) are divided into two groups, the Duke and Morello. The fruit of the former is borne on stout, round-headed trees, is red or crimson in color and not very acid, while with the latter, tree is small and with slender weeping branches. The fruit is round, of a bright red color and very acid. Figure 55 shows the characteristics of the sour cherry tree. The following are among some of the best varieties of each group:

Heart—Gov. Wood, Black Tartarian, Downer's Late and Windsor.

Bigarreau—Yellow Spanish, Cleveland, Rockport and Schmidt.

Duke—May Duke, Royal Duke.

Morello—Early Richmond, English Morello, Montmorency.

The fruit is marketed in several ways. In some places it is sold in the common quart strawberry box and put into the bushel crate or carrier, in other localities it is sold in the four or eight-pound grape basket, while on the Pacific Coast it is shipped in small shallow boxes holding two layers of large, finely-sorted fruit. As grown in the East, where the fruit is likely to decay quickly, the quart box is perhaps the best package unless it is to go to canning factories, when the package is of no great importance, so long as the fruit is delivered in good condition and will keep until it is canned.

See methods of propagation in Chapter XVIII, and insects and fungous pests and their destruction in Chapters XX and XXI.

VIII

THE QUINCE

(*Cydonia vulgaris*)

In the past few years quince growing, as a business, has not been as profitable as formerly, owing, perhaps, to an oversupply of this fruit, or the abundance and low price of other fruits. It is not a fruit that can be used for dessert without cooking, and consequently is not consumed largely—only for canning, but its aroma and peculiarly agreeable flavor make it a much prized fruit for preserves. As a shipping fruit, it is not so valuable as for the local market, from the fact that the slightest bruise or scratch disfigures it, and when taken from the box or barrel, where packed with pressure, it presents anything but a pleasing appearance, but where it can be taken into market in the bushel box or market basket it shows to better advantage and sells at good prices.

THE ORCHARD

The best soil for the production of this fruit is a deep, rich, moist loam; not one containing stagnant water, but well drained, naturally or otherwise. Trees two or three years from the root graft or cutting are in the proper condition for planting. They are trained in two ways, i. e., in the tree form and bush form. The advantages of the tree form are that cultivation can be done better and the trees present a better appearance, while if the borers attack the trunk they can be easily

discovered and destroyed. The bush form is the most natural to this fruit, and if when trained to the tree form suckers are not cut away as they come out, it will soon take the bush form, and it may be grown in this form with less labor, while if borers get in between the trunks it is more difficult to get at them. If, however, one trunk should be killed there will be others to

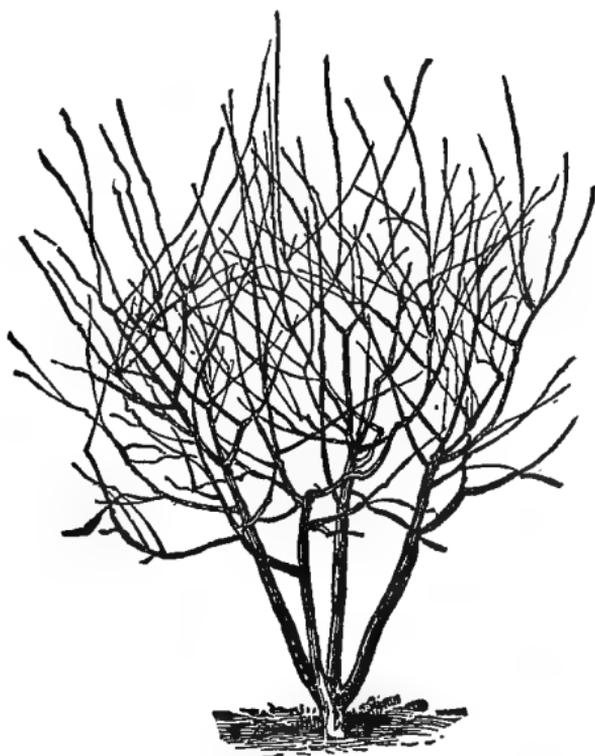


Fig. 56—Low-Branching Quince Tree

take the growth of the root and the tree is continued. A low-branching five-year-old quince tree is seen in Figure 56.

Distance for Planting—Ten by ten or 12x12 feet are good distances, according to the soil. The roots of the quince are very fine and numerous and consequently it is easily planted. No fruit responds more quickly to

good cultivation and fertilization than the quince, but nitrogenous manures should not be used too freely during the summer. If stable manure is used, it had best be put on in the fall and late cultivation should be avoided, as a late growth tends to increase the danger of an attack of the fire blight, which is often very destructive to the quince. For the production of fruit from three hundred to five hundred pounds of sulphate of potash and one-fourth to one-half ton of fine ground bone will make a good dressing, according to the condition of the land and the growth of the trees.

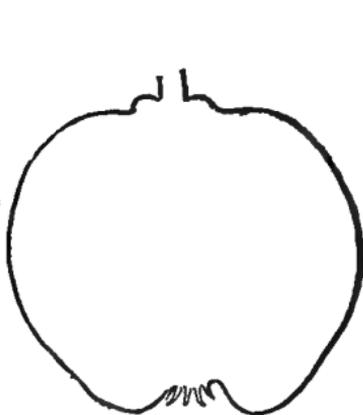


Fig. 57—Orange Quince

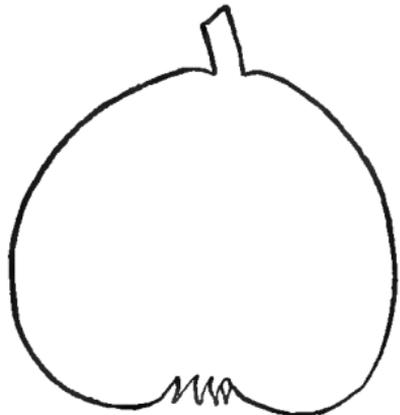


Fig. 58—Rea's Quince

Pruning—Little or no pruning is required after the trees have become established, except to cut off the suckers from the trunk or roots if they become too numerous and to keep the head in good form. In good soil the quince begins to bear paying crops of fruit in from four to six years from planting in the orchard and continues to bear, with good treatment, for from twenty to forty years.

Harvesting—The fruit should not be gathered until it begins to turn yellow, when it may be all picked at once. Like the varieties of the apples with yellow skin, it must be handled with greatest care, as even

slight bruises or scratches make the skin turn brown. The fruit may be kept a month or more in a cool cellar, or longer in cold storage, but there is little demand for it after the fall canning has been done.

VARIETIES

There are but few varieties in cultivation, and these show less distinctive characteristics than those of any other kind of fruit. Among the best are the following:

Orange (Figure 57)—This is an old standard sort, nearly round in form, of a bright yellow color and fine quality.

Rea's (Figure 58)—One of the best in cultivation; of the largest size, of good quality and comes into bearing early.

Champion—A late variety that is valuable when the demand continues into November; but not as valuable as the last two mentioned.

THE MULBERRYCHINESE (*Morus alba* var. *multicaulis*)RUSSIAN (*Morus alba* var. *Tartarica*)

Commercially, the fruit of the mulberry is of little value. Some varieties yield a large quantity of fruit, but it is so small and ripens so unevenly that it is of little use, except for poultry and pigs. It may have a value as a preventive of injury to the cherry and strawberry crops, as the robins and cedar birds are very fond of the fruit and will take less of the former fruits.



Fig. 59—The New American Mulberry

The varieties that produce the largest and best fruits, the New American (Figure 59), Downing (Figure 60), Hicks, Townsend, etc., are either grafted or budded upon the



Fig. 60—The Downing Mulberry

Chinese (*Morus alba multicaulis*)

or Russian stock (*Morus alba Tartarica*), the latter being a little more hardy, but none standing north of the forty-third degree parallel, many being killed even much farther south.

For the best success, the trees should be planted in a warm, rather poor soil, with full exposure to sunlight and air. Sometimes the trees are injured by too rapid growth, in the same manner as the sweet cherry trees, in fact, they both succeed under about the same conditions.

The Russian mulberry, introduced into the Middle West as a timber tree and bird food, to save the cherry crop, has proved of little value, the fruit being too small in size and quantity. The weeping form, known as Tea's weeping mulberry, is an acquisition to our list of beautiful ornamental trees. It is not perfectly hardy north of Boston.

THE GRAPE

- THE FOX GRAPE (*Vitis Labrusca*)
- SUMMER GRAPE (*Vitis aestivalis*)
- FROST GRAPE (*Vitis cordifolia*)
- EUROPEAN GRAPE (*Vitis vinifera*)

The grape, from its healthfulness, the large range of the country over which it flourishes and its large products, may be placed next in importance to the apple. The area planted is somewhere between 400,000 and 500,000 acres, of which about one-half is in California. The number of vines planted is given in the last census reports as 200,000,000 and the yield of fruit as 1,144,-278,000 pounds. The largest closely planted grape area in the world is claimed to be that of the "Lake Shore Grape Belt," a tract extending from Brocton, N. Y., to Sandusky, O., and from Lake Erie to Lake Chautauqua. This fruit is of especial importance, because of the success attained in growing it in the home garden on the south side of fences, walls and buildings.

ORIGIN AND HISTORY

There are about twenty species of the grape in the United States, but all of the varieties of any importance in cultivation have come from the four above mentioned species. In 1820 only one or two of the varieties now cultivated were known in any section of this country, and all of the especially valuable kinds have been produced within forty or fifty years. A few fairly good

varieties have been produced by hybridization, but most of those in cultivation are chance seedlings, or selected seedlings of such hardy varieties as the Concord, etc. The introduction of foreign blood, as it is called, i. e., the crossing of our native species with the European grape (*Vitis vinifera*) has always resulted in a weak vine, liable to diseases and to injury from cold, yet in flavor and keeping qualities they are superior to the former, and by continued effort it is hoped that varieties may be obtained of superior quality and hardiness. The greatest hope, however, seems to be in crosses between these and hardy native varieties.

THE VINEYARD

The best soil for the growth of the vine is a light sandy or gravelly one, on a high elevation and exposed to the south, where the fruit will be of fine quality and there will be little danger from late frosts in the spring and early frosts in the fall. The more very small stones in the soil the warmer it will be and the richer the fruit. While this fruit may be sometimes ripened on low land, competition is so great and prices are so low that much profit cannot be expected, except under the best of conditions. We may escape frosts now and then on low land, but the loss of even a few crops in a series of years would render the business unprofitable. Steep slopes should be avoided, on account of the washing of the soil during heavy rains, as the cost of terracing is so great as to take any possible profit.

Vines—The best vines are strong, one-year-old plants, from the cutting or layer, and with a good amount of root. Before planting the top should be cut back to about two buds and the roots to one foot in length. See chapter on the propagation of the vine.

Distance—Before planting the land should be thoroughly fitted by plowing and harrowing, and be marked

out with a plow or a marker. The distance of planting most practiced is eight by ten feet, though small growing vines may be planted six by ten feet. Close planting has a tendency to cause mildew and rot, especially if planted on land not fully exposed to air and sunlight.

Planting—The crown of the vine should not be planted deep, as the grape roots naturally run very near the surface. Three or four inches is deep enough for the crown, but the ends of the roots should be put down into the moist soil, as seen in Figure 61. It is

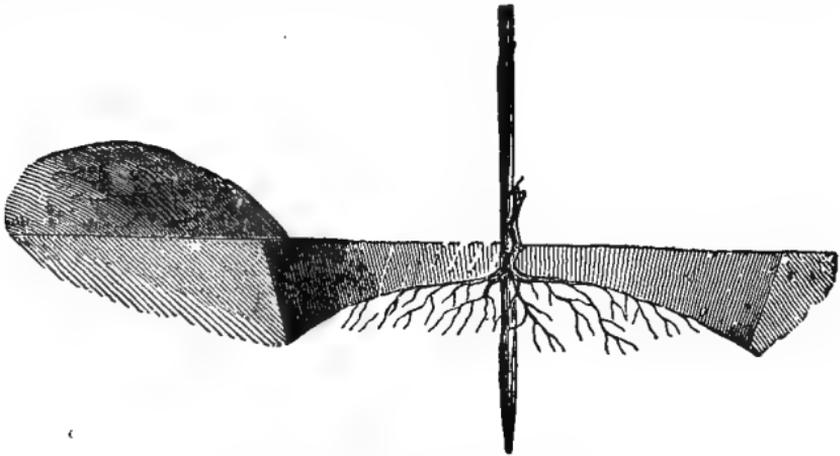


Fig. 61—Planting the Grapevine

sometimes the practice to put the roots on the sloping side of a furrow, with the crown four inches deep and the root spread out flat, at an angle of about forty-five degrees, then covering with soil and pressing it firmly about them. If a double furrow is plowed, leaving a ridge between them, the vine can be easily and quickly planted. The best surface soil should be used in filling in about the roots, and if it is very poor a little fine ground bone should be well mixed with the soil at planting.

Fertilization—The grape does not require a large amount of fertilizers. The elements most needed are



Fig. 62—Vineyard with Cover Crop



Fig. 63—Vineyard Without Cover Crop

potash and phosphoric acid, and this is, in part, the reason why it succeeds best on gravelly soil. Enough nitrogen must be applied, however, to make a moderately vigorous growth of wood. A very good formula for the grape, to be varied somewhat according to the soil and the condition of vines is: Fine ground bone, five hundred pounds, sulphate of potash, three hundred pounds; or nitrate of soda, two hundred pounds, sulphate of potash, two hundred pounds, acid phosphate or fine ground rock phosphate, four hundred pounds. If the vines make a poor growth of wood, add more bone or nitrate of soda, but if the wood growth is large, use only the potash and phosphoric acid. A cover crop, sown about August 10, of peas and barley, will be found very useful, especially on sloping land, to supply organic matter, hold the soil from washing and to protect the

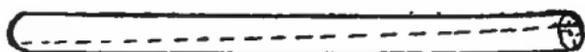


Fig. 64—Economical Use of Posts

grape roots from severe freezing. Figure 62 shows a vineyard with cover crop of peas and barley, and Figure 63 the same without the cover.

Cultivation—The first two years after planting, some hoed crop, like peas or beans, may be planted among the vines, but a late growing crop, like the potato, might do harm by causing a late growth of the vine, the crop being dug in August or September.

Supports and Trellises—The trellis most in use and which is the most satisfactory for the commercial vineyardist, is made of posts and wire. Chestnut or cedar makes the most durable posts, though other materials are used. If the posts are six inches in diameter at the small end and are sawed diagonally, as seen in Figure 64, so that they are 2x6 inches at the opposite

ends, two good posts are made of what usually makes but one. The posts are set from twenty to thirty feet apart, according to the weight of the vines, or even a greater distance, and small stakes are put in between. Two or three wires are used for the support of the vines, according to the method of training. If the vines are trained as in Figure 65, known as the Kniffin system, only two wires are needed, but if more than two canes are grown, more wires will be needed. Wire makes the best support, as it is the cheapest, the most durable, and the vines will support themselves more or less by their tendrils without tying. No. 14 and No. 16 galvanized wire are the sizes most in use.

The wires are fastened to the posts or stakes by the common wire fence staples, the top wire being placed on the top of the post. The height of the posts varies in dif-

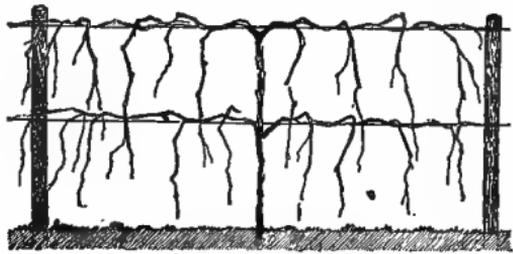


Fig. 65—The Kniffin System of Grape Training

ferent localities from five to six feet and they should be planted from three to three and one-half feet deep, to be beyond the action of frost. Chestnut and cedar posts will last from twelve to fifteen years, and should be renewed before quite rotted off, that the weight of the vines does not break them over when loaded with fruit. The wires are stretched on the trellis with the common wire fence stretcher. Many devices are employed to brace the end posts; the most common perhaps is to put in a short post six to eight feet from the end of trellis and brace to that. Another is to run the wire over the end post and sink a heavy stone about three feet deep around which the wire is wound, as shown in Figure 66. This latter method

is very satisfactory if care is taken not to catch the cultivator teeth into it when turning the ends of the rows. On the north side of a vineyard, where a windbreak is needed, a tree like the Norway spruce or European larch can be planted at the end of each row and after a few years the wire be fastened with a screw eye to the trunk near the ground, and thus a brace and windbreak and shelter be provided. The trellis need not be put up until the beginning of the second year's growth, where the vines are strong, or the third year if they have made a small growth.

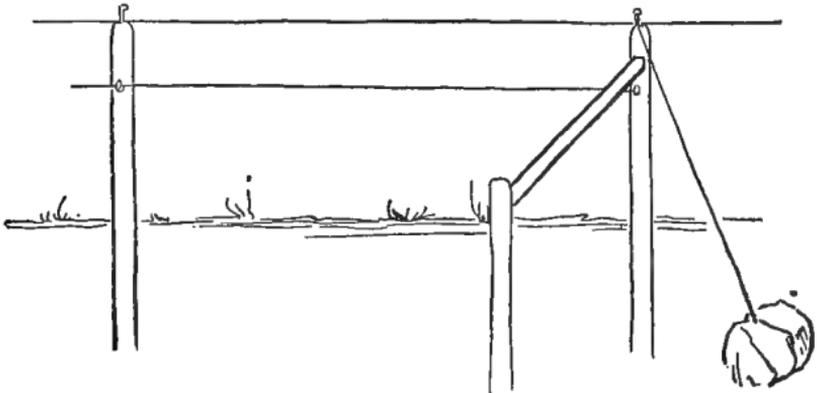


Fig. 66—Method of Bracing the End Posts

TRAINING AND PRUNING

The First Year—It is the common practice the first year to let the vines lie on the ground, giving them no care further than to see that they are not injured in cultivating, but this is not the best way, as the leaves that lie on the ground are sure to be attacked by mildew, while if trained to a small stake they would be much less subject to this injury.

The Second Year—At the end of the first year, unless the vines have made four to six feet of growth, and before the sap begins to run, the tops of the vines

are to be cut back to two buds, in order to obtain a very vigorous start for the second year. If, however, the growth is more than four feet, the vine is to be cut at the level of the first wire on the trellis. During the second year of the strong, or the third year of the weak vine, two canes are allowed to grow from the two top buds, running along the first wire of the trellis. All laterals should be pinched off when they have *made one leaf*, but *not removing this leaf*, as it would cause the bud at the base to grow, a thing that is to be avoided if possible. Then when another leaf is formed on this lateral it is pinched again, thus forcing all of the growth into one or two canes.

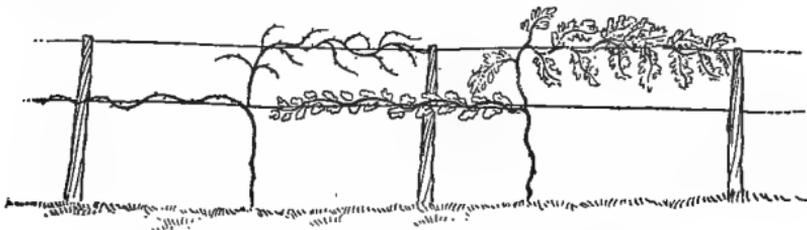


Fig. 67—The Modified Kniffin System

The Third Year—At the beginning of the third year the stronger one of the two canes is carried to the top wire of the trellis for fruiting, while the weaker one is cut back to two buds, from one of which is to be grown a new cane for the next year's fruiting. The vine is now fixed on the trellis, as shown in Figure 67, and each year from this on the training required will be the same, the forcing of the summer's growth into the top or fruiting cane and into the one new cane that is to replace each fruiting cane after the crop has been taken from it. The fruiting laterals on the top canes will need pinching off as soon as the last cluster of flower buds can be distinguished, or owing to their soft growth may be broken off by high winds. These laterals must be kept headed in all summer and will need attention

several times during the summer, as well as all laterals on the new cane on the lower wire. A large amount of foliage should never be removed from a vine at any time; it is much better to stop growth when it has reached the proper length.

The winter pruning required after the vine has become established, i. e., after the third year, is simply to cut away the old fruiting cane at or near the point where the new cane started, and cutting away all of the laterals on the new cane. This work may be done at any time after the leaves have fallen and until about the middle of March. After this date the vines are likely to be injured by bleeding. It is not best to prune when the canes are frozen, as they are then very easily broken. The common hand-pruning shears (Figure 26) are used for this purpose, of which there are many forms, those having the flat spiral or wire spring being preferred by the writer.

Pruning Old Vines—In many gardens are to be found old vines that have not been pruned for years, and which produce fruit that is almost worthless in consequence. The owner still neglects them because he does not know how to take hold of the vine and put it into shape. Such a vine, with a little care, may be made productive and can be brought up in a few years, to any system of pruning. The first thing to do is to cut away all of the old wood, leaving only the required number of new canes for the system of training desired. Any vine that is vigorous will have enough new canes to fill up the trellis or side of a building and will often produce as much fruit on the few remaining canes after pruning as if the vine were not pruned at all, and that of a much better quality. In case the vine is not vigorous and has but few or no new canes, the whole top may be cut off and only the desired number of new canes be allowed to grow during the

following summer, when after one season a large crop of fruit may be expected. In both of these cases all laterals must be kept pinched off in the same manner as if the vine were in the vineyard. A very good way to locate the canes on an old vine of this kind that it is desired to save is to start near the ground and mark them with blue or red chalk at frequent intervals and then cut out all not so marked.

Thinning the Fruit—The money value of a crop of grapes depends very largely upon the size and perfection of the bunches, and this will depend a good deal upon the number of bunches allowed to grow on a vine. On a vine that is vigorous and well supplied with wood, more bunches of fruit will set than it can mature to the greatest perfection, and the number should be reduced as soon as the berries are the size of small peas. The number of bunches that are to be allowed to grow will depend upon the vigor of the vine. In a well established vineyard the average number should be from twenty to thirty to the vine, making, at a distance of 8x10 feet and the bunches averaging one-half pound, 5440 to 7160 pounds per acre, which is perhaps about the average of vineyards under good care. One, two or three bunches are allowed to each lateral, according to the number and strength of the laterals.

Gathering the Fruit—Unlike other fruits the grape does not improve in quality after being picked but soon loses its lively fresh taste, and must be fully ripened on the vine. In many localities the fall frosts hold off so that maturity is practically assured every year, but in others it is often destroyed before fully ripe. The ripeness of the fruit is generally determined by the color, but it may be more definitely shown by the changing of the stem of the bunch where it joins the cane. When this takes the color of the cane for one-fourth to

one-half of an inch, it is safe to pick and put into storage. Light frosts will injure unripe fruit, but when fully ripened it will not be injured except by a freeze.

To retain the beauty of the fruit, the bunches should be removed from the vine by taking hold of the stem and cutting with a knife or scissors, so as not to injure the bloom. Where large quantities are to be picked, in some sections, they are placed on trays four feet long by eighteen inches wide with cleats on ends and a single layer deep, the trays to be stacked one above another. These trays are made by nailing head pieces upon the ends of a board of the required dimensions.

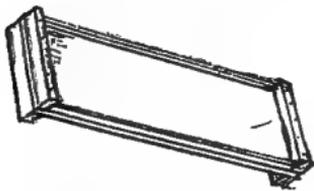


Fig. 68—Grape Tray

Strips two and one-half inches wide and three-eighths inch thick are nailed on the edges of the trays to keep the fruit from falling off. (Figure 68.) This gives circulation enough about the fruit

and large quantities can be placed in a small space until they are packed for shipping.

Packing and Shipping—For nearby markets grapes are packed in open trays, holding from twenty to twenty-five pounds, the common Diamond market basket, containing ten to twelve pounds, or in small chip or veneer baskets, holding from three to six pounds, and taken into the market with the bloom uninjured, but for long distance shipping they are almost invariably packed in the three, five, eight or ten-pound veneer basket with a cover. Varieties with a tough skin pack the best in the last named basket, though hundreds of tons of the thin-skinned Concords and Wordens are packed and shipped in this way. To do this work requires considerable skill and quick movements. In sections where large quantities of grapes are grown, the

packing is done by the buyer, or at a central packing house of a grape union. In both cases the results have proved much more satisfactory than where each grower packs his own fruit, as the grade will be much more uniform, and as skilled help can be employed, the work is better and more cheaply done. In shipping, the local market should be considered first, as better prices can often be obtained there, because the fruit can be put into the hands of the consumer in better condition than where it has been packed in a basket, and the cost of package and transportation may be less.

Grapes in Cold Storage—Unless one has especially good facilities for keeping this fruit, it is best not to attempt to carry it much beyond the holidays, as there will be often much waste. Prices do not generally improve very much after this time and the quality deteriorates very rapidly unless the conditions for storing are very favorable. In storing with ice, the moist air from the ice chamber should be cut off from contact with the fruit, as it causes the stems to mold. A too dry atmosphere also must be avoided, which causes the stems to shrivel. The most successful cold storage houses for grapes are cooled by chemicals, where the temperature and moisture can be more exactly regulated than with ice.

VARIETIES

Varieties are classified or grouped into white, red and black or purple. Of the hundreds of varieties known but a very few are of much value for commercial purposes, and only those of decided merit will be mentioned.

BLACK VARIETIES

Worden—This is perhaps the best very early grape in cultivation. It resembles the Concord very closely,

though the bunch is not quite so large; the berry is larger than the latter, of a dark brown purple color until fully ripe, but is in good eating condition a week or ten days before the Concord. It has the same thin skin as the latter and is more liable to crack during rainstorms, just as it is getting ripe.

Concord—One of the most vigorous and productive, and perhaps the most largely planted of all. The bunches are large, the berries of good size, the skin thin and the pulp is tender and juicy but rather acid at the center. In Northern localities it is often cut off by the early frosts in the fall.

Campbell's Early—A comparatively new grape that begins to color earlier than Moore's Early, but like the latter the pulp does not become soft and sweet until after the Worden is in good eating condition. It however hangs a long time on the vine and finally becomes very rich, sweet and tender.

Wilder—A hybrid grape of large size and good quality. It ripens with the Concord, has a thick skin and a soft, sweet pulp that is very satisfactory. The vine is very vigorous but subject to mildew and anthracnose, and the berries to anthracnose and black rot. With favorable conditions and good care it is desirable. The fruit keeps much longer than the others mentioned.

RED GRAPES

Delaware—This little grape is everywhere known. It is hardy and productive but of slow growth and the thin leaves are liable to injury from mildew. It is one of the best in quality and by proper spraying the leaves can be prevented from mildewing and the variety made profitable.

Brighton—In size of bunch, vigor and productivity, and in quality of fruit, under favorable conditions,

no variety is superior to this, but the vine is tender and often injured by diseases so that it has been discarded, by many growers, as a commercial variety. It must be planted near other varieties to have it pollenize, as it is not self-fertile and fails to set full bunches when planted alone.

WHITE VARIETIES

Green Mountain (Winchell)—The earliest good white grape that produces a bunch of large size and fine quality. The vine is vigorous, hardy and productive, but the fruit is not of very attractive color, and has not been largely grown for market.

Moore's Diamond—This variety produces very large clusters of beautiful fruit of good quality. The vine is hardy and generally free from disease. It ripens a little later than the Concord and for Northern localities is therefore not profitable.

Niagara—The bunches, and the berries as well, are a little larger than those of the last named variety, but the color is not quite as good and it is a little later in ripening. The vine is very vigorous and productive, but is very much subject to disease, especially in the North.

Of the varieties of grapes of different colors, those of a purple color sell the best, a very bright red, like the Delaware, the next, and the white or green, unless of a golden color, the poorest.

GIRDLING THE VINE

In Northern sections and with very late varieties the crop is often cut off by early frosts in the fall, and girdling (taking out a narrow ring of bark below the fruit) is practiced to some extent to hasten the ripening. The effect of this girdling is to stop the backward

flow of the elaborated sap to the parts of the vine back of the girdle, and as a result the foliage beyond the girdle is much increased in vigor and the fruit in size, and it matures a week or ten days earlier than the un-girdled cane. The fruit thus grown has a more watery consistency, does not taste as sweet, but many analyses of girdled fruit show it to contain several per cents more sugar. The lack of sweet taste is due to the acid being more quickly soluble than the sugar. Only the part of

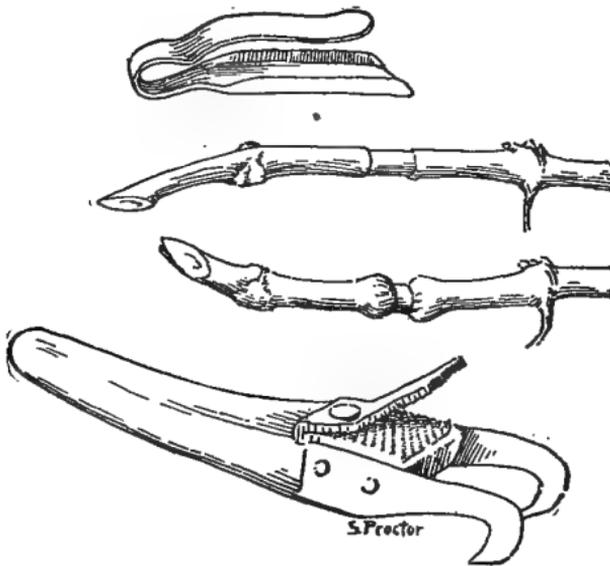


Fig. 69—Implements for Ringing Grapevines

the vine that is bearing the fruit should be treated, i. e., that bearing the fruit, for if the whole vine is girdled, there being no elaborated sap to go below the cut, no new roots will be formed, and the vine will consequently make a very weak growth the next season if it is not killed outright. To obtain the best results, several strong and vigorous canes should be grown below the girdle, when no injury will result from this practice. By this operation the growers in Northern sections can

get their fruit into the local markets before the main supply from the large grape growing sections gluts them and the prices are too low for profit. The work of girdling is done with a common pocket knife, or some implement made for this purpose, as shown in Figure 69.

The best time for this work is when the berries are about one-third to one-half grown. The width of the ring varies from one-quarter to one inch, according to the size of the canes, the smaller the cane the narrower the ring. In girdling, care must be taken not to make the cut on the *bend* of the *vine*, as in that case it is very liable to be broken by the weight of the fruit or by high winds.

THE BLACKBERRY

THE HIGH BLACKBERRY (*Rubus villosus*)

THE DEWBERRY (*Rubus Canadensis*)

This is one of the very important native fruits, and is found growing wild in almost every section of the country; perhaps the most noted section for the growth of this fruit is New Jersey, from which large quantities of fruit are shipped to many Northern and Western cities. This fruit is noted for its medicinal properties and is a very valuable addition to the list of late summer fruits. In the garden the blackberry is commonly planted in some out-of-the-way place where it is allowed to spread unmolested, until it becomes an impenetrable tangle, where neither man nor animals can get the fruit. It is then voted a nuisance, when with a little care at the proper time it would have yielded an abundance of fruit. It should be more largely grown than it is now, both in the field and garden.

THE COMMON HIGH BLACKBERRY

The Soil—While the blackberry will grow in a great variety of soils, it succeeds best in a rather heavy moist one. If planted on a thin soil a very large amount of manure or fertilizer must be used in order to produce a large growth of tops that will shade the ground and thus keep it cool. A plantation in thin soil will not last as long as one in heavy land. On a

thin soil, if water is available for irrigation, large crops may often be produced, or this result, a soil-cover, may sometimes be obtained by heavy mulching. The danger from mulching is that the roots are brought to the surface of the ground and the mulch must be kept up all of the time, or when it decays, or if it is removed and the land cultivated, the surface roots will be destroyed.

Planting—The best time for planting is in the fall, but the plants may be set with success in the spring if it is done early. If it is necessary to delay planting until late in the spring, a plantation may be made by taking up the new soft suckers, putting them into a pail of water as they are dug and setting them without exposure to the sun and air. The soft ends of the canes should be cut off before they are dug. This method may be practiced at any time during the summer whenever young shoots can be obtained, and is a very convenient way to fill out a newly planted field. The distance of planting varies greatly with different growers, ranging from 4x6 to 6x8 feet. Two methods are practiced, the *Hill system* and the *Row system*. The advantages of the former are that most of the work of cultivation can be done by the horse, and the fruit may be more easily gathered than in the close row. With the row system the soil is more covered, and more shaded, a thing that must be provided to get the best results, especially in dry weather, and the fruit will be larger, as the largest and best fruit is always found under the shade of masses of foliage.

Cultivation—There are few crops that may be so easily grown, if the work be done at the proper time, as the blackberry, and few also that if neglected require so much care to put into condition again. All suckers not needed to fill out the rows or hills must be treated as weeds and the ground be kept light and loose at all

times during the summer, especially during dry weather when the fruit is ripening. By frequent cultivation the roots are kept deep in the soil, which produces the cool condition under which they succeed the best, and plant food is being rapidly developed by the frequent exposure of the soil to the air. Late cultivation is generally to be avoided, but in seasons when there is but little moisture in the soil during August, it may be best

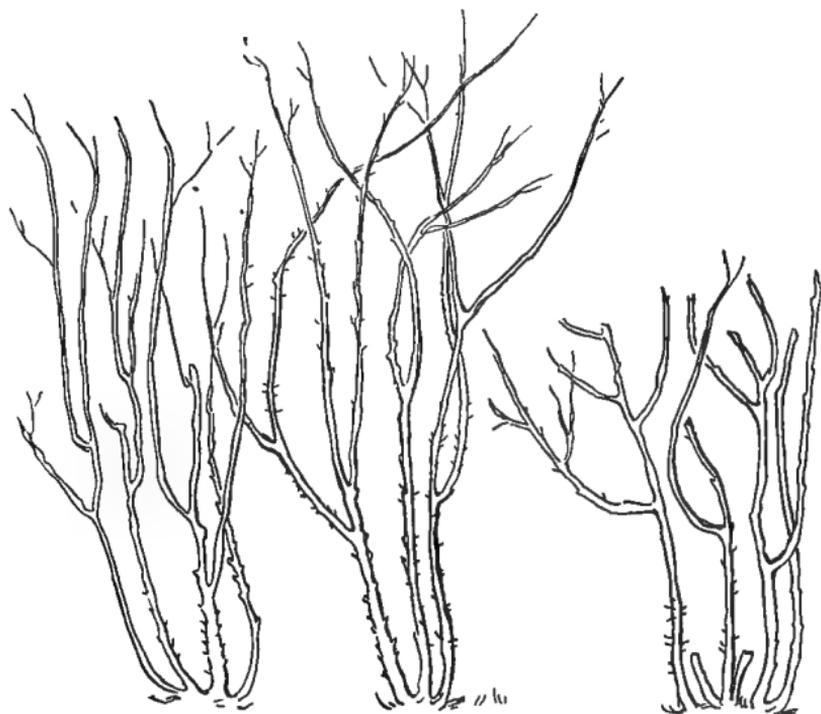


Fig. 70—Blackberry Canes Pruned and Unpruned

to keep up cultivation till the middle or the last of September, or until there has been a considerable fall of rain.

Pruning—Success in the growth of this crop will largely depend upon pruning. The first year, at planting, the canes are cut back to within five or six inches of the ground, and from each of these canes will grow,

the first summer, one or two canes, and perhaps one or two sprouts from the roots. These may be expected to bear a few berries the next season, but the fruit, being so near the ground, will not be worth the trouble of protecting from the spatter of dirt during heavy rains. The second summer more numerous new shoots, from three to six feet long, should be produced, that may be expected to bear a crop of considerable value the third season. After the canes begin to bear, the work of pruning consists in cutting out the old canes that have borne a crop, thinning out the small, weak shoots, and heading back the new ones so that, as seen in Figure 70, when they are loaded with leaves and fruit they will not be bent down to the ground.

The *old fruiting canes* are cut away by some growers in the late summer or early fall, but are left by most of them until the leisure days of winter. Some growers summer prune by heading back the new canes when they have made about three feet of growth, which causes a stocky and branching condition, as seen in Figure 70, while others let the canes grow to their full length and do not head back until after growth ceases in the fall, or until the winter or spring pruning. After many trials of the different methods and under many varying conditions and soils, we conclude that the single unbranched cane with numerous strong buds along it will give more fruit than the summer pruned canes with buds that mature later on the branched growth resulting from this summer pruning. Another objection to the branching canes is that with a heavy fall of wet snow or heavy accumulation of ice, the laterals are liable to be broken from the main canes. Pruning is often delayed by many until after the buds have begun to grow in the spring, that it may be definitely known what canes are winterkilled and what are not, otherwise many canes that perhaps were alive would be cut out,

while many dead ones would be left, if the pruning were done before growth began.

Training—While many growers do not give their blackberry plants any support, it is often much better to have some way of holding them up from the ground in cases of heavy foliage and crops of fruit during wet weather. A very good and inexpensive support consists in stretching No. 14 or 16 galvanized wire on each side of the row and holding it in place on a crosspiece from one to two feet, according to the width of the row of canes, nailed to stakes set at intervals of from

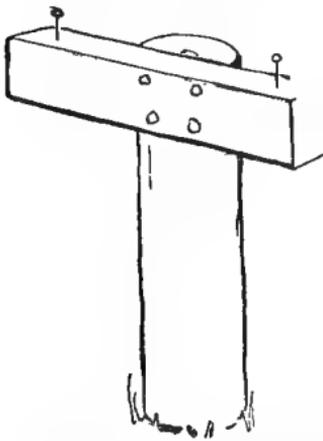


Fig. 71—Crosspiece in Blackberry Trellis

fifteen to thirty feet apart, as shown in Figure 71. At the end of each crosspiece is driven a strong nail to catch the wires. In putting up the trellis one wire is drawn on the ground close up to the row on each side and fastened to one end stake. It is then drawn as firmly as it can be done without breaking, and then fastened temporarily at the other end, and caught over the nail on each

stake, as seen in Figure 72. The wires are then drawn together in as many places between each stake as may be found necessary to bring the canes into an upright position, after which they may then be drawn more tightly and only a few canes will be found that will need tying. This support has the advantage that the wires can be quickly taken off the crosspiece, drawn along the middle of the row during the summer, again caught on the nail, thus all new canes brought into the row, so that cultivation may be carried on more comfortably and the fruit be more readily gathered. Only

a limited number of canes should be allowed to grow in the row or hill, and yet there should be enough to cover the ground well during the months of July and August. The larger the canes the fewer there need be. They should stand from six inches to one foot apart, and all small canes be treated as weeds.

Winter Protection—There is no variety of blackberries that we find hardy under all conditions, and in order to insure a crop every year, some means of protection must be provided. This is not generally

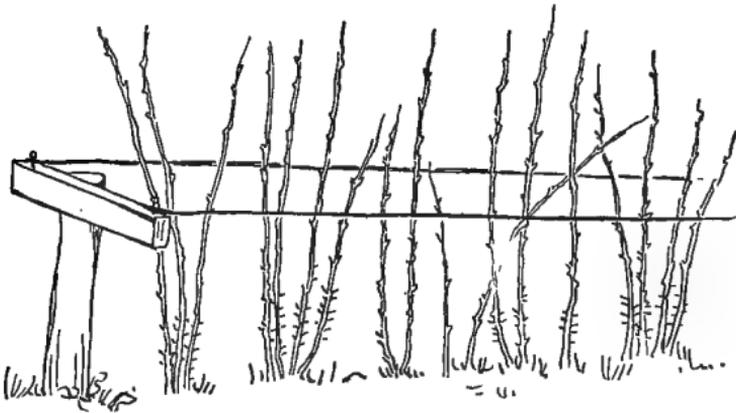


Fig. 72—Support for Blackberries and Raspberries

practiced, however, except in the extreme North, and in many cases the cost will be more than the gain. The method of protection most in use is covering with soil, as described under the raspberry.

VARIETIES

The number of varieties that are widely grown are but few, and these do not succeed over a very wide range, therefore the reader should consult his own experiment station or some successful grower in his own vicinity as to what to plant, and plant only those that are generally profitable.

Agawam—The earliest hardy variety for the North. Fruit of large size, fine quality and sweet as soon as black. It is rather soft, but firm enough to carry to a near market and keep for two or three days. Its large size, good color and earliness make it profitable. Succeeds best on heavy soil. In some places it has been attacked by the fall orange rust, but this is not a serious defect on strong land.

Snyder—A very hardy and upright growing variety that is largely grown at the North. In heavy soil the fruit is of large size and good color, but on light soil and where the bushes are not growing vigorously it is small and ripens unevenly in color, so that the berries have a mottled appearance. It also turns red after being put on the market, yet it is more largely grown in many localities than any other.

Taylor—The canes of this variety are much lighter in color than the two last, very upright and spiny in growth. The berries are long, black and of good quality, ripening about one week later than the Snyder.

Eldorado—This comparatively new variety is of the Snyder type, equally hardy, and as far as tested seems to be productive. The fruit is without the color defects of the latter.

Of varieties that are valuable in some localities may be mentioned the Ancient Briton, Erie, Ohmer, Early Harvest, Bangor, Mersereau, etc.

Picking and Marketing—If the fruit is to be shipped a long distance it should be picked every day, that all of the berries shall be firm. It should not be picked while wet if it can be avoided, and should be put into a cool place as soon as possible after picking. It is marketed in quart baskets, put into crates holding thirty-two quarts. The prices at which the fruit sells vary in the local market from five cents to twenty cents, and where shipped a long distance, from three cents

to fifteen cents, according to season and condition of fruit. The yield will vary from 1000 to 5000 quarts per acre.

THE DEWBERRY (*Rubus Canadensis*)

This species of blackberry is found growing wild from Newfoundland to Virginia and west to the Rocky mountains, and possesses many desirable qualities, but its habit of running on the ground and its liability to winter-kill in cultivated land have prevented its cultivation as a commercial crop. By giving proper treatment, however, it has been found to produce paying crops in some cases. If the canes are covered during the winter with a little coarse hay or straw and this material is then put under



Fig. 73—Lucretia Dewberry

them in the summer, conditions are produced that will result in a large crop of fruit, and as it ripens one or two weeks earlier than the high blackberry it brings a good price. Some growers of this fruit

have, in addition to the above treatment, trained the canes to stakes, by which means the fruit can be more easily gathered, but if fully exposed to the sunlight and air the berries are not as large as when shaded. For the best results, the land must be made very rich, so as to produce plants enough to shade the ground, and an abundance of moisture be present at the time of ripening.

Varieties—There are several varieties listed by nurserymen, but the only one that has been grown to any extent is the Lucretia. (Figure 73.) This is a vigorous grower, as hardy as any, and the fruit is of large size and excellent quality.

See methods of propagation in Chapter XVIII, and insects and fungous pests in Chapters XX and XXI.

XII

THE RASPBERRY

THE RED RASPBERRY (*Rubus strigosus*)

The red raspberry is the most popular of the bush fruits in most localities. It is found in a wild state from Labrador to the mountains of North Carolina and west to Missouri and Minnesota. Like the blackberry, it delights in a cool, moist location, but is found growing in almost every kind of soil. It is propagated in the same way as the blackberry and the general treatment in the field is the same. The varieties that are most cultivated are not quite as hardy as those of the blackberry, but, as the canes can be more easily protected from cold by covering, the crop is quite as certain to be profitable. As with the blackberry, large fruit cannot be expected unless the land is rich enough to produce a large growth of canes to shade the soil and keep it cool.

The distance for planting varies much with different growers and different methods. In a very rich soil the canes may grow so large and tall that if planted in rows six feet apart or in hills 4x6 feet, the ground will be well shaded, as seen in Figure 74, while in thin or poor soil the cover would not be obtained if set 3x5 feet. The trellis used for the support of the blackberry (Figure 72) is sometimes used; the canes are sometimes tied to stakes, though no support is used by most growers.

Pruning and Training—The methods of pruning and training outlined for the blackberry apply to this

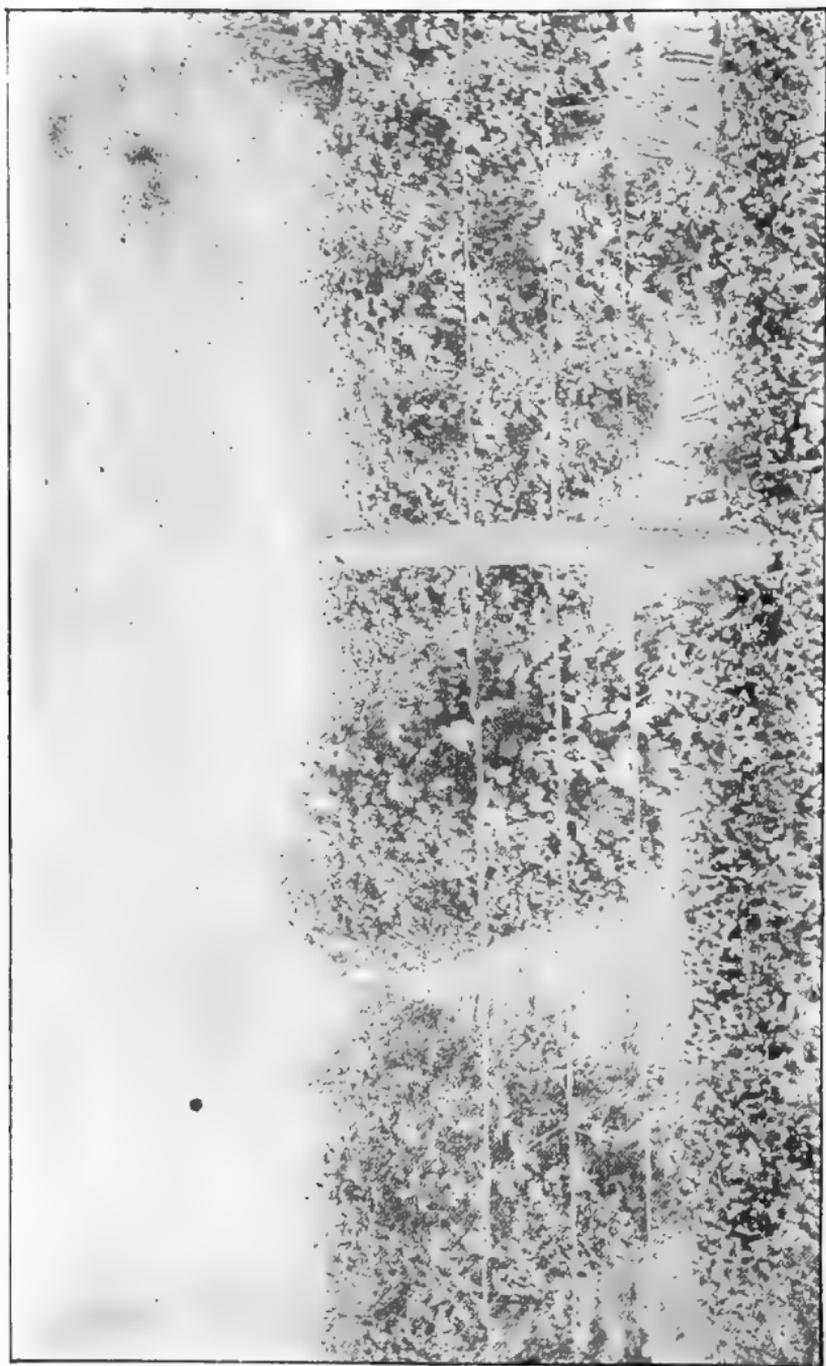


Fig. 74—Red Raspberry Field of N. J. Sharpless

fruit in almost every particular; it is better, however, to cut out the fruiting canes soon after the fruit has been gathered. Summer pruning is not as generally practiced as upon the blackberry, but some growers obtain good success by this practice.

Winter Protection—The canes being small and flexible, they can be laid over to the ground and covered with soil and thus injury from cold be prevented. The work of laying down the canes is very simple, three men being employed to the best advantage. One man with thick gloves on grasps a cluster of the canes growing together and with a strong pull bends them to the ground, as seen in Figure 75; the second and third man then throw on soil enough to hold the canes down.

Another cluster of canes is grasped and the process is repeated. The canes should be bent toward the south, so that the sun may not strike

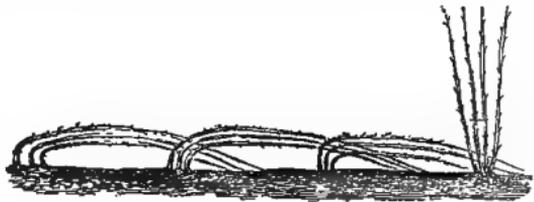


Fig. 75—Laying Down Red Raspberry Canes

them perpendicularly, which would cause them to start too early in the spring and injure them. After all are laid down the plow is run lightly on each side of the row, turning more soil over or against the canes. It is not necessary that the canes be entirely covered, as the moisture and warmth of the soil without covering is sufficient to keep them from injury. In the spring the canes should be taken up before growth begins, as the buds will start more quickly when near the ground than when standing upright. Deep working of the soil among both raspberries and blackberries should be avoided, as both are shallow rooted plants and when worked deep the roots are sometimes seriously injured and the growth of the plants is

checked. As with the blackberry, there are but a very few varieties that are of much value at the North, while at the South many of the so-called hardy varieties lose the foliage by burning during the summer.

VARIETIES

Cuthbert—While this variety is often winterkilled, where it does withstand the weather it yields a very large crop of large berries of good quality, and is very profitable. The berries are large, of a slightly conical form, and rather firm, so that it carries fairly well to market. In color it is not the best, but it sells well. It succeeds best in a rather moist soil.

King—A very early variety of bright red color and fine quality. In size it is not as large as the *Cuthbert*, but is one of the largest of the very early kinds, and one of the most productive. It is rather more hardy than the *Cuthbert*.

Loudon—A very stocky, hardy growing plant that in good soil produces large fruit of good quality. It requires a rather heavier and richer soil than other varieties. In a few cases it has been reported as being attacked by mildew when the fruit is about ripening in wet weather. This perhaps would be prevented by thorough spraying just as the blossom begins to open in the spring.

Other varieties that are of value in many localities are *Miller*, *Phoenix*, *Thompson's Pride* and *Early Prolific*.

MARKETING

The fruit is very soft and breaks down quickly in the market in hot weather. It should be marketed in pint boxes, and be picked every day. It should never be picked when wet if it can be avoided. As soon as gathered the fruit should be put into a cool, dry place,

and then shipped to market at the earliest possible moment. The prices obtained range from five to twenty cents per pint, according to quality and condition.

THE BLACKCAP RASPBERRY (*Rubus occidentalis*)

The blackcap raspberry, in its wild state known often as the thimbleberry, differs in the habit of growth, color of fruit and method of propagation very widely from the red raspberry. It grows in hills and throws up no suckers from the lateral roots, but sends up strong shoots from the center of the plant each year, and is propagated by the ends of these canes rooting, under favorable conditions, during the late summer and fall. Figure 76 shows the rooting of blackcap plants.

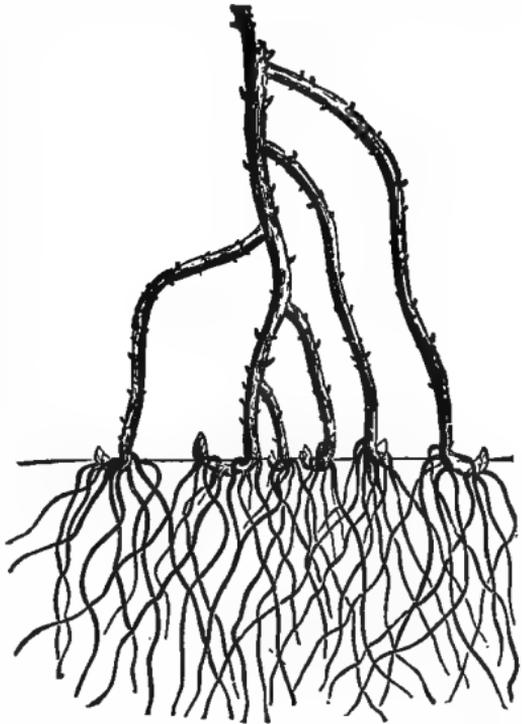


Fig. 76—Rooted Tips of Blackcap Canes

The fruit is black in color, less acid than the red varieties, but with larger and perhaps more numerous seeds. It was very popular some ten to fifteen years ago, but now in many markets there is little demand for it. It yields much larger crops than the red varieties, and comes to the market following the strawberry and just before the red raspberry.

Distance of Planting—They are planted from 4x5 to 5x6 feet, according to the vigor of the variety, and cultivation is generally done with the horse both ways. Blackcap plants should be planted only in the spring, as the roots are very soft and tender in the fall, and the slight pressure of the foot will bruise them, while in the spring they have become somewhat hardened. The end bud of the “tip” or plant should not be planted more than an inch or two below the surface of the soil, but the roots must be put down into the moist soil. Figure 61, illustrating the planting of the grapevine, shows a good way of planting the blackcap raspberry. Most failures in planting the blackcap raspberry come from putting the end bud so deep that it cannot break through the cover soil.

Pruning—The pruning required by the blackcap is about the same as for the blackberry, though it will stand more summer pruning and perhaps requires two or three “pinchings-in” to make the canes stand up without support. Some growers tie to stakes, while others use the trellis and do not attempt to cultivate both ways. The fruiting cane should be cut out as soon as the fruit has been gathered in order to allow full growth of the new canes.

Harvesting and Marketing—The fruit is picked in quart baskets and sent to market in twenty-four or thirty-two-quart crates. It carries well, but the prices are very low, ranging from five to ten cents per quart, yet the yield is generally large and the fruit ripens nearly all at one time, so that the cost of growing and picking is small and much profit may be expected where there is a demand for this fruit.

VARIETIES

Scarcely a variety is now grown that was in cultivation ten years ago, on account of disease and

deterioration of varieties, and it is advisable not to depend upon the old sorts too long but renew the plantations after four or five years with new kinds. Among the best at this time may be mentioned the

Palmer—This is an early variety of large size and good quality, of dark color and productive. One of the best for general cultivation.

Kansas—Perhaps more productive than the last, a little later in ripening, but especially valuable on account of its quality and hardiness.

Cumberland—One of the most vigorous and productive of the blackcaps. It is late and of good quality. It is recommended very highly wherever grown.

Other varieties that are grown in some localities are Souhegan, Gregg, Ohio, etc., etc.

THE PURPLECAP RASPBERRY (*Rubus neglectus*)

This group of raspberries has of late attracted much attention on account of their great vigor, productiveness and fine quality. In habit of growth they are like the blackcap, but with a fruit about half way between this and the red raspberry, and the flavor and texture of the latter. They are not as hardy as the other two species, yet the canes seldom kill down so close to the ground but that laterals bear more or less of a crop of fruit every year. The color of the fruit, a reddish-purple, is such that it does not sell readily, but it is especially valuable for home use. It is propagated in the same way as the blackcap, and should be treated in the same way as this species as to pruning and other particulars. Among the leading varieties are:

Shaffer—One of the oldest of this group, and one of the best in quality, but is not quite as hardy as some of the later kinds. The fruit is large in size but is too soft for distant market.

Columbian—A more vigorous plant than the last, and very productive, but the fruit is not of as good quality.

Numerous other varieties of this type have been introduced, but all of them are of the same dark red color that is not attractive in the market, and none of them should be planted largely for market unless there is a certainty of a demand for them.

YELLOW RASPBERRIES

Yellow varieties, or albinos, of the blackcap and the red raspberry, are listed in most nursery catalogs, but they are of little value in the market, as they are not attractive, and are not of as good quality as the red or black varieties. The best among the yellow raspberries is the Golden Queen or Yellow Cuthbert, which is supposed to be a white or albino form of the latter. When first picked it looks well, but it soon turns to a brown color. The yellowcap raspberry and the white blackberry are of no commercial value and are to be planted only as curiosities.

XIII

THE CURRANT AND GOOSEBERRY

THE CURRANT

(*Ribes rubrum*)

This is one of the most healthful fruits, is easily grown, and should be found in every garden. It is grown to a considerable extent for market, and where the soil is suited to its growth it is found profitable. It succeeds best in a deep, moist loam, but if too wet the plants are heaved out in the fall and spring by frost. To prevent this heaving out the land may be heavily mulched in the fall with coarse stable manure or straw, but this must be removed in the spring before the roots have made much growth, or it will cause the roots to grow so near the surface as to be injured by the cultivator, and the second winter the bushes will be likely to be tipped over by high winds. Shallow level cultivation will give the best results. The land must be kept rich with a heavy dressing of stable manure or fertilizer each year, using enough to produce a few strong new canes each season, for there is no fruit that runs small so quickly on old wood as the currant.

Planting—The distance most generally planted is 4x6 feet, and they may be planted either in the fall or the spring, as is most convenient. Some growers set the plants nearer than four feet in the row, and prune the bushes to three or four strong canes. The best plants are strong one-year cuttings, though many

growers prefer two-year-old plants. The currant comes into bearing the second or third year from planting, and with proper care should last for a generation at least.

Pruning—The pruning required consists in removing the old wood after it is three or four years old and allowing only a limited number of new canes to grow. These canes should be strong and upright, so as to carry the fruit high that it may not be spattered by heavy rains. If the canes are low it is well to mulch while the fruit is ripening, but this must be removed at the earliest possible time after the fruit has been harvested, so that the roots may not be drawn to the surface.

Harvesting and Marketing—Currants are marketed in quart baskets in the same manner as strawberries and raspberries. It is a fruit that will hang a long time on the bushes, especially if grown under the shade of trees or when the foliage is heavy, and is often in condition for marketing for more than a month. Some growers pack about ten pounds of this fruit in a common market basket and sell by the pound. The prices range from five cents to fifteen cents per quart, with an average of perhaps not far from eight to ten cents for the season. The yield under good conditions is often 200 bushels per acre and upwards.

VARIETIES

While there are many more or less distinct varieties, they are not so marked in their variations as most of the other fruits. It is often said that the difference in the varieties sold under different names is due to the treatment they receive as to soil and fertilizers, and this is in a measure true, yet there are several varieties that are marked enough to warrant distinct names. Among the best of these are:

Cherry (Figure 77)—Bush stocky and vigorous, producing short bunches of large berries of a decidedly acid quality. This variety is found badly mixed in most of the nurseries with the Versailles, a long bunched and more vigorous grower, but not as valuable a variety. For this reason the Cherry is not as desirable as some other varieties that have been kept free from mixtures.

Wilder—A variety resembling the Cherry somewhat, but with a longer bunch and rather more vigor of bush. The stock has been kept free from mixture and is free from the objection to the Cherry.

Fay's Prolific—This is perhaps the most planted of any variety. The bush is vigorous and very productive, the fruit is large, bunches longer than the Cherry, but of about the same degree of acidity. It is a more valuable variety than the latter from the fact that it is entirely free from mixtures.

Red Cross—Resembles the Wilder very much in bush and bunch of fruit, but perhaps a little more vigorous.

Pomona—A very vigorous and productive variety of especially good quality. Grown in a very rich soil the fruit is of good size and its immense productiveness and fine quality make it often one of the most profitable varieties in cultivation.

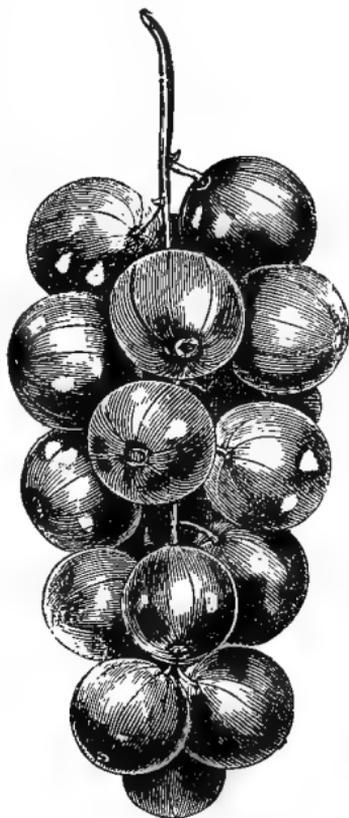


Fig. 77—Cherry Currant

White Imperial (Figure 78)—White varieties of this fruit are not very popular in the markets, but as the fruit is much less acid than the red kinds and of much better flavor, they should be planted for home use, and the markets be educated to know of their superior quality.

The above variety is the best in quality of this group, and is equally productive with the White Grape, which is also a good kind, but more acid than the latter.



Fig. 78—White Imperial Currant

The Black Currant (*Ribes nigrum*)—The black currant is a vigorous growing, hardy and productive fruit, but is not generally in demand except in markets where there are many English or German people. In its uncooked state it has a peculiar flavor that is not liked by Americans, but it makes a most delicious jelly or marmalade. It is easily grown, is free from all insect pests and fungous diseases that attack the red currant, and where there is a market for the fruit at reasonable prices it would be very profitable. If a hybrid

could be produced between this and the red currant, with improved quality and with the same hardiness and vigor, it would be a valuable addition to our hardy fruits. Among the best varieties are the Black English, Black Naples and Lee's Prolific, the latter perhaps being the best of the three.

The Golden Flowering Currant (Ribes aureum)—

This is the common flowering currant of the garden, an improved variety of which, known as Crandall's Improved, has been introduced, that produces a much larger berry of rather better quality than the original. The principal objection to this variety is the habit of not ripening all of its fruit at one time. Like the black currant, this is of little value for market, but offers some hope of value if it can be crossed with some other species and thus give us a hardy and vigorous strain that will be as free from disease and insects. Crandall's Improved is the only variety that is offered by nurserymen.

See Chapters XX and XXI for protection from insects and fungus pests.

THE GOOSEBERRY

EUROPEAN (*Ribes grossularia*)

AMERICAN (*Ribes oxycanthoides*)

The gooseberry is not a fruit that finds a ready sale in our markets in large quantities, but its consumption is increasing, and it should be more largely used. The season for marketing is longer than that of the currant, from the fact that it is sold in both the green and the ripe state. The conditions of growth are about the same as for the currant, but it will grow fairly well under the shade of trees. The land should be made rich with an abundance of potash and phosphoric acid and nitrogen enough to make a fair growth of wood. In pruning the same plan should be followed as with the currant, cutting out the old wood after it is more than three years old, and thinning out some of the small and weak new shoots, and thus forcing the growth into those shoots that are left. Among the varieties that

succeed over the largest area may be mentioned the following:

Columbus—Fruit large, greenish-yellow, and of good quality. Plant vigorous and very productive. One of the best.

Downing—A very hardy and productive variety, with light green fruit of medium size. It is especially valuable for cooking on account of its tender skin and good quality.

Red Jacket—One of the best of the red fruited varieties. Fruit of large size and good quality.

Industry—An English variety that under some conditions is very satisfactory. The fruit is of large size and good quality, but the bush generally makes a slow growth.

For insects and fungous diseases attacking the gooseberry, see Chapters XX and XXI.

XIV

THE STRAWBERRY

EUROPEAN (*Fragaria vesca*)

AMERICAN (*Fragaria Virginiana*)

In some particulars the strawberry is the most important fruit crop of the temperate zone. It rivals the apple in the time that we may have it in the market in a fresh condition. Coming from the extreme South soon after New Year, a supply is kept up from the South to the North and from the North to the South until August. It is the first fruit of the season, and will produce, under good conditions, more bushels per acre than the potato. It is of especial importance to the grower just starting into business because an income can be obtained within twelve to fourteen months after planting. It is a fruit that succeeds in a great variety of soils, but is most profitably grown on a deep, rich sandy loam. In a very dry time on light land the crop is often injured by drouth, but if a heavy coating of stable manure is turned under before setting and the land is well mulched before the fruit begins to ripen, a crop will be carried through a great deal of dry weather. The strawberry often yields a very heavy crop on reclaimed meadows, but under such conditions the tendency is to run to plant instead of fruit, and the fertilizers used should contain a large amount of potash and phosphoric acid. A very good fertilizer is made of three parts of good hard wood ashes to one of fine ground bone used at the rate of from one to two tons

per acre, according to the fertility already in the soil. A southern slope should be selected for an early crop and a northern one for a late crop.

FITTING THE LAND

It will be especially advantageous to work the soil deeply with a trench plow, fining it to a depth of fifteen to twenty inches, as the more deeply and finely it is worked the greater will be its capacity for resisting drouth. If it is plowed in the fall it will work up much earlier in the spring, and if stable manure is plowed under in the fall it will give better results than if turned under in the spring. Turf land that is to be devoted to the strawberry should be planted with some hoed crop like potatoes, etc., for one season, or it may be planted with some leguminous crop like cowpeas, soy beans, hairy vetch or clovers, that can be turned under to supply nitrogen, and also humus to hold the moisture. The surface of the land should be thoroughly fined with the harrow and drag or leveler and marked out carefully to rows of accurate distances, that the work of cultivating may be done quickly and easily. If the land is not well supplied with plant food any good fruit fertilizer may be scattered along the rows, to be worked in as the plants are set, the remainder to be worked in with a weeder or fine-toothed cultivator within a few days after planting.

TIME FOR PLANTING

While the strawberry may be planted at any time in the year when the ground will work, it is the practice of most of the large commercial growers to set only in the spring. This is done so that the plants may have plenty of time to make a full growth and mature an abundance of blossom buds, and the largest crops will be produced when planted at this time. Strong layers

or potted plants will yield a few very large berries, and it is from these plants that we often obtain the prize berries, but the cost of plants and the small crop obtained does not warrant the outlay if grown for profit.

PLANTS

Only plants with young, white roots should be used if the best results are expected, and plants taken from a bed grown for fruiting are not as good as those grown for plants alone when all of the plants are dug out by lifting the soil for several inches deep. In digging, the plants should be protected from the air as soon as

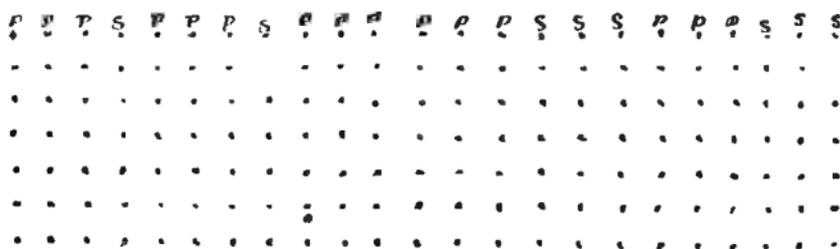


Fig. 79—
Method of Planting Perfect and Imperfect Varieties

Fig. 80—

out of the ground by putting into sacks or covered baskets and be taken to a cellar or moist shed, where the dead leaves and runners are all pulled off, the roots straightened out and placed in bunches, or if to be sent away tied in bundles of twenty-five or fifty each. Placed in this way for a little time, the roots are straight and easily planted. If plants are to be shipped for some distance the roots should be packed in damp moss with the leaves exposed to the air, when they will keep for a long time in good condition.

Staminate and Pistillate, or Perfect and Imperfect Plants—In selecting varieties it must be borne in mind that if those with pistils only are planted, little or

no fruit will be produced, but if every third or fifth row be of a variety that has perfect flowers, all will be fertilized and a good crop the result. The diagram, Figure 79, illustrates this planting; or if it is desired to secure plants of the staminate variety for planting unmixed, they may be planted as shown in Figure 80.

PLANTING

There are many different ways of putting the plants into the ground, the success of any one of which depends upon the roots being placed deeply in the moist soil,

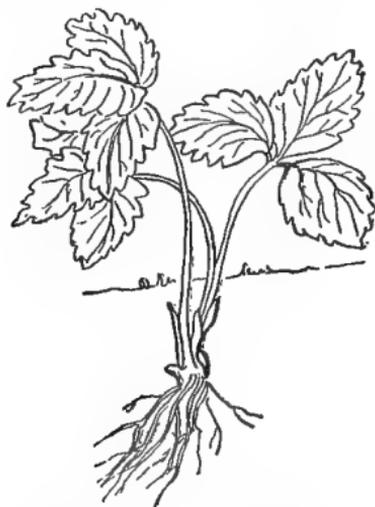


Fig. 81—Planted Too Deep



Fig. 82—Planted Too High

well spread out and the soil firmed closely in contact with them. A very good way to determine if the plants are properly set is to take hold of the leaf, and if the plant pulls out it is not planted firmly enough, while if the leaf breaks off it is properly firmed. The depth to plant is illustrated by the accompanying figures: Figure 81 shows a plant set too deep, Figure 82 one too shallow, and Figure 83 one set just right. Methods or systems of planting are very numerous, but only two or three will receive attention here.

The Hill System—This consists in setting the plants in rows of from three to three and one-half feet apart and one foot apart in the row, and keeping the runners cut off, when at the end of the season each plant has made a large number of crown buds, and under favorable conditions will produce a large number of berries. All of the runners are of course pulled or cut off as they start out. The only serious objection to this system is that with the roots continually starting out higher on the crown as new buds are formed, the plants at the end of the season are rather shallow rooted, and are liable to be heaved out during the winter unless a deep covering of mulch is placed around them. This method has the advantage that with the runners removed the ground about the plants can be kept clean very easily and cheaply, and the fruit easily mulched and harvested.

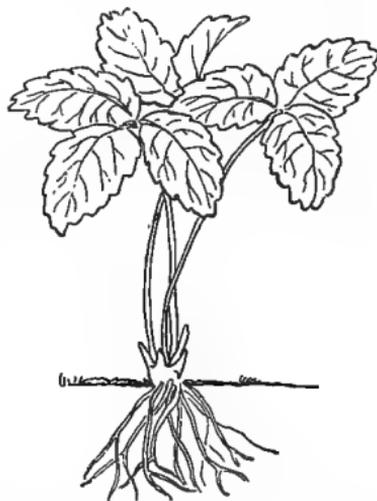


Fig. 83—Planted Just Right

The Hedge Row System (of Kellogg)—This is a modification of the hill system, the plants being set in rows two and one-half to three feet apart, and in



Fig. 84—The Hedge Row System

the rows about two feet, and treated the same way as in the hill system except that plants are allowed to fill in the space at eight to ten inches apart. This is in fact but a modified hill system in which the hills come

close together, thus serving to protect one another, and, the ground being well filled with roots, there is less danger of their being heaved out by frost. The same heavy covering during the winter will be needed as with the hill system, taking care not to cover the crowns too deeply. In Figure 84 the old plants are represented by o, the runners by x.

Wide Matted Row—This consists in setting the plants in rows three, four or five feet apart, according to the richness of the soil, and one to two feet in the



Fig. 85—Strawberry Field with Wide Matted Rows

rows, and letting the runners grow over the space between the rows from four to six inches apart, thus making beds of fruiting plants eighteen inches to three feet wide. Figure 85 shows strawberry field of A. A. Marshall of Fitchburg, Mass., set 4x5 feet, and run into beds three feet wide; irrigation pipes are seen in the foreground. Some growers place the runners the proper distance apart as they grow, and others let the bed be covered in a natural way and then dig out the surplus plants in the fall, the last of August or early September. The first plan, however, is the better, as then each

plant has an abundance of room to fully mature and will give a much larger crop of fruit with larger berries than the small plants of the second method.

The Matted Row System—Probably more berries are grown by this system than by any other, and perhaps it requires less labor, yet the size of the fruit will be smaller and, in time of drouth, the ground between the plants not being stirred easily, the roots will be near the surface, and therefore more injured. One advantage that the wide matted and the matted row have over the hill and the hedge row system is that the roots are running through all of the soil, holding it together, and the plants are not as likely to be thrown out by frost. Whatever the system, the crop will depend more upon whether the land is rich in plant food and has an abundant supply of moisture in it at the time the fruit is maturing than anything else.

CULTIVATION

If the plants have been set in regular lines both ways, most of the work of cultivation can be done by the horse cultivator or the small hand cultivators, of which there are many different kinds. All of the runners are generally cut off until the plants get strong, or up to about the first of July, after which such as are needed are allowed to grow. After the runners begin to grow, if in the matted row, great care must be taken not to disturb them after they have become rooted. If the plants are grown by the hedge row or in the hill system, the runners being cut off before they are rooted, they will not interfere with the use of the hand or wheel hoe, and better work can be done, and be done more cheaply. The land should be kept fine and mellow to the depth of two or three inches, and the drier the time the more frequently the soil should be cultivated.

If the plants are not making the growth that is desired, more fertilizer should be applied about July 1, and again early in September. Chemical fertilizers should not be applied when the leaves are wet, but, if dry, can be applied safely unless used in very large quantity. If it should adhere to the leaves it can be easily brushed off with a broom or by drawing a bush over the row. If large quantities of quickly soluble fertilizer like nitrate of soda, sulphate of ammonia or the potash salts be used, it must be scattered at a little distance from the plants and the soil must be frequently stirred to keep it from burning the leaves as it is deposited on the surface of the soil by evaporation.

During the first season the young plants should be sprayed two or three times to keep the rust fungus from gaining a hold. In soils that are infested with the plants known as the chickweeds, of which there are two troublesome species, which grow during very cold weather, the land must be cultivated until the ground freezes, and also in the spring the small chickweed plants must be weeded out. Under this condition the cost of cultivation is much increased and the crop will not be as large as in land free from this pest.

IRRIGATION

One of the great needs in strawberry growing is an abundance of water as the fruit is ripening, and even if the soil is naturally moist and we have done all that could be done to preserve what there is in it, there often comes a season when a crop would be largely benefited by the use of water on the surface. Of the profits resulting from the establishment of an artificial supply of water we have no figures, but that must depend largely upon the cost of the water and its application. If one is situated so that water can be carried to the

strawberry field by gravity in open ditches or cheap troughs, the cost need be but small, while if to be carried a long distance in pipes and be raised to a considerable height it would be very much greater. There are two methods of applying water most generally employed, the ditch method and the sprinkling method.

The Ditch Method—This is the simplest and most used. The water is let into ditches at the upper part of the field where it can run down between the rows as



Fig. 86—Ditch Method of Irrigation

shown in Figure 86. If the fall is so great that the soil will be washed, hay or straw is trodden into the ditch, when it will run more slowly and spread out better among the plants. If the land is nearly level, the water must be directed by means of frequent small ditches and be carried to different parts of the field by means of pipes or troughs. Cheap hose may be made of cotton cloth for this purpose that will last a long time if taken up and thoroughly dried after being used.

The Sprinkling Method—This method is not so much in use as the last, but possesses some merits over it, as the water is applied in the most natural manner and over the whole surface, and when properly applied has generally given remarkable results. It can, however, be applied only where there is a good head or force to distribute in a fine spray to considerable distance. The best time for applying water is an important matter. It has been found that the same amount of water applied at night will do much more good than if applied in the morning, that there is less loss by evaporation, and the ground is less hardened. If water is applied, enough should be used to wet down to the roots fully, or little or no benefit will result, for if only the surface soil is wet the roots work up to the surface and continued dry weather will be more destructive than if no water were used.

WINTER PROTECTION

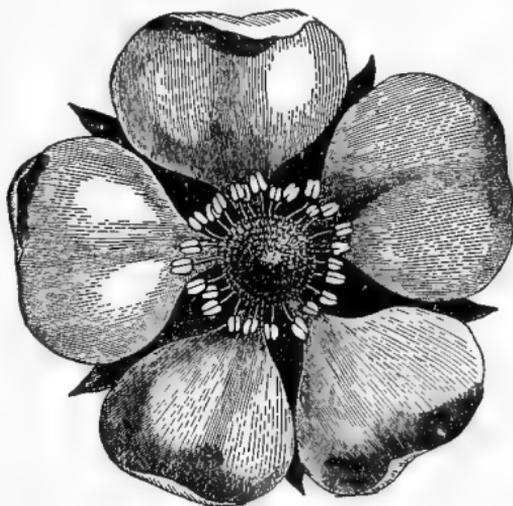
While the strawberry is perfectly hardy, growing, as it does, at the extreme North, if the ground is not covered with snow from the time it is frozen in the fall till settled weather comes on in the spring, the plants will be heaved out, and for this reason it is the practice of all Northern growers to cover the strawberry fields as soon as the ground is frozen in the fall. If deeply covered before the ground is frozen the plants are often smothered, and all of the old leaves destroyed, and, while this does not ruin the crop, yet the plants do not start with the vigor that they would if these leaves were uninjured.

Mulching Material—Various materials are used for this purpose, among the best of which are pine needles, rye straw, oat straw, meadow or sedge hay, corn stover, buckwheat straw, soy beans, etc., etc.; of these perhaps

the best are the pine needles, clean rye or oat straw and soy bean straw. But whatever is used, it should be free from weed seeds, as nothing reduces the yield of a plantation more certainly than numerous small plants growing about them and carrying off moisture and plant food from the land.

In the spring the mulch is drawn off from the crown of the plants as soon as growth has begun, and after the plants have begun to bloom it is best to draw the mulch closely under them so as to keep the fruit clean and the crown roots shaded.

Some growers remove the mulch in the early spring, clean out all small weeds, stir the surface soil and then put it back close up about the plants again. This insures a clean bed and helps to retain the soil moisture that in light land is so often deficient.



**Fig. 87—Staminate or "Perfect"
Strawberry Flower**

VARIETIES

Among the hundreds of varieties that are in cultivation, there are many that succeed well in one place that do not do well in others, and the grower will have to depend largely upon trial of several sorts and the testimony of those who are successful in growing this fruit in his own locality. It may be said that no variety will succeed long in one locality. It is a fact that no varieties are generally grown now that were

popular ten years ago, and some do not retain their vigor even that time. It is therefore the part of wisdom to have a trial bed of the most promising new kinds in order to know what is best adapted to each individual locality. The local experiment station will be the first to try all promising kinds, the best of which each grower should give a trial. Varieties are either *staminate*, or perfect (Figure 87), those having both stamens and pistils, and will bear fruit if planted alone, or *pistillate* (Figure 88), the flowers having only pistils, and must be

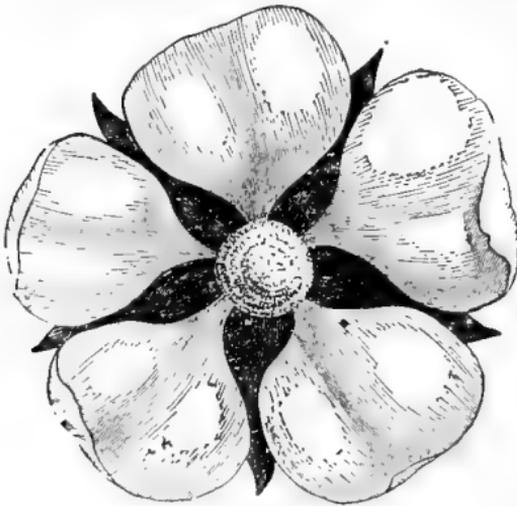


Fig. 88—Pistillate or "Imperfect"
Strawberry Flower

planted near some staminate variety to produce fruit. The pistillate flowered varieties are more productive, as a general rule, than are the staminate kind, due probably to the strain on the flower of the latter to produce pollen. Among the varieties that are most grown are:

Clyde—A staminate variety of great vigor of plant and freedom from disease that does well on rather light land, when the plants are not too close together, but on heavy soil, or if the plants are very close together, the color is poor and the berry is soft. It requires a rich soil to make it carry out to perfection the large crop of berries that it will set.

Haverland—A pistillate variety that has made the largest record for productiveness of any now in cultivation. The fruit is medium to large, and is borne on

long and slender stalks that do not stand up under the weight of its heavy crop of fruit. This fault, together with the small size of the berries under ordinary conditions, places it in the list of only medium value.

Glen Mary—A perfect flowered variety of vigorous growth and good quality. The fruit is large but somewhat irregular in form. The flowers do not produce as much pollen as some other varieties, and if planted as a fertilizer for pistillate sorts it should be planted in every third or fourth row.

Sample—One of the most productive pistillate varieties, producing berries of large size and good quality. For general purposes it has proved one of the most profitable. It is medium in season and often carries its fruit very late.

Brandywine—One of the most vigorous perfect flowered varieties, producing berries of large size, firm and of the best of quality. It is a rather late variety, and under most conditions is productive, but under others it is reported as not productive. It is a good pollenizer for late varieties.

Other varieties that are of value under some conditions are Bubach, Senator Dunlap, Nick Ohmer, Seaford, Gandy, Warfield, Excelsior, Marshall, etc., etc.

MARKETING

The strawberry is a very perishable fruit, and must be handled with the greatest skill to give the best results. If possible the picking should be done early in the morning or the latter part of the day, and after picking at any time the fruit should be taken to some cool place where there is not too much of a draft of air to dry them too rapidly. It is not advisable to put them on the ice, if it can be avoided, on account of the condensed moisture that will collect on the berries when

brought from the cold storage, yet if properly exposed to cool, dry air for a little time after being taken from cold storage they will not be injured by this treatment.

Package—The quart basket is almost universally used, packed in a bushel (thirty-two-quart), twenty-four-quart, and sixteen-quart crate or carrier. Most of the thirty-two-quart crates are now considered as gift packages, and are not returned to the shipper, but are sold to local growers near the markets for ten cents each. If the grower delivers his fruit to the retailer he may have his crates reserved, and thus only a small number will be needed to market a large crop of berries. One of the best packages for carrying and displaying the fruit is the "Marshall" carrier, Figure 89, in which twenty-four quarts of berries are packed, and it has the advantage that all of the fruit is exposed to the view of the purchaser without removing any partitions, and if well put up will attract customers by the large amount of fruit exposed in one mass. This figure shows thirty quarts, with only from eight to fifteen berries in a basket. Soiled baskets should never be used, as the fruit shows to better advantage in new baskets, and the new ones are as cheap as old baskets collected from the consumers.

Picking—This is one of the greatest problems of the strawberry grower. Some employ boys, some men and some women. The first are the most difficult to manage, and do the work in the most uncertain way. Girls and women do their work well, are easily managed, but are rather slow in many cases. Quick, active young men make good pickers; the cost per quart, however, is much greater, but they can often be brought into the field in times of an emergency when other help is not available. Numerous methods of recording the number of boxes picked by the different pickers have been devised, perhaps one of the best of which is the card system,

where the picker keeps his record card, and when fruit has been picked the record is made by punching out the proper number of boxes. At the end of each day or week, as the case may be, the first card is taken up and the total number is punched on another card, which is kept by the picker until payment is made. In picking the fruit, each berry should be picked by the stem, and not be pulled off, and for a local market should be allowed to become fully ripe before being picked.

Sorting and Packing—It will be found very difficult to find pickers in many places who will sort the fruit as picked so that it will be most satisfactory for a fancy market, and it is therefore the practice of most growers of fancy fruit to have it sorted and packed in a shed or house near the strawberry field. All that is done often, where the pickers are reliable, is to sort over and pack the top layer of berries, picking out any defective berries and replacing them with sound ones, and turning the top layer so as to present the best appearance. Others turn out all of the berries in a box and sort and pack all of the fruit. This must be done very carefully, or the berries will be so crushed that they will not stand up long after they reach the market. If, however, this is properly done, the fruit will keep longer, for all of the overripe berries having been removed, decay will be less rapid, and much better prices be obtained.

Many growers make two sorts, those that are perfect in every way and of large size, and those of small size and possibly with some other defect. The second grades are sold for canning, making syrups, etc., and often will sell at as good prices as the average run of berries not sorted, while the fancy berries bring high prices and sell the seconds.

The common bushel crate or carrier is the most used for shipping to near markets, but when shipped long distances those holding forty-eight or sixty-four



Fig. 89—The Marshall Strawberry Carrier

quarts are largely in use. The Marshall carrier (Figure 89), holding twenty-four quarts, is especially adapted to fancy berries, as all the fruit can be seen at once upon taking off the cover, and presents the most attractive appearance possible.

For insects and fungous pests, see Chapters XX and XXI.

THE CRANBERRY*(Vaccinium oxycoccus)*

This delicious fruit is distributed over almost the entire country and under favorable conditions produces large and profitable crops. The entire crop of the country for a single season has been over 808,000 bushels, of which Massachusetts produced 432,000 bushels, New Jersey 175,000 bushels, Wisconsin 101,000 bushels. It can only be profitably grown in a soil nearly saturated with water, bogs and wet meadows being utilized for this crop. The conditions for success are wet, boggy land, with an abundant supply of water, so that the "bog" may be flooded in a short time in case of a late frost in the spring when the plants are in bloom, during the summer to prevent injury from the "leaf roller" insect, and in the fall to protect from frost before the fruit is gathered. Water should be in sufficient supply also to keep the bog flowed all winter.

PREPARATION OF THE BOG

All growth of trees, bushes, grasses or other plants must be removed from the surface and the bog made level by grading. Ditches should be made at intervals so that the water may set back into them to hasten flooding, and to quickly drain away the water after flooding. The level of the water in the ditches for the best results is from ten to twelve inches below the surface

at all times. After all growth has been removed from the surface and the land roughly graded perfectly level, it should be made as fine and mellow as possible, after which a covering of clean, sharp sand from three to six inches deep is spread evenly over it. The land is then ready for the plants.

Setting the Plants—The plants, or rather cuttings, are the end runners of established bogs, twelve to fifteen inches long, cut from the edges of the rows or paths, or often taken from some more solid part of the bed. If possible these cuttings should be taken from some spot where the plants are producing large crops of large, finely colored berries. The bog is marked off in from nine to eighteen-inch squares, and the cuttings, three or four in a bunch, are forced through the sand into the fine soil below with a blunt wooden dibble or paddle, and the sand pressed firmly about them. In planting the cuttings, care should be taken not to break off the lower end of them in forcing through the sand. After planting no weeds should be allowed to grow, all that appear being pulled out by hand. It is not the general practice of growers to use the hand hoe unless obliged to do so, and a good bog is so soft that it would not hold up a horse. Sometimes when the land is especially poor, a light dressing of any good commercial fruit fertilizer just before the sand is put on or after the plantation has been in bearing several years, will produce marvelous results. Well prepared bogs will yield good crops the third year, and after this nearly a full crop every year, unless insects or frosts destroy them. The yield of a good bog under favorable conditions has often been between one hundred and two hundred bushels per acre. The average of all bogs in the Cape Cod section in a single season has been one hundred and seventeen bushels; that of the country between eighty and ninety bushels.

HARVESTING

This crop must be harvested before fall frosts unless water facilities are such that the bog can be flooded at ten or twelve hours' notice. The crop is gathered by hand picking and by means of the rake or scoop. With the latter 400 to 450 quarts per day are picked by the most active pickers, while hand pickers will hardly pick more than 200 quarts unless the crop is large and thick.

Storing and Marketing—The cranberry is a fruit that keeps well in an airy, cool, but not too dry place, the temperature never going down to thirty-two degrees.

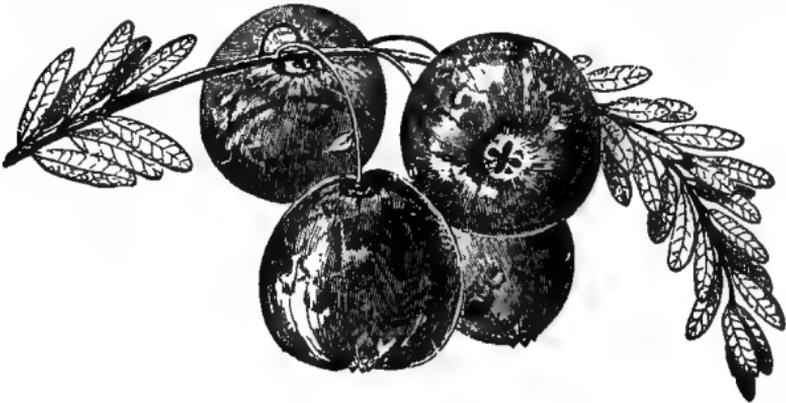


Fig. 90—The Large Bell Cranberry

For home use, if put in fruit jars and covered with cold water, the fruit will keep until May or June if placed in a moderately cool cellar. It is most largely sold in barrels of about 100 quarts. Prices obtained range from \$3.50 to \$15 per barrel, an average of about \$7. Some markets demand the fruit in crates, and many dealers buy in barrels and repack in crates or boxes.

RENEWING A CRANBERRY BOG

After ten or fifteen years of fruiting many bogs begin to fail, and are renewed by resurfacing, or with

little expense by again covering with sand. A light covering of sand every five years would probably give satisfactory results. It is found in some cases that a light dressing of superphosphate will give the plants a vigorous start and greatly improve the yield and quality of the fruit.

INJURIOUS INSECTS

Two insects have become somewhat of a menace to the cranberry crop—the “leaf roller” and the berry moth. The former is prevented from doing serious damage by flowing for a few days or a week soon after they begin to work seriously. The berry moth is more or less destroyed by the use of arsenate of lead sprayed upon the plants and fruit while quite small. For further particulars as to controlling insect pests, see bulletins of Massachusetts and New Jersey experiment stations.

Many varieties of cranberries are now being grown. They may be divided into three groups, i. e., the Bell, Olive and Bugle types. Figure 90 shows the large Bell variety.

THE BLUEBERRY AND HUCKLEBERRY

BLUEBERRY { (*Vaccinium Canadense*)
 (*Vaccinium corymbosum*)
 (*Vaccinium vacillans*)

HUCKLEBERRY (*Gaylussacia resinosa*)

While these berries are found in our markets in considerable quantities in almost every section of the country, the supply comes wholly from bushes grown in the pastures, fields and swamps. Many attempts have been made to cultivate it in garden and field, but with poor or indifferent success. Like most plants growing naturally on land with a good soil cover, they become weakened and soon fail if exposed to much sun and air about the roots and lower branches. In the pastures and meadows the ground is shaded by grass and undergrowth, and the stems of the bushes by close growing foliage about them, and to insure even a moderate growth these conditions must be provided in the garden. The natural soil cover of the meadows may be replaced by leaves, old hay or even by a close planting and a mulch of fine soil, and if the soil is naturally a little moist or the season cool and moist, a fair growth will be made. An acid soil seems to be a necessity in growing this fruit.

TRANSPLANTING

Plants that will come up with a bog or clump of roots should be selected, and only those producing the

largest berries taken. Cut back severely and set close together about as deep as they stood in the pasture, tramping the soil firmly about the roots. A mulch should be placed around the roots and if very dry a liberal amount of water be poured into the holes to settle the soil about the roots before the mulch is put on. Additional mulch or manure should be placed about them when it becomes thin. Another method of treatment which is more generally satisfactory is to clear a blueberry or huckleberry lot of everything but good, strong bushes of these fruits. Divide into three lots and early in the spring spread manure or fertilizer among them. Then mow the tops of one plot close to the ground. The two plots not cut down will produce a large crop of fruit if the season is favorable, and the new canes on the other plot will make a strong growth that for the next two years will yield very large and fine fruit. The second spring plot No. 2 is cut down, and No. 3 and No. 1 bear fruit. After this three years' rotation two plots of bushes will be producing vigorous canes that will yield an abundance of fine fruit, if, in addition to cutting back, an occasional dressing of manure or fertilizer be applied.

Many brush pastures, by a little thinning out of "robber" plants, treated in the above manner, may be made a source of considerable income. Women and children can generally be found who will pick the berries on shares "if the picking is good," and the fruit be gathered when it will bring the best prices.

SUB-TROPICAL FRUITS

THE ORANGE

THE SOUR ORANGE (*Citrus aurantium*)

THE SWEET ORANGE (*Citrus aurantium dulcis*)

THE MANDARIN ORANGE (*Citrus aurantium nobilis*)

THE POMELO, GRAPE FRUIT, ETC. (*Citrus decumana*)

THE HARDY ORANGE (*Citrus trifoliata*)

THE LEMON (*Citrus limonum*)

Next to the apple the orange is by far the most important fruit in the United States, although it can be grown only in special localities. It is to the Southern sections of the country what the apple is to the Northern sections. It is a good shipping fruit, even better than the apple, and its beautiful color and delicious flavor make it a close rival. Orange growers are generally very enthusiastic in their work, and well they should be, for the beautiful tree with its bright green leaves and wonderfully fragrant white flowers, followed by its golden fruit, makes it an object for admiration, and when the work is carried on in a systematic, business-like way, except when injured by frost, orange growing is profitable.

While easily grown, the trees must have constant care to keep them growing vigorously, and to protect them from insect pests, and in some sections to protect them from frosts.

PLANTING THE ORCHARD

Orchards are started in two ways: (1) by planting trees already budded with desirable varieties, and (2) by planting seedlings (stocks) in the orchard and budding them after one or two years' growth. The best stock for the extreme South is the sour orange, and for Northern sections the hardy orange (*C. trifoliata*). In a general way the preparation of the soil, pruning of the tree before planting, etc., are the same as for the apple or peach. In planting an orange orchard or grove, local conditions of soil, exposure and markets must be very carefully studied. In different sections the distance varies much, according to the variety grown, the method of pruning and richness of soil, so that no rule can be given. Enough room should be given for the full development of the trees.

Training the Trees—A round, low-headed, compact tree with an abundance of foliage is the ideal condition. If possible give the tree a slightly conical form by keeping the leader or central shoot a little stronger than the lateral branches. In other words, don't let the laterals outgrow the leader. The low head has many advantages. All the work of trimming, thinning, spraying, harvesting and protecting from frosts can be more cheaply and better done on low trees, and less fruit will be blown off in case of cyclones or heavy storms.

Cultivation—As with other orchard fruits, the aim should be to produce a vigorous and healthy tree. If the soil is naturally rich and drouth resistant, less cultivation and less fertilizing material will be needed. If the soil is very thin, even with a large application of plant food, very frequent cultivation must be practiced. Where the supply of water for irrigation is abundant, less plant food and less stirring of the soil

will be needed, but very few good crops are grown, even under these conditions, without considerable cultivation. A very cheap source of organic matter (humus) in the



Fig. 91—Orange Tree in Tub

soil may be produced by sowing cover crops of clover, vetch or other leguminous crops about the time the trees are maturing their main annual growth. If there

is any one season when drouth is more likely to occur than another, care must be taken that the cover crop is not making its greatest growth at this time, as with the great loss of plant food and moisture in this way at such a time the trees are likely to be seriously injured.

Protection from Frost—To secure fruit and trees from injury by frost, provisions must be made for their protection, which should be ready at all times for use at shortest notice. When the trees are grown close to the ground coarse hay, reeds, brush or other similar material can be quickly piled up around the trunks and in among the branches at but little expense. Such material could no doubt be obtained near at hand or be grown especially for this purpose. After danger is past it could be used for bedding or for mulch. Folding covers, lined with paper, could be employed over small trees, which, if kept stored in a dry, airy place, would last a lifetime, and often in a single night save the results of years of labor and much invested capital. Other methods of protection may also be suggested, all of which should be investigated before adopting any of them. Figure 91 shows a sweet Florida orange tree grown in a tub, by Mr. E. H. Wrenn, Mt. Airy, N. C. It is eight and one-half feet high and its top ten feet in diameter. In winter it is kept in a brick store, heated with a stove, and in summer out of doors. It bore over 200 oranges the past season.

VARIETIES

As with all other kinds of fruit, the varieties of oranges are very numerous, and new and improved kinds are constantly coming to notice. The work being done by the Department of Agriculture at Washington in searching every orange growing section

of the world for choice varieties to be tested in this country will no doubt lead to a rapid improvement, and each grower must follow this investigation and be ready to adopt those that prove the best. Among the varieties now largely grown may be mentioned Boone's Early, Satsuma, Homosassa, Jaffa, Maltese Blond, Pineapple, Washington Navel, etc.

POMELO (GRAPE FRUIT)

This fruit is practically a large orange with a thick skin and an acid, slightly bitter pulp. It requires nearly the same treatment as the orange. A few varieties to be recommended are Duncan, Royal, Triumph, etc.

KUMQUAT (GOLD ORANGE)

A most beautiful ornamental tree producing very small fruit in immense numbers. The rind as well as the pulp is edible, the fruit being especially valuable for preserving in the whole state. The great beauty of the trees, their great productiveness, and the quality of the fruit, especially when preserved, should make this fruit very popular in the near future.

THE FIG

(*Ficus carica*)

While almost a tropical fruit, the fig, by careful manipulation and winter covering, may be made to bear fruit as far north as New England. In the South it must be grown rather slowly after it reaches fruiting age, as a rapid growth tends to the formation of leaf buds rather than fruit buds. The soil should not be cultivated deeply, as the roots run near the surface.

The strong new shoots that outgrow their neighbors should be pinched back when they have reached the desired length. This is much better than to allow long shoots to grow without checking and finally cutting off large shoots at the end of the season.

At the North small trees may be grown in tubs or boxes, putting them in a warm, sunny place in summer, and storing in a dry, warm cellar or pit during the winter. They are sometimes even grown in the garden if planted in a warm, dry soil in the summer, and should be covered deeply in the winter with soil so that they will not freeze, but the tub or box system is much the best. Among the best varieties are the



Fig. 92—Bearing Branch of the Fig Tree

Black Ischia, Brunswick and White Adriatic. A bearing branch of the fig tree is seen in Figure 92.

THE PERSIMMON

AMERICAN (*Diospyros Virginiana*),

JAPANESE (*Diospyros Kaki*)

This fruit, a native of the Middle and Southern States, is one that should be given more attention. When ripe the fruit is beautiful, of good quality, and is produced in large quantities. Few trees are planted in orchards, though some of the new varieties would war-

rant their extensive cultivation. When grown in a too rich soil the trees are often destroyed by cold, therefore at the North it is best to plant in a rather light soil. The fruit of most varieties is not edible until the decaying process almost sets in, when they become very delicious. The Japanese persimmons are much superior in size and quality, and are becoming of some commercial importance in the South. They are not hardy north of Washington. It is grafted upon the native stock, which may tend to make it more hardy. An effort is being made to produce new varieties of the native species, as well as from crosses with the Japanese, and we look for a great improvement in this fruit. Among the best varieties now in cultivation are Hyakume, Taber's No. 129, Yeddo, etc., etc.

The cultivation required for success is not unlike that to be given to the Japanese plum or peach, though it is not as easily transplanted as either of the above.

THE LOQUAT

(*Eriobotrya Japonica*)

The Japanese medlar or Japanese plum, as it is sometimes called, is a delicious fruit about the size of the Reine Claude plum, but of a brighter color. The fruit ripens in March and April, and while the trees are hardy as far north as the Middle South, its fruit matures only as far north as the middle of Florida. The leaves are large, dark green above, with a whitish down upon the under side, making it a decidedly ornamental tree. In Southern Florida it is being somewhat extensively planted, and the fruit often finds its way into nearby markets, but is little seen in the Northern markets. Besides its being used in a fresh state, eaten from the hand, it is preserved, having something of the flavor of sweet cherries.

XVIII

THE PROPAGATION OF FRUIT TREES AND PLANTS

While it may not generally be advisable for the fruit grower to attempt to grow trees for his own planting, in many cases it may be best and profitable to do so, and it certainly will be of great advantage to all to know how they are propagated, to enable them to judge of the value of the trees they buy, and if one can have well grown ones on his own place, ready to transplant at just the right time, and in a perfectly fresh condition, they will be much more sure to do well than the average nursery trees.

In this chapter I shall attempt to give only the practice of the most reliable nurseries, so illustrated that with a little practice the intelligent and energetic man may grow good trees for his own planting, and perhaps supply some to his neighbors. The boys and girls should become interested in this work, in which they might soon become skillful, and perhaps lay the foundation for the establishment of the nursery business in sections not now supplied with home grown trees.

THE PROPAGATION OF THE APPLE

None of the varieties of the apple reproduce the same kind from seed. Thus there has never been but one Baldwin apple tree grown from seed; all of the trees of this variety, except the first one, that came from seed, have been grown by inserting buds or cions

from this tree, or others like it, into other seedling stocks. The stocks most in use for this purpose are those imported from France or other European countries, where the people have gained great skill, and where the price of labor is much less than in this country, though a few of our nurserymen grow good native stocks, either from imported seed or that from strong natural or unbudded trees.

If only a small number of seedlings are needed, the seed can be obtained from strong trees of natural fruit, separating it from the pulp or planting the whole apples, first cutting them into quarters and planting in the fall before the ground freezes. If the seed is cleaned it may be planted in the fall, where the mice or squirrels will not destroy it, or it may be kept over in dry sand or fine dry loamy soil buried in the ground where there is no standing water, care being taken that the sand does not become wet. In the spring the seed should be sown as soon as the soil will work fine and mellow.

The Seedbed—Any rather moist, rich loam will grow good apple seedlings if it is properly prepared. It should be deeply worked with the plow or spade and well enriched with partly decomposed stable manure, or with fine ground bone and potash at the rate of 1500 pounds of the former to 500 pounds of the latter per acre. After the seedbed has been thoroughly fitted the seed should be sown in drills fifteen inches apart if to be cultivated by hand, or thirty inches if it is to be done by the horse, and be covered about one-half inch deep. After the seedlings are an inch or two high they should be thinned to about two inches apart, weeding out all weak or defective seedlings, and during the season cultivate thoroughly at least once a week. If in July the seedlings are not making the growth they ought, some quick acting fertilizer should be scattered along the row and cultivated in.

Digging the Seedlings—In the fall, before the ground freezes, the seedlings, which should have made a growth of from one to two feet, must be carefully dug and heeled-in, i. e., packed in trenches of light soil, where there will be no standing water, with the soil carefully worked in among the roots and nearly all of the top covered with soil, and as very cold weather comes on a covering of straw or hay be put on to keep the ground from deep freezing. If the seedlings are to be root grafted, they are washed after digging and packed in sphagnum moss or sawdust and put into a very cool cellar.

Root Grafting—Much has been said pro and con as to the value of the root-grafted apple tree as compared with the budded tree, and it may be said that both are good when the work is properly done,

and the writer believes that a root graft, skillfully made in December or January, and carefully stored in a cool cellar in moist sand or light soil until the last of April and then planted in a rich soil, will make as good a tree as most budded stocks, but, for the amateur, budding will give the best results.

The root graft is made by taking the seedling and first trimming off the lateral roots and the end of the

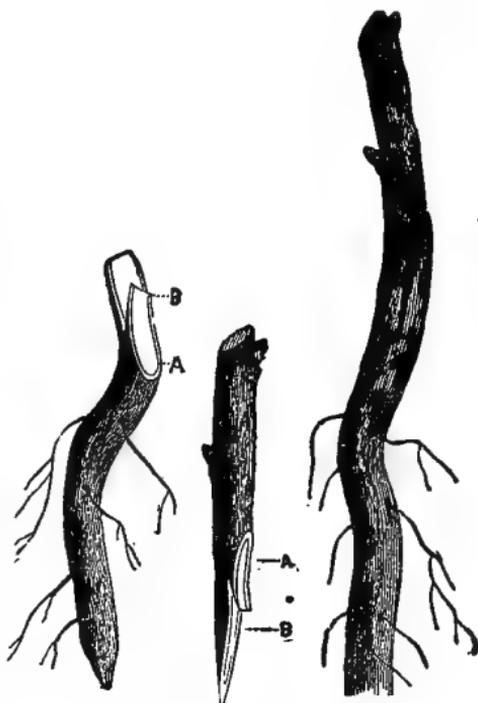


Fig. 93 Fig. 94 Fig. 95
Root Grafting

main root to about six to eight inches long. A cut is then made just below the collar about an inch long, as seen in Figure 93. A tongue is then cut at A B; the cion, Figure 94, a piece of the last season's growth of the variety desired, is then taken, and a similar cut is made at A B, the two being pressed together with the cambium layers of both stock and cion in as close contact as is possible, as seen in Figure 95. The graft is then tied firmly and evenly with waxed string, waxed cloth or raffia fiber. The success of the work depends upon the smoothness of the cut, the perfection of the union of the cambium layers, and close and firm tying. To shut out the air and moisture from the grafted surface and insure a more complete union, it is best to cover the cut with grafting wax or with waxed cloth after tying. After the grafts have been made they should be packed in boxes in moist sand or fine sandy soil, pressing the packing very firmly about the grafted parts. After the box is filled it is placed in an upright position, that any growth that may take place will be toward the union of the graft. The grafts should be planted as soon in the spring as the soil will work up light and mellow, and they are best set with a dibber or spade, the top bud being set at the level of the ground.

In planting with the spade the blade is inserted to its full depth, worked back and forth until the desired space is made, when a graft is placed at each end of the opening made, and one in the middle, thus setting them about four inches apart, with the top bud just at the surface of the soil. The spade is then again inserted a few inches outside of this opening and the soil pressed very firmly against the grafts. The soil should then be trodden firmly on both sides. In taking the root grafts from the boxes it is best to keep them in a pail of water until they are planted.

Budding—For propagation by budding, the seedlings that have been heeled-in the previous fall are taken up as soon as the land will work up mellow in the spring, the ends and lateral roots trimmed as for root grafting, and planted in the same manner as the root grafts, except that they are set only as deep as they stood in the seedbed. The seedling and the root graft are now planted in the nursery and in a few days after planting the surface of the soil must be made fine and mellow and be kept in this condition throughout the growing season. To insure success in budding, the stocks must be made to grow vigorously and be kept free from insects and fungous pests by spraying with kerosene and the bordeaux mixture.

Budding is best done when the seedlings are approaching maturity, ranging from the first of August to September 15 in different parts of the country, but it must be done when the bark will peel readily. The buds used should be those from vigorous fruiting trees that produce the type of fruit desired. Before the work of budding begins, a sufficient number of bud sticks (Figure 96) should be prepared, as well as an abundance of tying material (raffia fiber) cut to the proper lengths, according to the size of the stocks to be budded. The bud sticks and tying material are carried in a moistened wrapper slung over the left shoulder, so as to be readily reached by the right hand. The stocks should then be trimmed for five or six inches above the ground of all shoots and leaves, so as not to interfere with the work of budding. A sharp shoe knife with a thin blade and a rounded point is generally used, though the budding



Fig. 96—Bud Stick

knives (Figure 97) sold by dealers in horticultural supplies are preferable.

The process of budding consists in first making a cross cut, as shown in Figure 98, then turning the knife and starting about three-quarters of an inch below, making an upward cut to the cross cut, where by a quick turn of the hand the bark on both sides of the cut is raised, as shown in Figure 99. A bud stick is then taken, and, placing the knife about half an inch below the bud, a cut is made through the bark upward, taking a little of the wood with the bud. The bud is then held by the stalk of the leaf that has been left for

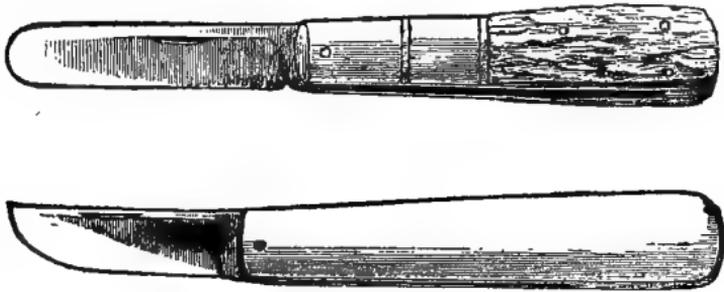


Fig. 97—Budding Knives

the purpose, and the point inserted under the raised bark and pressed down until it is well in place, as seen in Figure 100. If the bark does not peel quite readily enough the rounded point of the knife is pushed under the raised points and run downward, raising it so that the bud will be properly set, but buds will not be as sure to grow as if the bark peels with the pressure of the bud as it is forced down in place. After being inserted the bud must be firmly and evenly tied with some soft and flat tying material or soft string, as seen in Figure 101. The material most in use is raffia fiber, so commonly employed for tying asparagus and other vegetables.

The conditions of success are: (1) a vigorous growing stock; (2) a well matured bud; (3) a sharp, thin-bladed knife; (4) a clean, smooth cut; (5) little exposure to the air and a good fit under the bark; (6) firm and even binding. After the buds have been inserted a week or two the stocks should be examined, and if the bands are cutting into them, the result of rapid growth, they should be loosened a little, or if the



Fig. 98



Fig. 99



Fig. 100



Fig. 101

bud has united sufficiently a cut may be made on the side opposite the bud, when the band will be gradually loosened by the continued growth of the stock.

The buds require no further care until the following spring, when the stock is cut off just above the inserted bud, and we have practically the same condition as in the root graft just planted, except that, in the latter, one year's growth of roots has been made in the nursery, while in the former it has been just transplanted.

Nursery Treatment—Taking the budded seedling and the newly transplanted root graft, we will give the treatment required to produce a first-class tree for

orchard planting. The conditions of success are: (1) a rich soil and frequent and thorough cultivation; (2) allow only one bud to grow, i. e., the bud inserted into the stock in budding and the top bud of the cion on the root graft; (3) allow only one shoot to grow (Figure 102), a clean, straight growth being necessary to a satisfactory tree. The young trees must be protected from injury by insects and fungous diseases as in the

orchard, and the same methods are to be employed.

At the beginning of the second year, and before the growth begins, the one-year-old shoot should be cut back to the height at which it is desired to have the top formed. (Figure 103.)

This height may be from two to four feet, according to



Fig. 102
Nursery Treatment of Young Trees



Fig. 103

the method of training to be followed in the growth of the young tree, those not having made over two or three feet being cut back to the ground for a new start. Buds of those trees that have been topped at from two to four feet high will start all along from the top of the ground in most cases (Figure 102a), but only a few at the top are generally allowed to grow, the others either being rubbed off as soon as well started, or being allowed to grow an inch or two and then the ends pinched to check their growth, thus forcing all development into the branches desired for the head. These branches

pinched are to be finally cut off close to the trunk. The last method has the advantage of making a more stocky tree, though not quite so smooth and clean.

At the end of the second year apple trees, either root grafts or budded stock, should stand from five to seven feet high, and be from three-fourths to one inch in diameter at the ground, with four or five strong shoots near the top and evenly placed on all sides of the trunk. Such trees, i. e., two-year trees, are better than those older or younger for general planting, and should not be allowed to stand longer in the nursery.

Digging Trees from the Nursery—The value of nursery trees to the purchaser largely depends upon how many of the roots are secured in digging them from the ground, and how long they are exposed to the air before they are planted in the soil again. The best way to get them from the ground is to first dig the soil away from the tree down to the roots, which will be, in well cultivated land, about six inches. Then with sharp spades cut a circle around the tree at from one to two feet, according to the size of the tree, severing all roots that go outside of that limit. With two strong spades, one on each side, and a third man to pull, the tree is then lifted out with the largest amount of roots that it is possible to secure. If a large number of trees is to be dug and the help is limited, all of those of one variety are first loosened and then, going over the row again, all are taken quickly from the ground and the roots covered, or each kind may be planted before another kind is dug. Trees should never be kept out of the ground any longer than is absolutely necessary. If trees are to be transported a long distance, the roots should be protected from drying by the process known as "puddling," which consists in dipping them in a thick mixture of clay and water, the covering thus formed making an almost air-tight covering over the roots.

Trees from Home vs. Distant Nurseries—The question as to whether it is best to grow our own trees, to purchase them from nurseries near home, or to send to sections a long distance away where they have peculiar advantages of soil or special skill that comes from long practice which enables them to grow better trees and at a lower price, is one that needs careful consideration. There can be no doubt as to the value of two trees equally well grown, the one from a nursery within a short distance of the place of planting, where they may be dug and planted the same day, and one grown hundreds of miles away. The one grown in the home nursery will be, beyond question, the best to plant.

It is the practice of local nurseries to buy young stock of parties who are very skillful, and are growing in large quantities, plant them in their own nurseries for a year or two, and then sell to the local trade. These trees are, as a rule, more sure to grow than trees planted at first hand, but are more expensive. The question as to where to obtain the best trees for planting is an important one, and can only be settled by a very careful consideration of all the surrounding conditions, but one thing must be impressed on the planter—that it does not pay to buy poor stock at any price.

PROPAGATION OF THE PEAR

The pear is propagated in practically the same way as the apple, but requires more care in the selection of the seed, in the growth of the seedlings and in their care in the nursery. The stocks most in use by the nurserymen are imported, and called French stocks, but by a careful selection of seed and an especially good soil, good native seedling stocks may be grown.

The varieties of the pear are generally increased by budding (see page 189). Some nurserymen, how-

ever, use the root graft, though this method cannot be recommended for general use.

Nursery Treatment—The best soil for the growth of good trees in the nursery is a deep, moist loam, perhaps a little clayey, but thoroughly underdrained. The seedlings are cared for and planted in the same manner as the apple, but more attention must be given to them that they do not cease growing from the time planted until they are budded, for, if from want of plant food or moisture they are checked in growth, the leaf blight may attack them, the leaves fall, and budding cannot be done. If it is found at any time in July that growth is weak, some quick acting fertilizer should be scattered in a furrow close up to the roots and be cultivated in. Frequent cultivation must be kept up from the time the seedlings are set out until budding is completed—once a week is not too often—and in case of drouth more frequent working of the soil will be advisable. The leaf blight fungus, described in Chapter XXI, is more likely to attack pear seedlings in hot, moist weather, in low land, than upon that in full exposure to air and sunlight. The preventive, other than that mentioned, is spraying with the bordeaux as used in the orchard.

The budding of the pear seedlings, cutting off of the stock and the forming of the head is the same as to time and method as for the apple, but it generally requires one year longer to grow a first-class pear tree than for the apple.

Top-working—Some varieties produce a weak stock or trunk, and to make good, upright, clean trees, must be "top-worked." This consists in budding in summer, or splice or tongue grafting in spring, on some strong growing stock like Clapp or Flemish Beauty. In this way a stout trunk is obtained much earlier than can be produced on its own stock. Old trees of unprofitable varieties may be grafted over as described for the apple.

PROPAGATION OF THE PEACH

Peach trees for orchard planting are more easily grown than those of any other fruit. The soil best suited to the production of first-class trees is a medium deep loam, that will not be subject to drouth, and fully exposed to a good circulation of air. Much care must be exercised in the selection of the seed, that coming from vigorous, healthy trees being the best. Much of the seed used is sold as coming from Tennessee, North Carolina, etc., where it is claimed that the disease known as the "yellows" does not exist. It is undoubtedly true that this disease is less prevalent in the above-mentioned sections, but it is thought that it may be found there, and as the "natural" fruit often is less vigorous than many of the budded sorts, it would seem best to use seed from the most hardy, healthy and vigorous varieties, whether budded or not. The seed should be obtained as early in the fall as is possible, and be "bedded," i. e., mixed with soil and exposed to the frost so that it will germinate more readily in the spring.

Bedding the seeds consists in selecting a rather moist soil of sandy loam, where there will be no danger of standing water, and making a pit from six to ten inches deep, and of the size required for the amount of seed to be used. In the bottom of this bed a layer of seeds two or three deep is placed, then a layer of soil of the same depth, treading it firmly, then another layer of seeds, and so on until the bed is filled a little above the level of the surrounding soil. Here the seeds remain exposed to the action of moisture and frost until they begin to sprout in May, when they are thrown upon a wire screen, and the shells will separate from the kernel if the frosting has been a success. If any seeds fail to sprout they must be carefully cracked with a light hammer. As the kernels are separated from

the shells they should be kept covered with moist sand or soil until ready for planting.

They are planted in rows from four to five feet apart and about two inches in the row, covering with fine soil from one to two inches deep, according to the character of the soil. Under proper conditions of cultivation and in good soil the seedlings should be from eighteen to twenty-four inches high by the last of August, when they are to be budded. If larger than this they are more difficult to bud, and will make a tree the following season too large for the best results in planting in the orchard. The peach is the most easily budded of any of the fruit trees, but care must be taken not to put in fruit buds. Buds should be taken from the best and most fruitful trees and not from the nursery rows, though the latter will be more certain to grow, and fewer blossom buds be obtained.

The process of budding is the same as for the apple. As the peach seedlings grow very rapidly about the time of budding, a closer watch must be kept that the bands do not cut into the stocks so as to cause them to break off in the wind. The stocks are cut off, as seen in Figure 43, the following spring, and the buds start into rapid growth, requiring early attention that the inserted bud is not injured by other buds that start about it. The care required the first season is to see that only one leader grows, but all laterals are allowed to grow, and at the end of the first year's growth the tree is ready for planting in the orchard. Peach trees are graded according to size into No. 1 and No. 2, or according to height, as five to seven feet, three and one-half to five feet, and three to four and one-half feet. The trees most planted are those of medium or second sizes, for the reason that these have more dormant buds on the main stem than the larger trees, and consequently more stocky heads can be formed from them.

PROPAGATION OF THE PLUM

Varieties of plums are propagated by budding on several kinds of stocks, the most in use being the French or Myrobalan, strong growing varieties of the native or American plum, and the peach stock. For the European varieties the Myrobalan is most largely used, though the use of the American stock is increasing. The Japanese plums are grown on both the Myrobalan and the peach stock, the former doing the best when to be planted on heavy soil and the latter when to be set on rather light soil. The nursery treatment is practically the same as in the growth of the apple, and the amateur finds no great difficulty in growing good trees. Some growers are using peach roots on which to graft the Japanese and some American varieties, the claim being that when worked in this way, and planted deeply, roots will soon grow from the cion and thus the trees are on their own roots in a short time. The Japanese plums grown on peach stocks are generally large enough for planting at one year from the bud.

PROPAGATION OF THE APRICOT AND NECTARINE

These two fruits are propagated in the same manner as the peach, being budded on the peach stock.

PROPAGATION OF THE CHERRY

Like the plum, the varieties of the cherry are propagated on imported stocks. Two kinds are used, the Mahaleb and the Mazzard, the latter being most largely used and most valuable. The soil for the best results is a light, rather rich loam, kept well cultivated, by which means the seedlings are brought into good condition for budding the last of August. If growing very rapidly at the time the buds are inserted, it is often the practice to head back the seedlings to check their

growth, and thus cause a more perfect union of the bud with the stock. After the stock is cut off in the spring, the bud grows very rapidly, and the trees are often large enough for transplanting to the orchard at one year from the bud.

PROPAGATION OF THE QUINCE

The quince is propagated by cuttings, by layers, by stools and by root grafts, but as the two former methods are rather difficult, the last two are the ones most used.

Root Graft—For this purpose small pieces of apple roots are used; the trimmings of the seedlings are taken and cut into lengths of three or four inches, each one to be grafted on a cion six to eight inches long, of the desired variety, and are then planted in the same manner as the apple root grafts described on Page 186. The apple root supplies moisture and a little food material until roots are formed on the cion, when it fails to grow more, and we have the quince on its own root.

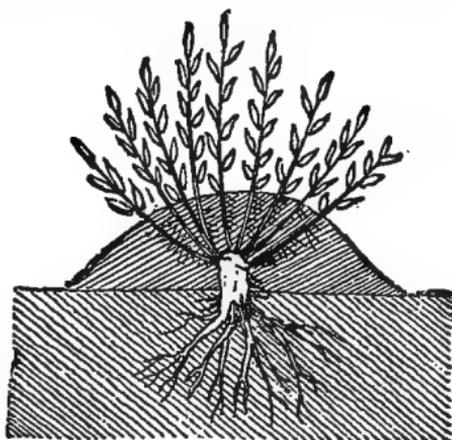


Fig. 104—Quince Stool

Where only a few trees are desired they may be grown by what is called the "stool" method. This consists in first cutting a small, young tree down to within four or five inches of the ground, and allowing it to throw up new shoots that grow one season, as seen in Figure 104. At the beginning of the second season a mound of soil is made about this "stool" deep enough to keep the base of the shoots moist all of the time

during the summer, when in the fall roots will be found well developed. These shoots are then cut off and treated as rooted cuttings, which after one season in the nursery under good conditions should be large enough to plant in the orchard.

PROPAGATION OF THE GRAPEVINE

The grape is propagated by cuttings, by layers and by grafting, and is one of the most easily propagated of the fruits.



Fig. 105—
Grape
Cutting

Cuttings—Two kinds of cuttings are employed, the long cutting and the short cutting. The long cutting, under ordinary care, gives the best results, the short cuttings only being employed under glass. The long cuttings are made of canes of the last season's growth, of medium size, about eight to ten inches long, containing two or more buds to each cutting. (Figure 105.) The best time to make them is in the fall before the ground freezes, tying in bundles of twenty-five and carefully heeling-in in a sheltered place or in a cold-frame where they will not freeze, and where they can be gotten at early in the spring for early planting. Cuttings are sometimes planted in the fall, but if this is done

a heavy mulch of stable manure should be put on the bed before the ground freezes to keep them from being heaved out by the frost.

Layers—Perhaps the best method by which the amateur may increase his stock of vines is the "spring layer." (Figure 106.) This consists in taking canes of last season's growth and bending them down into a trench five or six inches deep in the spring before growth begins, and after the buds along the cane have made a few inches of growth, filling in the trench with

good soil, when during the summer roots will form at each node or bud, and in the fall we shall have as many rooted plants as there are shoots. If, after the cane has been bent down, only the buds at the end of the cane and those near the vine start, it may be bent up, when the buds at the highest point will grow. If any of these new canes grow faster than the others the ends should be pinched off so as to force the growth into the weaker ones.

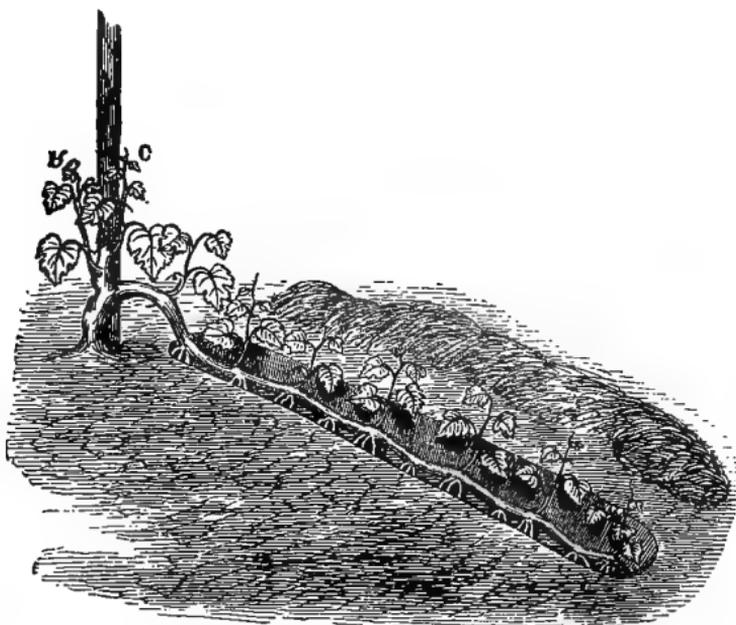


Fig. 106—Layering the Grapevine

Summer Layer—This consists in taking a cane of the present season's growth and bending it down into a trench in July, covering with five or six inches of soil as in the spring layer, but only two vines will be produced from each cane layered, i. e., that at the end of the cane and that part nearest to the vine. By these two methods anyone who has a vine or two in the garden may increase the number with much more certainty and with less labor than from cuttings.

Grafting the Vine—Many of the varieties highly recommended by nurserymen prove of little value except under the most favorable conditions, and after planting it becomes necessary to destroy them or to change the variety. The latter can be done with a limited success only by grafting, though no one has been able to make more than a small per cent of grafts to grow, but when they do succeed the growth is so great that the graft bears fruit often the next year after grafting. The most successful method of grafting the vine is by cutting

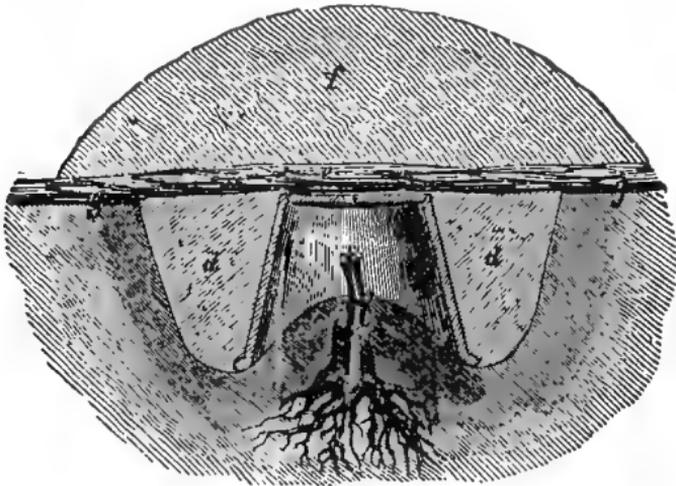


Fig. 107—Grafting the Grapevine

off the stock two or three inches below the surface of the ground in the fall before the ground freezes, and making a common cleft graft. If the stock does not split well a fine saw may be used to split it. After the cion has been inserted the soil is packed firmly about the cleft, no wax being used, then a small flowerpot is inverted over it (Figure 107), so that the cion may not be disturbed when being uncovered in the spring. More soil (*d d*) is now banked around the flowerpot, and, as cold weather comes on, mulch enough is put

on to keep it from freezing deeply (*gf*). In the spring, after heavy frosts are over, the covering is taken off, the soil packed firmly to the top of the cion, when, if the work is successful, growth will begin early and a large vine will result. This kind of a graft is also made by some in June after the leaves have unfolded, and the sap has become thickened, but the cions must be kept dormant in cold storage or deeply covered on the ice in an icehouse. If the stock used is very small the cion should be tied in with a strong string in order to obtain pressure enough to cause the cambium layers to unite.

PROPAGATION OF THE CURRANT AND GOOSEBERRY

These two fruits are propagated in the same manner as the grape, i. e., by cuttings and layers.

The Currant—Cuttings are best made as soon as the leaves begin to fade in August or September. They are made of the new wood, from six to eight inches long, and should be planted at once for the best growth. The soil should be a deep, moist, rich loam, and the planting and care is the same as for grape cuttings or root grafts, the top bud of the cutting being just covered with soil. Before the ground freezes the bed should be covered with several inches of strawy manure or other mulch to prevent the heaving of cuttings by the alternating freezing and thawing during the winter and spring. If the work is successful a large growth may be expected the next season, and the bushes will be ready to plant at one or two years from the time the cuttings were planted. Layers of the currant are made like those of the grape, but as cuttings root so easily under proper conditions, the layer is not much used.

The gooseberry is not easily grown from cuttings unless the canes are first covered with soil for one season, but readily grown by what are called "stools," as

described under the quince. After the shoots have been covered one season they are cut off and planted as cuttings, rooting readily, and at two years they are ready to plant in the field.

PROPAGATION OF THE RASPBERRY AND BLACKBERRY

These two fruits are increased in two ways, i. e., from suckers and from root cuttings. A sucker plant is one that naturally comes up from the roots of these plants, and is the cause of their spreading. If these sucker plants are taken up we find that they have but few fine roots, but if carefully taken up and transplanted at once make good plants, and are largely used in setting new plantations. The root cuttings are, however, much better, as they have an abundance of fine roots. Root cuttings are made by digging up the roots of the desired kind in the fall before the ground freezes, cutting them into pieces of from two to three inches in length, using everything from one-eighth of an inch up, and planting in rich, moist soil in beds or wide rows about as peas are planted, covering about two inches deep. Before the ground freezes deeply a covering of coarse stable manure should be put over the bed that the ground shall not freeze deeply. In the spring the covering is taken off as soon as severe freezing weather is over, the ground carefully cleared of weeds as the season advances, and by July the bed will be studded over with buds from the planted roots. The only care needed during the summer is to keep the weeds down, keep the surface of the soil mellow and to check, by pinching, any very strong growing plants that tend to injure their neighbors. At the end of the season the plants should average two feet in height and have a large mass of roots. Such plants are far more valuable than the sucker plants, and sell at about double the price.

The blackcap raspberry is propagated by the ends or tips of the canes taking root. This takes place to a limited extent without assistance, but to obtain the largest number of plants the ends of the canes should be carefully covered with one or two inches of soil the last of August or early in September. The layer or "tip" plants (Figure 76) are better if not taken up until the following spring, but if carefully dug and handled, it may be done in the fall with a fair degree of success. The tips should not be planted in the field until spring.

PROPAGATION OF THE STRAWBERRY

The strawberry is not generally grown as a nursery product alone, but the plants for setting new fields are often taken from the fruiting plantations. To a limited extent this practice is not seriously objectionable, but, as many kinds are often grown in the fruiting fields more or less closely together, there are many chances of their getting mixed. The plants cannot be as well dug as from a bed where all are to be removed, and therefore it is better to have all plants grown in beds where no fruit is expected. A method practiced by some of the experiment stations and others, called "summer bedding," is found very satisfactory. This consists in heeling-in, or planting in close rows or beds, the runners that are thinned from the rows or the field during the summer, where they remain until the following spring, when they may be set in the field at any time from the first of April to June without being checked in transplanting. In this way runners that have made but very short roots, if heeled-in and shaded for a day or two, will make strong rooted plants in a few weeks, and each plant will have full exposure to the air and sunlight, thus making very strong plants.

In the foregoing pages of this chapter we have given a brief outline of the methods employed in propagating the fruits and the treatment they require in the nursery, which we hope will enable those who are about to go into fruit raising and with some practice to grow, under favorable conditions, good trees and plants for their own planting.

FRUIT GROWING UNDER GLASS

While in this progressive age almost all of the fruits of the tropics and many local fruits are shipped to the North in a perfectly fresh condition from the South, yet to have native fruits out of season in the

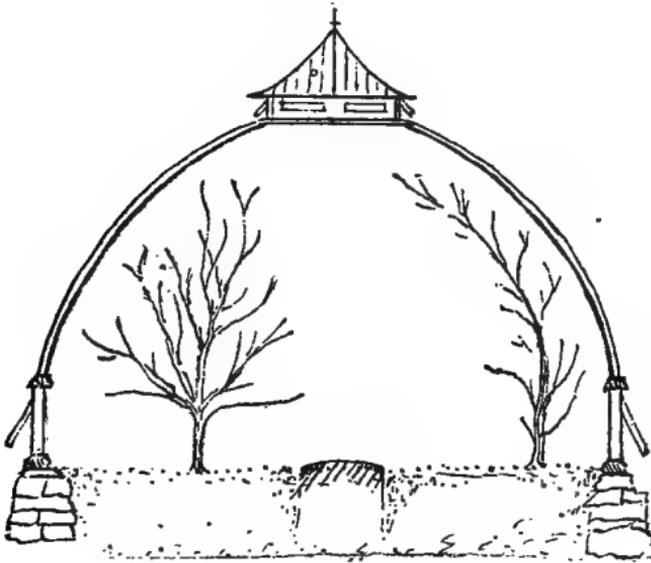


Fig. 108—Curvilinear Span-Roof House

great perfection that they may be grown in skillfully managed fruit houses will always be considered a great luxury. For many years past fruit growing under glass has received much less attention than formerly on account of the improved facilities for transportation, and as a market product to compete with Southern or Pacific Coast products the fruit houses will hardly be

able to hold their own except for its greater perfection. Large estates, with their numerous gardens and greenhouses, may add a fruit house, a cold or hot grapery, or force strawberries in any cool house, at little expense, with a great deal of satisfaction. So, too, the owner of a city home with but a few rods of land may have, if he can afford the expense, even choicer fruit than

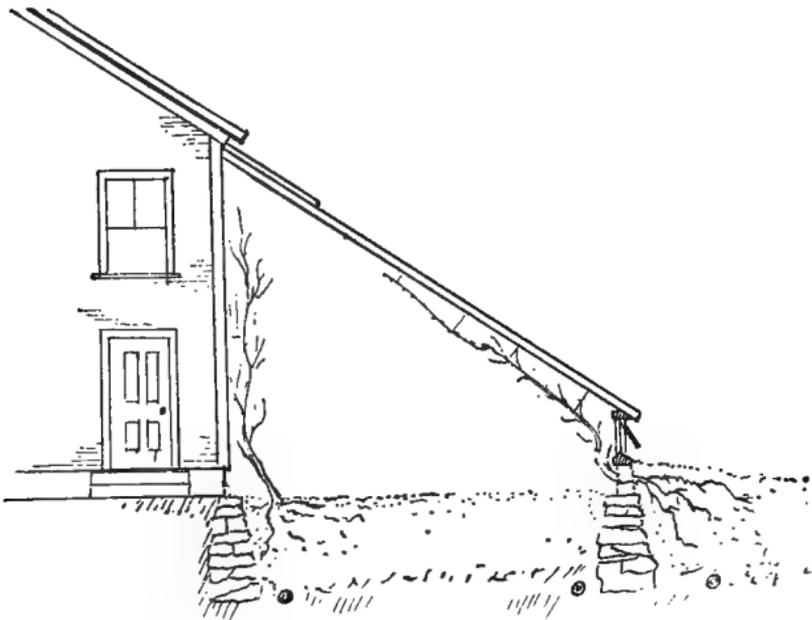


Fig. 109—Straight Sash Bar Lean-to House

can be grown by the farmer, and so control conditions as to have it through a much wider range of season. This expense, however, need not be great after the houses are built, and these may be simple and inexpensive structures built against the house or stable, or may be very elaborate and ornate, built by skillful greenhouse architects.

As with fruits out of doors the grower must be familiar with the needs of each crop—and they need practically the same conditions under glass that they

do in the field—and be prompt and persistent in carrying out the details of the work in all of its stages. A little neglect or wrong treatment for even a short time will result in more serious injury than in the field. Too high or too low temperature for even a short time at critical moments may often destroy an entire season's growth, and no one should undertake the care of fruit under glass unless they are so situated that attention can be given to the crop by someone at any moment of the day when conditions may require it. Among the fruits that may be successfully grown under glass are the peach, apricot, grape and strawberry.

THE PEACH AND APRICOT

For forcing these two fruits, very nearly the same conditions are required. The most approved house for this work is one with a span roof running north and south. Both the curvilinear (Figure 108) and the straight sash bar (Figure 109) are used, the former being more ornamental, while the latter will make a closer house. In the extreme Northern sections the lean-to has the advantage that it can be most easily heated, on account of the shelter wall on the north side. The foundation should be raised above the surrounding land to insure quick surface drainage and a dry atmosphere. The trees are generally grown in borders, but where space is limited they may be grown in pots or tubs and stored during the winter or dormant stage in close quarters in the houses, in stable cellars or in pits.

The Borders—The borders are generally made inside, as seen in Figure 108, but may be partly outside as well, as shown in Figure 109, and should be made of fine, light, but moderately rich material. Decayed sods, leaf mold, coarse bones, mortar waste and perhaps some sand if the soil is heavy should be well mixed together for this purpose. The border should be thor-

oughly underdrained with tile, as shown in the illustrations, with a free outlet, so that there shall be no possibility of water standing about the roots. Where the fruit is to be forced during the winter the inside border is probably the best, but where growth does not begin until spring the outside border has some advantages, requiring less care as to watering, though in case of heavy rain storms may become too wet unless drainage is very perfect. The roots of the trees planted inside reach the outside border through 6x18-inch openings in

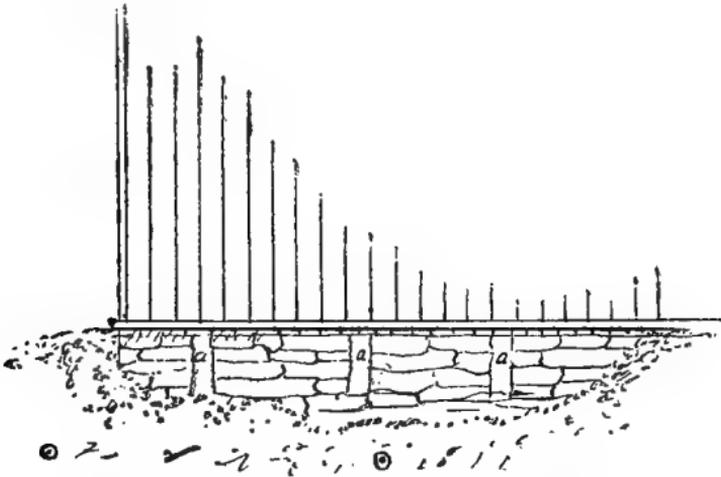


Fig. 110—Wall with Openings for the Roots

the wall, as seen at *a*, Figure 110, at intervals opposite where the trees are planted, the border being filled up nearly to the sills of the house. The soil should be worked over thoroughly several times, and be not less than two feet in depth.

Planting—Young, vigorous one-year-old trees should be used, the roots being well cut back and the top trimmed to ten to twelve inches, or perhaps better, cut down to two or three buds. The advantage of the latter method is that one clean central shoot may be trained from a single bud near the ground more easily than from a stock one foot or more high, and the buds

generally start with greater vigor when from near the ground. The planting and first year's treatment under glass is practically the same as out of doors, except that the training should be directed so as to produce the desired form, pinching here and there as needed to produce the flat form (*espalier*), or the tree form, as desired. The aim should be to obtain the conditions that would give the best growth if planted outside.

Watering—Water should be applied liberally whenever the border becomes dry, but too much water is much worse than too little. Syringe the foliage two or three times each week on bright sunny mornings. In extremely hot, moist weather, withhold water, and if the red spider appears—an indication of a too dry atmosphere—syringe more freely. Ventilate freely both night and day during the summer, but in very cold, wet weather, keep the ventilators partly closed. At blooming time withhold water and keep a dry, airy atmosphere. So, too, when the fruit is beginning to color, give more air and increase or reduce the temperature as the ripening of the fruit is to be hastened or retarded.

Cultivation and Fertilization—During the growing season the border should receive about the same attention as is given borders outside. The surface should be frequently stirred, and no weeds allowed to grow. If the border becomes too wet it will dry out more quickly if allowed to stand without stirring. Should the growth of the trees be weak and sickly a little quick-acting fertilizer like nitrate of soda will often give them a start.

Before growth begins each season a liberal dressing of well decomposed stable manure should be worked into the border. To this may be added to advantage, sometimes, a light dressing of air-slaked lime or wood ashes.

Training the Tree—Two plans or methods of training commonly practiced are the tree form and the “fan” espalier form, the latter being most in use. Much skill may be exercised in this work, and many modified forms of these two methods produced to adjust the trees to surrounding conditions. Each season the new shoots are to be cut back more or less to insure a moderate number of blossoms and enough shoots to renew the fruit bearing wood for the next season. No surplus wood should be allowed to grow, the whole force of the tree to be directed to the production of the fruit and the renewal shoots. During the summer all shoots not needed to carry out the plan of training should be cut off as soon as they appear.

Thinning the Fruit—To produce fruit of the best size, quality and color, but a limited quantity should be allowed to grow on a given space of wood. Reducing the number of specimens to one-fourth or even more will often not reduce the measured quantity of fruit ripened, while the number of seeds or kernels being largely reduced, the strain on the tree is not as great, and it will often make a much larger growth, and be in better condition for next year’s crop. No rule can be given as to the number of specimens to be left or the distance apart on the branches; each grower must “use his judgment,” but it is best to err on the safe side by thinning liberally, if the future good of the trees is to be considered. On a well branched, vigorous tree, four inches apart would give a large number of fruits, while if the tree is weak six inches would be a better distance.

Varieties—Among those recommended by successful growers are the following: Peaches—Royal George, Golden Eagle, Goshawk. Nectarines—Cardinal, Lord Napier, Darwin, Victoria.

Trees in Pots—When one has limited glass space

and a good cellar or pit in which to store them during the winter, trees of the peach, apricot and nectarine may be grown in pots with a good degree of satisfaction. Small one-year-old trees should be planted in six to eight-inch pots in rich soil in April or May, and be grown vigorously in the open air until October. For the best results they should be shifted once or twice into pots of larger size until, when well grown, they will be in twelve-inch size. They must have a constant supply of water and an abundance of plant food. To prevent too rapid evaporation of moisture from the soil in the pot, they should be plunged to their rim, or an inch or two lower if the soil is dry, in soil, sphagnum moss, or some other material that holds moisture well. They should be plunged where they will have a full exposure to sunlight and air.

Under no circumstances must the soil become dry for any considerable time, and whenever water is applied sufficient should be used to saturate the soil in the pots and that about it. If the roots are found to grow through the drain hole or over the top of the pot the ball of roots should be pulled from the pot and given a full turn, returning all roots to the inside of the pot, settling the soil firmly in place by tamping. As cold weather comes on less water should be used that the wood may become well ripened. Any mulch about the roots should be removed unless in times of severe drouth. Allow the trees to stand in full exposure until there is danger of bursting the pots by frost, when the pots may be protected or be taken up and placed in a frame where the pots can be protected.

At any time from December to March, after considerable exposure to frost has been given, the trees may be gradually exposed to a higher temperature in a light, airy house, starting at thirty-five degrees at night and forty to forty-five degrees during the daytime, and

raising it about two to three degrees a week until well started into growth, when the treatment must be the same as for trees planted in the borders.

GRAPES UNDER GLASS

Of all the fruit crops under glass none gives the satisfaction that the grape does, and none is so easily grown. They may be grown in cheap houses with a

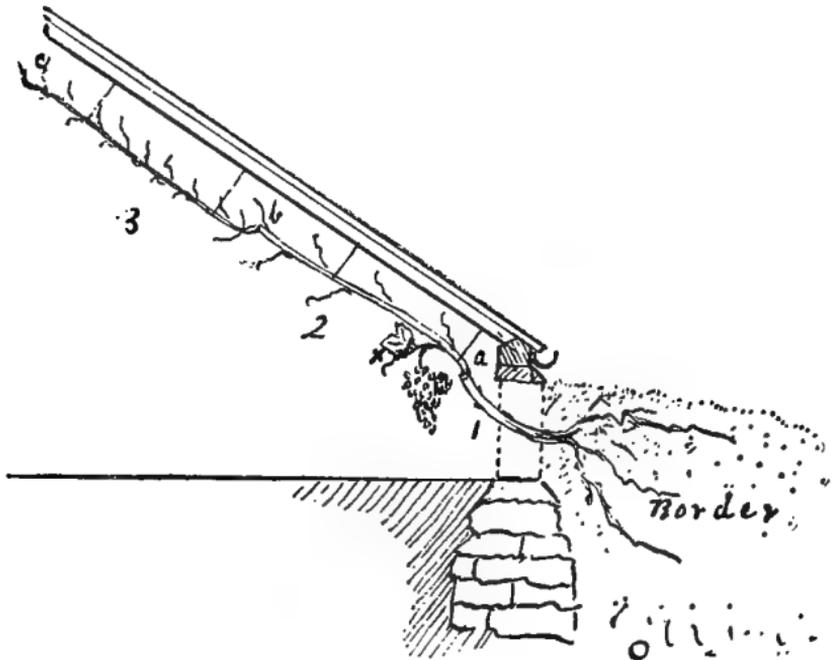


Fig. 111—Cold Grapery

border outside and without any artificial heat, the fruit ripening a little earlier than the outdoor crop, or in houses with borders inside, and by the aid of artificial heat, the fruit may be ripened at any time from July to January. Many of the varieties grown under glass possess such long-keeping qualities that they may be had in perfect condition nearly the year around by a

little especial care, i. e., cutting a part of the cane with each bunch and inserting it in a bottle of water and hanging in a cool, dry cellar.

Cold Grapery—Any glass house comparatively close, with long sash bars, and space for a border outside or in, may be used with success for this work. The best form is perhaps a lean-to eighteen to twenty feet wide facing the south, with long rafters or sash bars and ventilators at the top and bottom. Strong one-year-old vines are planted in the border outside, with the cane growing through the openings in the wall, as seen in Figure 111.

The Border—The border should be made about two feet deep, of about the same material used for making the fruit house border, i. e., partly rotted turf, leaf mold, sand, bones, old mortar, etc. It should be well underdrained and the whole texture, when completed, should be light, warm and rich. The first year it need be made only four to six feet wide, each year adding about two feet, until it is fourteen to sixteen feet wide. Fine ground bone and wood ashes make a good fertilizer if the soil is not too heavy.

Training the Vine (first year)—At planting the vine is cut back so that one or two buds will come inside of the wall, as seen at *a*, Figure 111. Only one cane is allowed to grow, and this should make from six to eight feet, but the end be pinched off when it has reached five feet, that the buds and wood may fully mature. No laterals are allowed to grow. If from any cause one of the lateral buds should start into growth, one leaf is allowed to unfold, when the cane should be pinched off just beyond it, as shown in Figure 111. The removal of this leaf would cause the bud at its base to grow.

Summer Care—During the summer little care need be given the border. If properly made it will take care of itself unless it should become flooded, which

good drainage will prevent. The inside treatment needed is an abundance of air and sunlight. As the time for growth begins keep the ventilators well open in all bright, warm weather, night or day, so that the vines will not start too early, but keep closed when very cold or wet. Sudden changes from high temperature to low and close hot weather tend to bring on mildew and rot, and must be avoided. During the summer the atmosphere should be kept on the dry side, syringing the foliage in the morning during bright weather once or twice each week and more frequently should "red spiders" gain a foothold. When in bloom and again when the fruit is ripening, and until well ripened, use but little water, and expose to full air and sunlight to ripen the wood.

Training the Vine (second year)—The first year's growth of five or six feet is generally cut back to two or three feet, as seen at *b*, Figure 111, and the second year be allowed to start a strong bud at the end. The lateral, Figure 111, will burst also, and a few bunches of fruit might be set, but this is not advisable until the second year. The ends of all laterals should be pinched off as soon as one leaf has been formed, as seen in same figure. Often several buds will start into growth from one node, all but the central one of which should be rubbed off entirely. As with the first year's growth, no laterals are allowed to grow more than one leaf at a time. At the end of the second year the leader will have made one clean cane from eight to fifteen feet long (Figure 111, *a, b, c*), with a few laterals on the growth of last year. (Figure 111, *a, b*.)

Training the Vine (third year)—At the beginning of the third season's growth we should cut the new cane to about three feet, thus increasing the fruiting cane to about six feet in length. From each bud of this cane will be sent out shoots at every node, as seen in Figure 112,

each of which will produce from one to three bunches of blossoms. As soon as these can be distinguished the cane should be pinched off to the last large cluster and one leaf; thus there will be, when set, one large cluster of fruit and one or more large leaves, besides the leaves of the main canes. During the summer, as soon as a new leaf has been formed beyond the last bunch, the end of the cane is pinched off and at the end of the season we will have short spurs upon which are large bunches of grapes. In pruning the laterals after fruiting, cut back so as to reduce the length of the spur for the next year's cane as much as possible. Figure 112 shows how much the spur would be elongated if the cut were made at the large bud, *b*, and how much shorter it would be if the cut were to be made as shown at *a*.

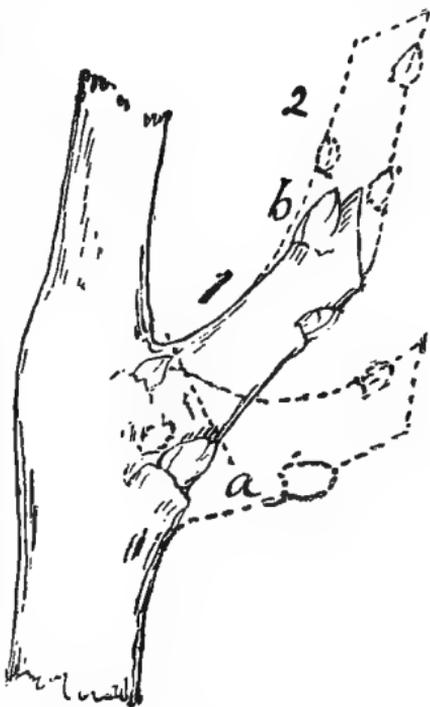


Fig. 112—Training the Vine the Third Year

Each succeeding season the work is a repetition of that of the third year until the permanent vine reaches the ridge of the house. Each succeeding year, however, will be likely to be met with some new difficulty, the result of climatic or other changes, insect pests or fungous diseases, which must be met and overcome. If a vine becomes weak or seriously injured by cold the root often may be in a healthy condition, and the top may be renewed by starting a new cane from the ground.

This is often practiced and the fruit from the young cane is much superior to that from the old, weak vine.

Thinning the Fruit—Almost every variety of the European grapes that are grown under glass sets so many berries to the bunch and the stems are so short that, when fully grown, they are so crowded that many are forced from their stem or are cracked, and the whole bunch soon decays. To prevent this loss, when the berries are about one-half grown, those on the inside with short stems are thinned out. Sometimes it is necessary to cut out more than three-quarters of the berries if the bunches set are very large and the vines growing very vigorously, but for an average growth one-third to one-half will be sufficient. Among the best varieties for the cold graperie are Foster's Seedling, Buckland Sweetwater and Black Hamburg.

Hothouse Grapes—The construction of the house for forcing grapes is practically the same as for the cold graperie, except that the border is generally inside, and artificial heat is used. The treatment of the vines after starting into growth is also very similar, though more care must be exercised during cold weather to prevent a chill, which will often bring on mildew or rot. Among some of the leading varieties for forcing are Muscat of Alexandria and Gros Colman.

FORCING THE STRAWBERRY

With a good supply of this fruit shipped to the Northern cities from the South as early as the middle of January, and then sent in from the North after the local crop has been harvested as late as September, and the many autumn fruiting varieties, the forcing of the strawberry will probably never become a large industry. When managed skillfully, fruit of very fine quality may be put into the market early in January, and bring the highest prices, as it must to meet expense of growing.

Success in this work depends largely upon strong, well rooted plants in large pots of rich soil, and a full resting state under similar conditions to those found in the field grown crop. Strong runners from vigorous plants are layered early in the summer in three-inch pots, as seen in Figure 113. As soon as they are well rooted they are shifted to five or six-inch pots and placed where they can have careful attention as to watering and plant food. They must be kept growing vigorously until the time for resting in the fall, and



Fig. 113—Layering Strawberry Plants in Pots

if the plant food in the pots becomes exhausted, as it often will when water has run through the soil freely, more plant food must be applied. For success an abundance of fine white roots and large, heavy leaves must be produced.

As soon as freezing nights come on, the whole plant and surface soil of the pots should be exposed to the weather, water should also be withheld, but the soil never be allowed to become quite dry. After having been thus exposed to freezing weather for a few weeks, forcing may begin, though the longer frozen the better they will force. The plants should be placed in a light,

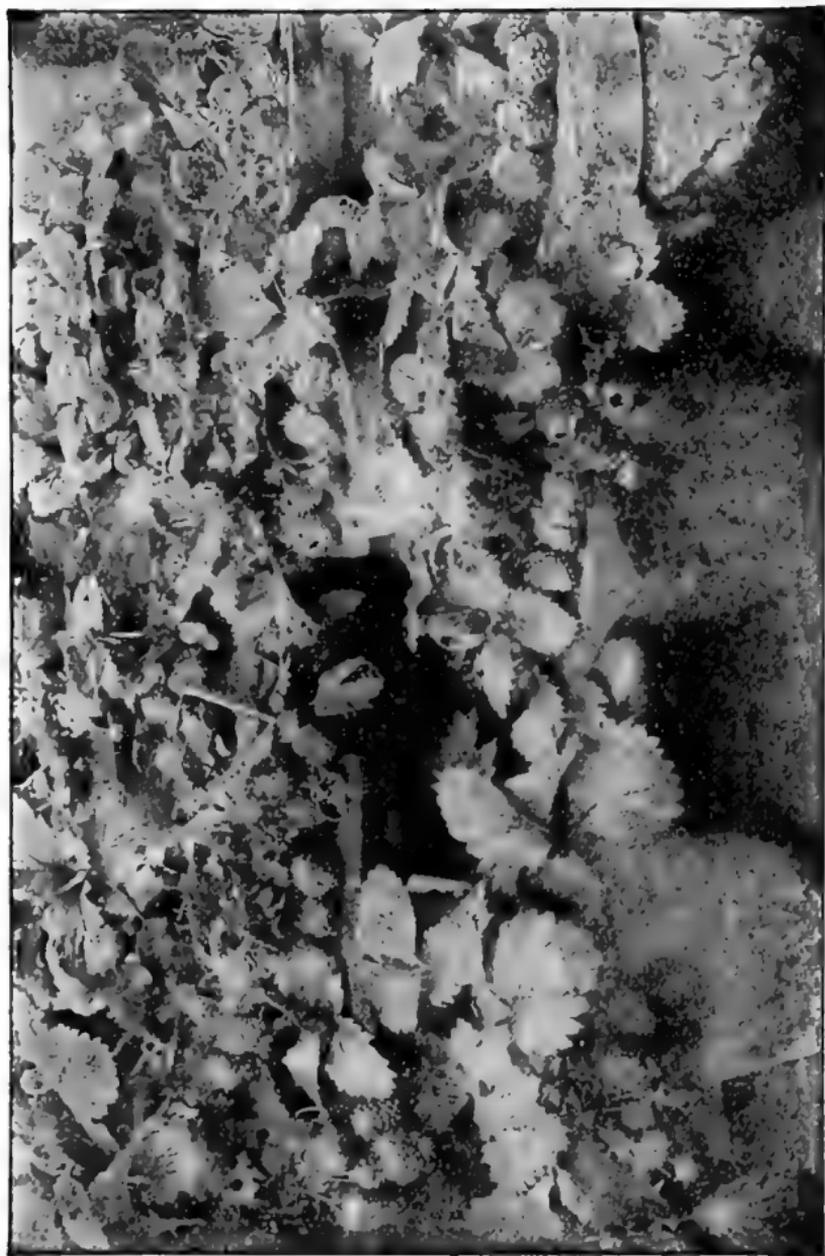


Fig. 114—A Bunch of Strawberry Plants at the Cornell Experiment Station

airy house, with a temperature beginning at thirty-three to thirty-five degrees at night and forty to forty-five degrees during the day, gradually raising it two to three degrees each week until forty to forty-five degrees at night and fifty to sixty degrees during the day is reached. As much air must be kept on the house as possible, and an abundance of water be given.

Liquid manure may be used every week after blooming if the plants are not growing rapidly. When the plants are showing bud they should be placed as near the glass as possible, but the pots be shaded by the foliage by placing close together, or by some packing like sphagnum moss about them. When the flowers begin to open the atmosphere should be kept as dry as possible. Fertilization of the flowers should be done by hand with the camel's hair brush or by having bees in the house. To keep the fruit from getting into the dirt and decaying, pieces of wire netting up a vigorous growth, and maintain as nearly as possible can be placed on top of the pots, as seen in Figure 114.

The aim in all stages of growth should be to supply the best soil and an abundance of plant food; to keep the temperature, moisture and air of an ideal season for strawberry growing outside. The best varieties for forcing are probably those that succeed best in field culture, and yet few can hope to supply the exact conditions under which they succeed in the field. I would suggest the Clyde, Brandywine, Sample and Senator Dunlap as among the best.

INSECT PESTS

There is nothing connected with the subject of fruit growing that is of more importance than a knowledge of the habits of the insect and fungous pests that we have to contend with and how to prevent their injury. It is a comparatively easy matter to make the trees grow, and perhaps to set a large crop of fruit, but if this fruit is injured by insects or fungous pests, it will not be salable at paying prices. With the increase of the number of trees or fruit plants in any given locality comes an increase in the number of these pests, and the successful fruit grower must equip himself with spraying outfits and make use of insecticides and fungicides if he will insure the quantity and quality of his fruit crop.

No attempt will be made to describe the various pests with scientific accuracy, but to show them as they will be seen by the practical fruit grower.

PREVENTIVES

The first consideration in growing good fruit is to so grow the trees or plants that they will be the least liable to the attack of insects or fungi. The condition of the tree will have a great influence on the amount of injury that will be done by these pests. The more vigorous the growth, the less will be the injury from fungous diseases, and, to a greater or less degree, that from insects also, as most of the fungi and many of the insects only attack the weak plants. An abun-

dance of plant food and good care and cultivation must therefore be the first point to be attended to, but cannot be wholly depended upon, for, when the season is right for the rapid increase of insects or fungi, trees under all conditions will be sure to be more or less injured unless the work of spraying is promptly and thoroughly done. Insecticides should be applied when the first insects appear, and fungicides before the spores come in contact with the host plant. If the first insect is destroyed there will be no further trouble, and if the first spore or seed of the fungus is destroyed, or, coming into contact with the copper sulphate, fails to germinate, there can be no further growth of that pest. Therefore we should adopt the rule that "prevention is better than cure," and it is certainly cheaper.

INSECTICIDES (INSECT KILLERS)

The substances used to destroy insects on our plants may be divided into two groups: Those that kill by contact, and those that kill by being taken into the stomachs of the insects, i. e., those killing "sucking" insects and those killing "chewing" insects.

1. Of the first, the most in use are Paris green, London purple, arsenate of lead, hellebore, arsenate of lime, arsenate of soda, white arsenic, etc.

2. Of the second group most in use, we may mention whale-oil soap, linseed oil, kerosene, crude petroleum and pyrethrum or Persian insect powder.

Promptness and thoroughness in the application of insecticides should be the watchword. The best pumps for the work in hand should be used, the preparation of the insecticides and fungicides should be most carefully done, and in mixing and applying the greatest economy of labor be practiced. In fact, in all the work attending the growing and caring for any crop of fruit, *thorough work and business dispatch* must be the rule.

if any profit is to be expected. In all this work of fruit growing the margin of profit is very small, and the strictest economy must be practiced even under the most favorable conditions.

PUMPS

Much of the success in the protection of our fruit crops depends upon the pump used, but there are so many good pumps now upon the market that no one need use a poor one. The main points to be considered are:

1. That the pump be large enough to throw the liquid with so much force that it shall break into a very fine spray and yet strike the plants with force enough to have it cover the surface of all the parts of the plant sprayed.

2. All the parts that come in contact with the liquids must be of brass or copper if copper solutions are to be used, as iron would soon be eaten out by the copper.

3. An effective agitating apparatus should be provided, or very unequal results will be obtained, and if Paris green and other insecticides are used, much injury may be done.

4. Good rubber hose should be supplied of sufficient lengths to be easily and quickly moved around the trees or plants being sprayed. It will be found that the best quality of hose will generally be the cheapest in the end, and that of half-inch diameter will last longer than larger sizes where it is to be moved and pulled about very much, as it does not kink up as much.

Co-operation in spraying, where orchards and fruit plantations are small, will be found of great economy, as has been the case in many sections where this has been done, as well as in co-operation in the selling of the crops, etc. The cost of appliances for spraying on

a small place is often more than the profits will warrant, and one outfit often would be sufficient to do the spraying for a large community or even a township, and at a great saving in time and money. Most of the spraying pumps and machines are rather delicately made, and must have good care, as with all other farm and garden implements, and one must be something of a mechanic to keep them in good working order. After using the pump with mixtures like the bordeaux, unless it is to be used very soon again, clean water should be run through it until both the pump and the hose are well rinsed out, and it is well to hang the hose up so that the water will drain out of it after using.

INSECTS INJURIOUS TO THE APPLE

Round-Headed Apple Tree Borer (*Saperda candida*) (Figure 115)—This is one of the most destructive insects to the apple tree, and one of the most widely distributed. The perfect insect (Figure 115, *c*) is a beetle about three-fourths of an inch long, with three light brown and two creamy white stripes upon its wing covers. It flies at night, laying its eggs upon the trunk in crevices of the bark, not far from the ground, in July and early August. The eggs soon hatch and the young larvae (Figure 115, *a*) penetrate the bark, feeding upon the bark for a time, often not reaching deeper than the sapwood until the following spring. The pupa or chrysalis is shown in Figure 115, *b*.

During the second season it works in the sapwood, and at the end of the second season may be found in a burrow or hole that often runs upward for several inches. After the second season it often makes a turn outward toward the bark, where it undergoes its changes, and the following spring comes out a perfect insect to go through its round of life again. In young trees it often starts on one side of the tree, works into it, then goes

upward and comes out on the other side. When the insect comes out of the tree it leaves a clean hole, and when one of these holes is found nothing need be done other than to prevent the decay of the injured parts by filling the hole with putty or forcing in linseed oil. Its presence may be known by the chips or droppings that are found forced out of its hole, or by the discoloration of the bark under the injured parts.

Remedy—The best and cheapest way to overcome the injury of this pest is to examine the tree twice each year, in August to find the very young larvae, and

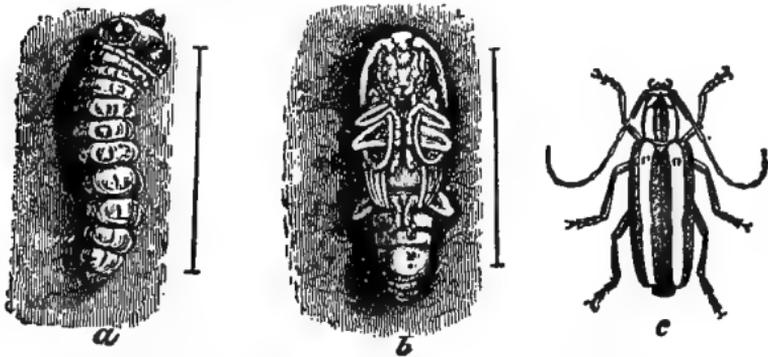


Fig. 115—The Round-Headed Apple Tree Borer

again in the following June to destroy those that may have escaped in the August examination, digging out the larvae with a pointed knife or killing with a wire. In doing this work, first pare off the outer bark until the opening where the larva entered is found, then follow the channel until the larvae are reached, or until the upward burrow is found, and insert the wire. If the larvae are very young they will be destroyed in the operation of paring off the outer bark, but if deep in the tree considerable effort will be sometimes needed to reach them.

The Flat-Headed Apple Tree Borer (Chrysobothris femorata) (Figure 116)—This beetle is smaller than the

last, of a steel gray color, and moves about in the daytime. It lays its eggs not only on the trunk, but sometimes on the main branches as well. It is generally found on the south side, and begins its work where there has been some injury to the bark. The larvae of the flat-headed borer work only in the bark and sapwood, and are more easily destroyed than the round-headed borer. The insect generally completes its changes in one year, and in many places it is more abundant than the round-headed borer, and is more destructive. Figure 116, *d*, shows the perfect beetle; *b*, the chrysalis; *a*, the larva, with the head enlarged at *c*.

Remedy—The presence of this larva may be known in the same way as that of the round-headed borer, and the remedy is the same. The use of washes on the trunk or branches is of uncertain, if of any, value, while examination, if thoroughly made, is sure to reveal the insects if present, and there is no uncertainty about it, while the cost is less.



Fig. 116—Flat-Headed Apple Tree Borer

The Oyster Shell Bark Louse (Mytilaspis pomorum)—This insect, shown in large numbers in Figure 117, injures the apple tree by sucking the juices from the twigs and branches. While young the minute insects move about freely, but soon, finding a desirable place, fix themselves and feed there until they die. During the winter and spring we only find the dead shell and numerous eggs securely covered by it. In this state the shell or covering is so securely sealed that it is with difficulty removed from the bark, and can be destroyed only by very strong insecticides. Figure 117, *a*, shows

the under side of a mature insect with the numerous eggs; *b*, same from above; *c*, twig infested by female scales; *d*, male scale, and *e*, twig infested therewith. It generally attacks weak trees and often destroys them.

Remedy—It may be destroyed while the trees are dormant by brushing over with linseed oil, by the use

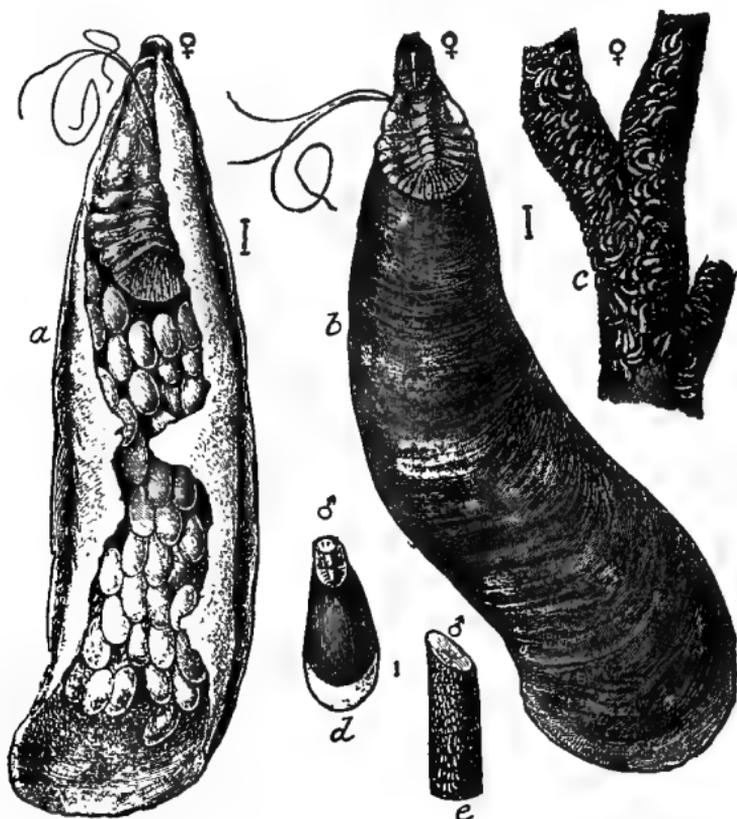


Fig. 117—Oyster Shell Bark Louse

of fifteen to twenty per cent mechanical solution of kerosene oil, or by a strong solution of whale-oil soap, two pounds to one gallon of water; or, after the leaves have unfolded, with a ten per cent solution of kerosene when the young are moving about, which is generally during the early part of June. As when used

for the woolly aphis, the kerosene should be applied with a nozzle that gives a fine spray, and only on bright days.

The Tent Caterpillar (Clisiocampa Americana) (Figure 118)—This pest is so familiar to almost everyone in its larval state as to need no description. The

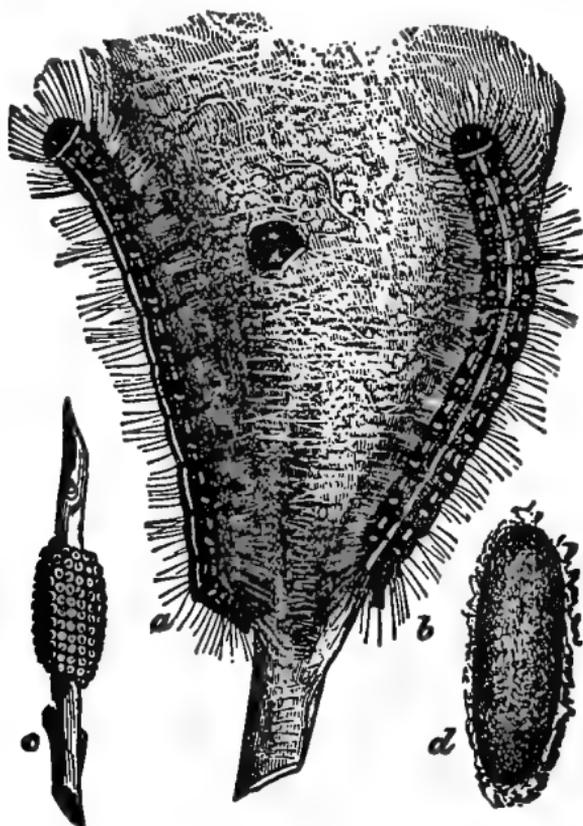


Fig. 118—The Tent Caterpillar
a b, nest and larvæ; c, eggs; d, cocoon

various stages of its growth are shown above, including eggs, nest and cocoon. Its eggs are laid during the latter part of the summer in clusters of 200 to 300 around small twigs at the ends of the branches, often on those of the wild cherry, peach and some other trees. Here they remain until the following spring,

until the leaves have started, when they hatch out, the larvae feeding rapidly upon the young foliage and forming a conspicuous web in the forks of the branches.

Remedy—The larvae may be found in their nests early in the morning, during wet weather, and in the middle of very hot sunny days, when they may be readily removed by drawing the web around them,



Fig. 119—The San Jose Scale

placing the mass on the ground and crushing with the foot. The best time to do this is as soon as they hatch out, and while the web is small, when with a glove on the hand a whole colony may be crushed with the fingers. During the winter, when pruning, by looking upward with the twigs against the sky, many of the clusters of eggs can be seen and removed, and all chance of injury from them be avoided.

San Jose Scale (*Aspidiotus perniciosus*) (Figure 119)—This dangerous insect, recently introduced from Japan or other foreign countries, has become a most destructive and troublesome pest that attacks the apple and other fruit trees as well as many forest trees. It has become widely disseminated throughout the country, and from its wonderful powers of reproduction, unless checked promptly by parasites, or destroyed by other means, it may seriously injure the fruit growing

interests of the country. The perfect insect is a minute circular scale varying from one-thirty-second to one-sixteenth of an inch in diameter, which, unlike the oyster shell scale, brings forth its young alive, and produces many broods each season, increasing so rapidly that in a single season entire trees may be destroyed.

There are several other scales that resemble this pest so closely that it requires an expert to determine the species, but the others do not increase so rapidly, and when trees are thickly covered with small scale insects of a circular form, it may be safely concluded that it is the San Jose pest. Most of the experiment stations of the country have been at work to discover a sure remedy for this pest, and many report satisfactory results, but orchardists generally have not applied the suggested remedies long enough to prove whether they will be able to control the pest without the aid of the State or government. In all such matters it is always better that the grower protect his own crops than be employed by the State to do the work, but it may be wise for the State to aid in the work, either by furnishing trained men to advise and assist, or to provide some compensation where the grower has suffered serious loss through no fault of his own. The salt, lime and sulphur mixture has proved the most effectual remedy, and in its modified simpler forms now used can be applied by the orchardist at no very great expense. The use of hydrocyanic gas for fumigating trees infested has reached a considerable extent in some States, and is reported as effective, but the gas is such a deadly one that if any other substance will be equally effectual this should not be used.

Remedy—Among the remedies which it is claimed will destroy or control this pest are kerosene oil, linseed oil, whale-oil soap, the lime, salt and sulphur mixture, and hydrocyanic gas. The application of these insecti-

cides and their effectiveness may be a matter of some uncertainty.

The Canker Worm (*Anisopteryx vernata* and *A. pometaria*) (Figure 120, *a*, male; *b*, female; *c*, eggs; *f*, larva; *g*, pupa)—In many sections of the country this insect is one of the most destructive of those attacking the apple tree, yet, knowing its habits, if prompt application be made of well known remedies it may be easily and cheaply prevented from doing much harm. Two species (as above) of this genus are found here, both of nearly the same form and of the same

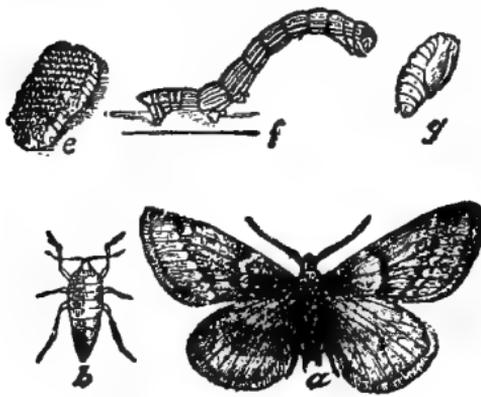


Fig. 120—The Canker Worm

habits. The female, which has no wings, comes out during warm nights after the ground has been frozen in the fall or early in the spring, from October to May, and lays its eggs in clusters on the trunk and branches. As soon as the leaves come out the eggs begin to hatch and the larvae feed upon the foliage until the trees appear as if fire had run through them. The larvae spend several weeks, eating all but the mid-ribs of the leaves, and when numerous do serious harm. When fully grown they are about three-quarters of an inch long and drop from the tree suspended by a web, going into the ground to undergo their changes. When the defoliation of the trees continues for several years the orchards become worthless.

Remedy—Taking advantage of the habit of the female insect, which must crawl up the tree to deposit its eggs, a band of gas tar or printer's ink is put around

the trunks of the trees after October 1, and must be kept fresh and soft whenever the nights are warm, up to May 1. If the ground is frozen all winter the bands need have no care until spring, when the frost is out and the nights are warm, when they will be crawling, and the tar or ink must be soft at these times so as to catch them. If the trees are young it is best to put a band of paper about the trunk, upon which to apply the tar, to prevent injury to the bark, but on old trees which have a thick bark no harm will be done. If the band is used care must be taken that there are no openings under it that the insects can crawl under, for it takes but a few individuals to lay eggs enough to destroy much of the foliage on a tree of good size. Another effectual remedy is to encircle the tree with a tin or zinc trough, in which is placed some cheap non-drying oil. The chief objection to this method is the cost of the troughs and the care required to keep them filled with oil and to keep them from being filled with the insects as they crawl into the oil. The remedy which is now most in use is to leave the trees until the larvae begin to hatch, and then spray with Paris green in water, quarter of a pound to fifty gallons, or with the bordeaux mixture, half a pound to fifty gallons. The first application should be made just before the flowers open and the second when the petals have fallen. This remedy has the advantage that constant attention need not be given during the winter, that this and many other insects are killed at one or two sprayings, and the bordeaux will prevent the apple scab fungus from injuring the foliage. Thus two objects are gained by one spraying.

The Apple Aphis or Plant Louse (Aphis mali)—The aphides, of which this is only one of a great number of species, are green, brown or black insects very small in size, that suck the juices of the tender shoots and

leaves, doing an immense amount of damage, and there are few plants that do not have a specific kind that feeds upon them. The apple aphid is green in color and often feeds all summer, but generally only during the early part of the season. Figure 121 shows two forms enlarged and one winged form of natural size.

Remedy—This insect is destroyed by the use of whale-oil soap, by tobacco water and by kerosene applied as for scale insects. If the leaves are much curled it is best to pick off those most curled before spraying is done, or the ends of the shoots are sometimes removed and burned or dropped into kerosene.

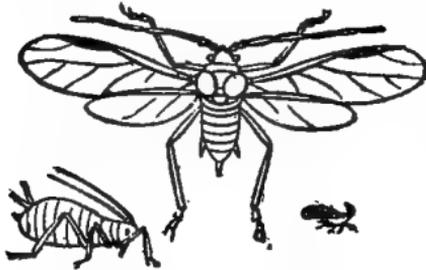


Fig. 121—The Apple Aphid

The Codlin Moth (*Carpocapsa pomonella*)—Figure 122 illustrates a part of an apple injured by this insect. *a* shows the burrow; *b*, the point at which the worm entered; *c*, full grown worm; *d*, pupa; *e*, moth with folded wings; *f*, moth with expanded wings; *g*, head enlarged; *h*, cocoon which encloses the pupa. This is perhaps the most destructive insect attacking this fruit. It flies at night and lays its eggs on the leaves or surfaces of the apple. The larva then moves about until it finds the calyx of the apple, when it enters and feeds until full grown, coming out at some other place and dropping by a web to the ground, or crawls to some shelter, as the crevice in the bark or other dry place, where it spins its cocoon. Generally but one brood is produced in a season, but under favorable conditions, the larvae that come out in June or July may complete their changes and lay another brood of eggs in August or September that will hatch and injure the fruit late in the season. This brood

enters the apple from other points than the blossom end—generally where a leaf lies close to the apple or where two apples touch.

Remedy—The application of Paris green with the bordeaux mixture as directed for the canker worm, has been found to destroy more than seventy per cent of the larvae of the first brood, but as this mixture would disfigure the fruit, if applied for the second brood, other remedies must be employed for the late brood. Pasturing

the orchard with sheep, swine or cattle is practiced by many orchardists for the purpose of keeping this insect and the apple maggot in check, with good results. If sheep or cattle are kept in the orchard it will be necessary to train the trees with a trunk five or more feet high,

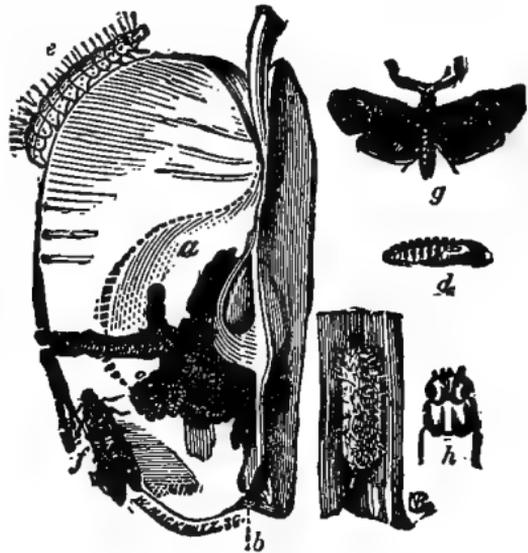


Fig. 122—The Codlin Moth

to prevent injury to the lower branches. Swine sometimes will injure the trees by eating the bark or by rooting and destroying the feeding roots. In the former case the protection of the trunk by wire netting or stakes driven down and wired to the trunk, and an abundance of food, will generally prevent them from rooting very deeply, but if this is not effectual “ringing” their noses will be. A large number of fowls will also be sure to destroy most of the insects that go into the ground to undergo their transformations, as

the codlin moth, canker worm and apple maggot. The cocoons may be also trapped by bands of cloth or straw put around the trunks, and examined occasionally during the summer, and the cocoons destroyed.

The Apple Maggot (Trypeta pomonella) (Figure 123)—This is one of the most destructive of the insect pests that attack the apple. The perfect insect is a small fly, about one-half the size of the common house fly, that appears in the latter part of the summer and early fall, laying its eggs under the skin, through a minute puncture which it makes. It attacks sweet and mild flavored varieties more than very acid or winter fruit, though some winter sorts are seriously injured by the maggots. Most of the injury is done as the fruit is approaching maturity, or after it has fallen to the ground.

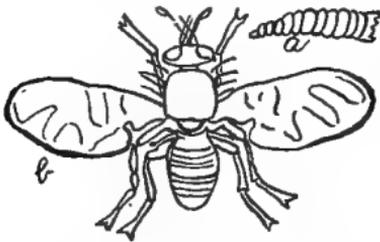


Fig. 123—The Apple Maggot

Remedy—No means has been found by which the insect can be caught or destroyed before the egg is

laid, and therefore the only way it can be prevented from doing harm is to gather the fruit before the eggs are laid or to destroy the poor fruit while the larva is still in the fruit. This is done practically and economically by pasturing the orchards with swine and poultry where the trees are low headed, and with cattle and sheep if the head is high. If the fruit is picked as soon as matured and put into closed buildings or sold at once, few insects will be matured, but to have this method a success *all* the growers in a locality must do the same. Summer and fall apples must not be allowed to decay on the ground, as it furnishes the best possible place for their breeding. Fresh dropped apples are worth from three to eight cents per bushel

as food for stock, and this will pay the cost of picking up all fallen fruit once or twice each week.

The Woolly Aphis or Louse (Schizoneura lanigera) (Figure 124, *a*, rootlet showing galls; *b*, wingless aphis; *c*, winged aphis; *d-g*, structural details; *b-g*, magnified) —Although this is commonly known as the root louse and generally found on the roots of the apple tree, it often causes much injury to the trunk and main branches. It is a small insect, about one-sixteenth to

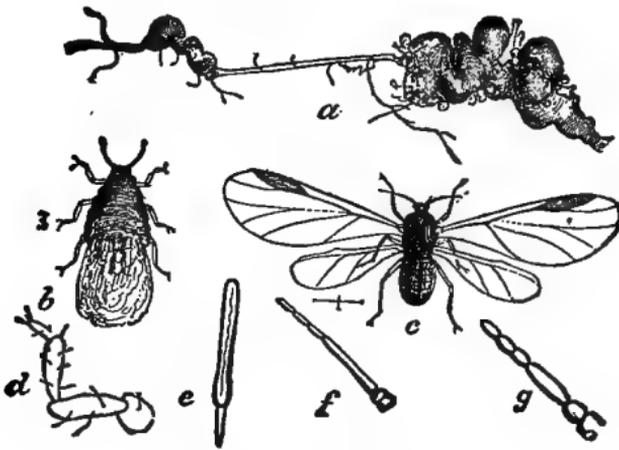


Fig. 124—The Woolly Aphis

one-eighth of an inch long, and more or less covered with a cottony, nearly white, substance, whence comes its name. It attacks the trunk and the branches in patches, sucking the juices and causing black, canker-like places which may spread, often destroying the limb. It most commonly attacks parts that have been previously injured in some way, as in climbing about to pick the fruit, in pruning, or an injury by the black rot fungus increasing its injuries. The roots of young trees are often seriously injured by this pest, baffling all efforts of the grower to make them grow, and the cause of this condition not being known until the tree is dug up.

Remedy—When the injury is upon the branches, the application of soft soap or strong whale-oil soap solution with a stiff brush will be effectual, or kerosene if applied in a fine spray so that it will not stand in drops on the foliage will be equally good. A bright airy day should be selected that the kerosene may be applied liberally and yet evaporate quickly if the trees are in leaf. When the leaves are off it can be much more freely used, and therefore the first or preventive measures should be tried. Its presence on the roots of young trees can only be determined by digging up one or two trees.

Plum Curculio (*Conotrachelus nenuphar*)—This pest, which is perhaps more destructive to the stone fruits than to the apple, is seriously injurious to the latter. It attacks the fruit in its young stage, making the crescent shaped mark shown in Figure 126, in which it lays its egg. These eggs do not mature in the apple, but the fruit is disfigured and at the punctured place often fails to grow, thus producing gnarly and irregular fruit.

Remedy—See under the plum.

INSECTS ATTACKING THE PEAR

The Round-Headed Borer, Flat-Headed Borer, San Jose Scale, Oyster Shell Bark Louse and Codlin Moth, described as attacking the apple, are also injurious to the pear, but the canker worm and apple maggot do not attack it. Remedies for the above insects have already been described.

Pear Tree Psylla (*Psylla pyricola*) (Figure 125)—A minute, flat, yellow, aphid-like, jumping insect that injures the trees by sucking the juice from the leaves and young branches. Wherever the punctures are made the juice exudes and a pool is formed in which

the insect works. The first indication of their presence may be numerous bees, wasps or hornets about the trees in search of the sweet liquid thus produced. Soon the trees have a dirty appearance due to the dust of the atmosphere collecting in the sticky exudations and to a dark colored fungus that grows in it. Orchards have been practically ruined by this pest in two or three years where no effort has been made to control it.

Remedy—Spraying in the spring before the buds have opened with a twenty-five per cent solution of kerosene, which will destroy most of the hibernating insects or eggs, if there are any, and, when the young begin to appear in June, spraying with a ten or fifteen per cent of the same, from one to three times, as may be needed. The trees should be examined in the warm days of spring and if this pest is found, spraying should be done as above, and from the first of June very frequent examinations should be made that the remedy may be applied as soon as the first insects appear.



Fig. 125—Pear Psylla

Pear Leaf Blister (Phytoptus pyri)—This mite causes injury by its puncture of the young leaves and new growing shoots, entering the tissue and causing blister-like swellings of a reddish color in the early summer. The mite is entirely hidden from view in the tissues of the injured parts, where it cannot be reached by any insecticide. The matured insect hibernates under the bud scales or bark of the tree, laying its eggs in the warm days of spring.

Remedy—Spraying with kerosene, twenty-five per cent, in water, before the leaves unfold, is sure to destroy most of the hibernating insects, and perhaps some of

the eggs. Also as the leaves turn down the mites may be seen on the outside, where many of them may be killed by a ten per cent kerosene mechanical emulsion.

INSECTS ATTACKING THE PEACH

Peach Borer (*Sannina exitiosa*)—In some years this insect is very destructive, while in others it can scarcely be found. When abundant it is a serious pest, one larva being able to girdle a tree three inches in circumference. The perfect insect lays its eggs on the trunk near the ground in May or June according to the locality, and the larva works its way into the inner bark and sapwood, feeding over a space amounting to an inch or more in diameter. If it works in a direct line it will nearly girdle a small tree. Its presence may be known by the gum containing its chips or droppings that exudes where the injury is made. Sometimes several larvae may be found in a single tree. The larvae feed through the summer and in the fall make a cocoon of soil, chips and gum near where they had fed and come out perfect insects the following season.

Remedy—A great many washes have been suggested to prevent the entrance of the larvae or to kill them as soon as they hatch out, but none of these have been found effectual. The only remedy that can be relied upon, and it is the cheapest in the end, is to examine the trees twice each year, in June and in August, and dig the borers out. It is but the work of a moment to draw the soil away from the trunk of the tree for three or four inches and if there is any gum exuding and this gum contains the chips of the borers the injured parts should be followed until the larva is found and destroyed. If no gum exists or if there are no chips in the gum the soil may be drawn back, as there is no insect there. After a borer has been dug

out, the soil should be put back to protect the collar of the tree from the weather.

Peach Aphis (*Myzus Persicae*)—The aphis or green louse, similar to that attacking the apple, is also troublesome in some seasons, but in others it does little or no harm. When the trees are attacked the leaves curl up and the lice are to be found inside of these curled leaves.

Remedy—Spraying with twenty per cent of kerosene before the buds start in the spring will destroy most of the hibernating insects or their eggs, and if ten per cent is used a few times in May and June before they become abundant, they may be kept from doing much harm. It is the practice of some of the most careful peach growers to spray as above before the leaves open and then as soon as the insects begin to appear make a thorough examination and pick off the first leaves infested, mark the tree on which it is found, and then spray with whale-oil soap, one pound to four gallons of water. In this way the insects never get very numerous, the leaves do not curl and the few remaining aphides are easily destroyed.

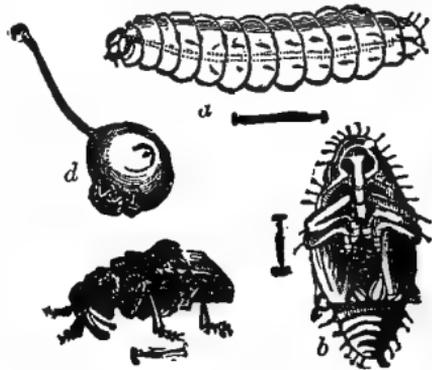


Fig. 126—The Plum Curculio

Plum Curculio—See under the plum.

INSECTS ATTACKING THE PLUM

Plum Curculio (*Conotrachelus nenuphar*)—A small brown beetle with projecting mouth parts or proboscis as shown in Figure 126, appears in the early summer when the plums are from one-eighth to one-

fourth of an inch in diameter and makes crescent shaped cuts on the fruit, *b*, in each of which it lays an egg. The eggs hatch and the larvae, *a*, feed on the fruit until it is destroyed, as at *d*, most of the fruit falling off soon after being stung, though some will hang on the tree until it colors and then falls. This insect is especially destructive to the European and Japanese plums. It often badly disfigures the American varieties but the larvae do not generally mature in the fruit of this group.

Remedy—The beetle is sensitive to a sudden jar, loses its hold and falls, and this habit is taken advantage of to capture it by spreading a blanket or screen under

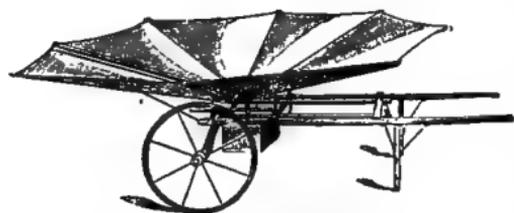


Fig. 127—The Johnson Curculio Catcher

the tree before jarring. A curculio catcher is found in the market in the form of an inverted umbrella mounted on a wheelbarrow-like frame, as shown in Figure 127. This is wheeled under the tree, the branches are jarred by a padded stick or mallet, and the insects caught in a tin can in the center of the screen. This is a sure remedy if begun early in the season and followed up every day for two or three weeks, but is rather expensive. The remedy found the cheapest by the writer is Paris green used with the bordeaux as per the spraying calendar of the station for the European varieties, but using the arsenate of lead with the bordeaux upon the Japan and American sorts.

Plum Aphis (*Aphis prunifolia*)—This insect is similar to the species that attack the pear and apple and is controlled in the same way.

San Jose Scale—See under the apple.

Peach Borer—See under the peach.

INSECTS ATTACKING THE QUINCE

Round-Headed Apple Tree Borer—See under the apple.

Flat-Headed Apple Tree Borer—See under the apple.

Codlin Moth—See under the apple.

INSECTS ATTACKING THE CHERRY

Cherry Aphis (*Myzus cerasi*)—This is the insect that causes the cherry leaves to curl up in the early summer. It is dark brown or black in color and increases so rapidly that it seems but a day from their first appearance until they cover many leaves and cause them to curl and finally to turn brown and drop off.

Remedy—If taken in time they may be destroyed by the use of kerosene as for the apple or peach aphid, but when the leaves have begun to curl it is almost impossible to reach them with any spray and the curled leaves should be picked off and the insects crushed or put into kerosene, before spraying begins.

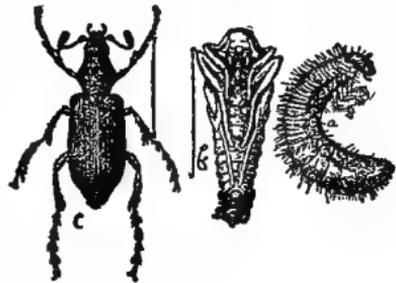


Fig. 128—The Rose Bug

Rose Bug, Rose Chafer (*Macrodactylus subspinosus*) (Figure 128)—See under the grape.

Plum Curculio—See under the plum. Paris green cannot be used on the cherry. Arsenate of lead is the best insecticide for the cherry, Japanese plum and peach.

INSECTS ATTACKING THE GRAPE

Rose Bug, Rose Chafer (*Macrodactylus subspinosus*) (Figure 128, *a*, larva; *b*, pupa; *c*, beetle)—This beetle, well known to almost everyone because of its

attack of the rose and many other garden plants in June, is seldom seriously injurious to vines in the large vineyards, but often destroys all of the fruit on vines in the garden.

Remedy—For the garden, hand picking is about the only means of saving the fruit unless the vines are covered with gauze or mosquito netting. If a pan with a little water and kerosene be held under the vine where the insects are feeding, and they are just touched, they fall from the vine and will be destroyed. In the vineyard, the spraying with the bordeaux and Paris green as used for other insects and fungous pests, will prevent the injury that sometimes would otherwise occur in a few vines on the edges of the vineyard.

Berry Moth (Eudemis botrana)—Some seasons a considerable number of berries in a bunch are shriveled and connected with other berries by webs, and upon examination we find a very active, dark olive colored worm eating the center of the berry. One worm often destroys two berries but not more. The only remedy suggested is to trim the bunches as soon as the fruit is picked and see that all wormy berries are destroyed.

Grape Leaf Hopper (Typhlocyba vitis)—An insect that has recently become destructive in many localities and one that vineyardists have not learned to control with any degree of certainty. It is a small, light colored, jumping insect that appears in July and August, often in swarms, and, eating out the green color parts of the leaf, gives them a light green or almost white color, which soon changes to brown, and the leaves fall. It also disfigures the fruit with its droppings.

Remedy—Clean up the vineyard early and give thorough cultivation during the early part of the season. All litter, leaves and grass should be raked up and burned in the fall or early in the spring, then a thorough spraying with twenty per cent mixture of kerosene early

in the season while the insects are not numerous will generally keep them under control. It has been found that by spraying in the morning with a ten per cent mechanical mixture of kerosene the insects are knocked to the ground, when by spraying them while on the ground with a twenty-five to thirty per cent mixture they will be destroyed.

Many other insects attack the grape, but while a few of them do serious harm and many of them are destroyed by the insecticides used for these described, it is the part of wisdom to examine the vines critically whenever working among them and to be sure that they are not in sufficient numbers to do any very great damage.

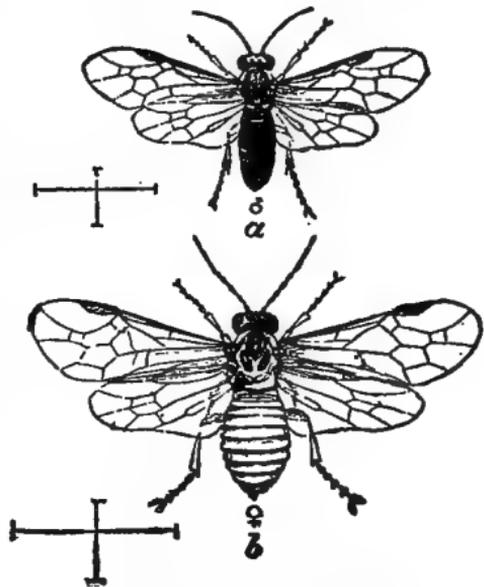


Fig. 129—Currant Worm Fly

INSECTS ATTACKING THE CURRANT

The Imported Currant Borer (*Sesia tipuliformis*)—This insect lays its eggs at the base of buds in the spring or early summer, the larvae penetrating into the center of the canes, feeding on the pith, and causing the leaves to turn yellow or the cane to break off. The following season it comes out a perfect insect to again go through its range of life.

Remedy—The presence of this pest may be known by the yellow color of the leaves, or the premature ripening of the fruit, when the injured canes should be

cut out and burned. Care must be taken that the cut be made below where the larva is feeding.

Currant Cane Girdler (*Janus flaviventris*)—This insect attacks the ends of the growing cane, making numerous punctures in a circle around it, then lays an egg below the girdle. Soon the end of this cane breaks off, leaving the egg at the end, the egg hatches, and the larva, ensured an abundance of food by the girdle, feeds downward toward the base of the cane, where the next season it may be found from one to three feet toward the root.



Fig. 130—Currant Leaf with Eggs of Currant Worm

Remedy—As soon as the cane breaks off it should be cut an inch or two further toward the base and the part containing the egg dropped on the ground, where it will be destroyed by the drying of the part cut off.

The Imported Currant Worm (*Nematus ventricosus*)—The most destructive insect attacking the currant. Figure 129 shows the perfect insect—*a*, the male; *b*, the female. Figure 130 shows a leaf with the eggs arranged on the midrib. The eggs are laid as soon as the leaves unfold, the larvae upon hatching first making minute holes, as shown in the figure, but feeding with such rapidity that in a few days' time the bushes are denuded of leaves and the fruit often hangs in an unripe state through the remainder of the season. Figure 131 shows full-grown larvae feeding.

Remedy—As soon as the small holes begin to appear in the leaves the bushes should be sprayed with powdered hellebore, one tablespoonful to two gallons of water, or Paris green, one teaspoonful to the same amount of water. If a large plantation is to be treated the bordeaux mixture should be used, adding Paris green, one-fourth pound to fifty gallons.

Currant Plant Louse or Aphis (*Aphis ribis*)—Many seasons the leaves of our currant bushes curl up



Fig. 131—Currant Worms Eating Leaves

and turn to a reddish-brown color, when upon examination we find a mass of these lice feeding within the curled leaves.

Remedy—As with the other aphides the time to destroy the pest is when they just begin to appear and before they become numerous and the leaves are badly curled. This may be done with the ten per cent mixture of kerosene or a strong solution of whale-oil soap. The work of destruction may be made more certain by picking off the leaves most curled.

Currant Fruit Worm (Eupithecia interrupto-faciata)—This insect injures the fruit by attacking a few berries in a bunch and when abundant causes much loss of fruit and a great amount of labor in preparing it for market.

Remedy—The only remedy suggested is to pick the injured clusters as soon as the injury is discovered, and destroy them.

Four-Striped Plant Bug (Poecilocapus lineatus)—A bright yellow and black bug about three-tenths of an inch long with two black stripes on each wing cover. It punctures the young leaves of the currant and gooseberry, producing irregular brown spots of dead tissue. When these spots are very numerous the leaves drop off.

Remedy—Spraying with a ten per cent mixture of kerosene or by knocking them off into a pan of kerosene are the only remedies suggested. In both cases the work should be done early in the morning.

INSECTS ATTACKING THE GOOSEBERRY

Imported Currant Worm—See under the currant.

Currant Plant Louse—See under the currant.

Currant Cane Girdler—See under the currant.

Gooseberry Fruit Worm (Dakruma convolutella)—In habits this insect is much like the currant berry moth, and the remedy is the same, which see.

INSECTS ATTACKING THE RASPBERRY

Raspberry Root Borer (Bembecia marginata)—Closely resembling the peach borer in many ways. They are pretty black and yellow banded insects with transparent wings that lay their eggs on the leaves in the middle of the summer. The larva feeds upon the pith of the canes and passes down to the roots in the fall or winter. The following spring it turns and comes

up, generally through another cane, and undergoes its changes several inches above the surface of the ground. The canes and the roots are often so injured as to start very slowly in the spring, turning yellow in the early summer and finally dying.

Remedy—The only remedy suggested is that of cutting off the injured canes and digging out the borer in the root. Vigorous growth will, in a measure, overcome its injury.

Raspberry Cane Borer (Oberea bimaculata)—A small long-horned beetle with a black body and a pale yellow thorax marked with three black spots. It flies in June and lays its eggs between two girdled places near the end of the young canes, when only a few inches high. The canes break off at the top girdle, when the food supply will be

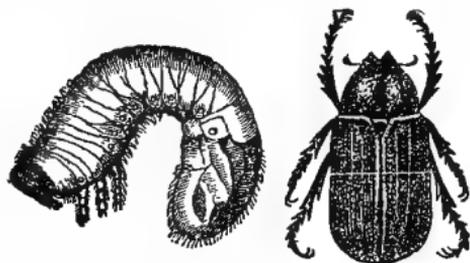


Fig. 132—The May Beetle and Larva

increased for the larva that soon hatches and bores down the cane, feeding in the pith until the following spring, when it comes out a perfect insect in May or June.

Remedy—To overcome this pest the injured canes should be cut off below the lower girdle soon after the egg is laid.

INSECTS ATTACKING THE BLACKBERRY

Raspberry Root Borer—See under the raspberry.

Raspberry Cane Borer—See under the raspberry.

INSECTS ATTACKING THE STRAWBERRY

May Beetle (Lachnosterna fusca) (Figure 132)—In the larval form this insect is injurious to the strawberry by feeding on the roots of newly set plants. The

perfect insect is too well known to need description, being the large brown beetle that flies at night into our open windows in May, called the May beetle or June bug, and the larva, the large white grub that we find in plowing turf land in the spring and summer.

Remedy—To prevent injury, the land to be planted with strawberries should be clean cultivated one or two seasons before the plants are set, as the insects only lay their eggs in soil well supplied with roots for their young to feed upon and avoid clean cultivated ground.

The Strawberry Crown Borer (*Tyloderma fragariae*) (Figure 133)—A small brown beetle about



Fig. 133—Strawberry Crown Borer

three - sixteenths of an inch long that lays its eggs in June or July about the crown of the plants. The eggs hatch soon and the larvae pass down

into the crown, feeding upon the crown and surface roots, and become perfect insects in August or September.

Remedy—As this insect is in the larval state during the middle of the summer, few or none of the eggs will be laid in the newly set plants, and if the old bed is turned under in July, most if not all of the larvae will be destroyed by this operation. Thus where this insect is abundant the annual method of cultivation of the strawberry becomes a necessity.

Spotted Paria (*Paria sex-notata*)—A rather smaller beetle than the last, nearly black with three light bars on each wing cover. It appears soon after the fruit has set, feeding upon the leaves, and when in large numbers causes considerable injury in the

beetle form. Its eggs are laid on the crown of the plant and no doubt do as much injury in the larval forms as in the mature form. The leaves of the plants attacked often show numerous small holes in them and when very numerous the young leaves are nearly destroyed.

Remedy—Plowing under the fruiting plantation in July has proved a satisfactory remedy.

Numerous other insects have at times been more or less injurious to this crop, but are only of local importance, and the reader is referred to the horticulturists of his local station and urged to consult them in cases of any new pests that may appear upon his grounds.

FUNGOUS DISEASES

Most of the diseases attacking our fruit trees and commonly known as rusts, blights, rots, mildews, etc., are known to botanists as fungi or closely allied plant growths. As a rule they are minute thread-like plants, that, growing in the tissues of other plants called "host" plants, just as the corn grows in the soil, destroy the parts affected, or so weaken them that the leaves fall off, the fruit is spotted or decays, or the trunks or branches are injured, etc. The plants of this class are often very minute, so much so as to be almost invisible to the naked eye, and propagate or increase by means of minute seedlike bodies called spores. These are so minute as to be invisible to the naked eye, unless in masses, and are carried about by the winds, often for miles at a time, and consequently there are few localities where these spores may not be found, and under favorable conditions be ready to grow.

Nearly all of this group of plants grow only under conditions of moisture and high temperature, though some of them, like the apple scab, flourish in rather cool weather. Most, if not all, of these spores require actual water for their germination, as dew or rain, and after becoming rooted in their "host" plant grow in the juices of the cellular tissues, sending their roots from cell to cell, taking up the cell contents for their own development, and the leaves, the branches or other parts attacked become weakened because the food supply is taken up by the parasite, the amount of injury to any

plant depending upon the number and vigor of the parasite or robber plant that is feeding upon its tissues.

The amount of injury done in a season will depend upon, first, the condition of the weather—little or no injury being done in cool, dry weather, while in warm, moist weather this class of plants are sure to develop rapidly; and second, upon the vigor and strength of the host plant to resist the attack of the parasites.

FUNGICIDES

Any substance that will destroy or prevent the growth of a fungus is called a fungicide, or fungus killer, and in the growth of all of our farm and garden crops it has become a necessity to use fungicides as well as insecticides, and the fruit grower must equip himself with apparatus for this work just as much as with tools for cultivation if he would insure his crops.

As explained under the treatment for insect pests, so with fungous pests the fruit grower must depend upon his local experiment station for full and detailed instruction as to preventive measures, appliances, and applying fungicides, but a brief description of the fungicides in most common use may not be out of place in this volume.

Copper Sulphate—This substance has become an almost universal fungicide and is most used in a mixture with lime known as the bordeaux mixture. Standard bordeaux mixture is made up of four pounds copper sulphate, four pounds caustic lime and fifty gallons of water. But where the fruit is in a condition to be disfigured by it, it is used as a weak solution of copper sulphate alone. The bordeaux mixture is found in the market already prepared for use and under various names, and many of them have some value, especially where the amount of spraying is small and the

cost of procuring materials and making would be more than the crop to be sprayed would be worth, but numerous experiments have proved beyond doubt that the freshly prepared mixture is much more effective and cheaper than any thus far found in the markets.

Solutions of Copper Sulphate—Where the fruit would be disfigured by the bordeaux, the two solutions of this substance without the lime are used, the *ammoniacal solution* and the *simple solution*. These solutions are equally effectual with the bordeaux for the time being, but are so soon washed off, in case of rain storms, that they must be renewed after every rain, and wherever the bordeaux can be used it will be much more satisfactory because more lasting.

Insecticides and fungicides have become almost as much of a necessity as fertilizers in the growth of farm and garden crops, and to ensure success in the business, the fruit grower must be equipped with the best implements for their application.

The cost of this equipment is so great that many small growers cannot afford to purchase it and the only way that the work of the small grower can be profitably done is by co-operation. One powerful, well-built pump with proper nozzles and an abundance of hose would be sufficient to do all the spraying in most of our small townships, and one man who has become skilled in the work would do the same amount much more quickly and better than if it were divided among a dozen or twenty. The cost of material would be much less when bought in large quantities and there would be much less waste of material when all was mixed in one set of vessels.

There are often seasons and sections where our fruit crops escape injury from insect or fungous pests, but there are few localities where they always escape, and the cost of spraying is so small when done in a

business way that no one should risk a complete loss of a crop which is sure to come at times when the season is especially favorable to insect or fungous life. As these pests are so minute as to be illustrated only in a highly magnified form, a description is all that will be attempted, the reader being referred to more scientific works on the subject of fungous pests.

FUNGOUS PESTS ATTACKING THE APPLE

The Apple Scab (Fusicladium dendriticum)—This is an olive green spot fungus that attacks the surface of the leaves and fruit, and grows with especial vigor during moist, rather cool weather. It feeds only on the epidermis or skin of the leaf or fruit, often causing the former to fall off during the summer, but only disfiguring the fruit, unless it is attacked very early in the season, when it too falls off, or it is disfigured or one-sided. This fungus does not work in the tissues of the fruit but disfigures it and injures its looks and its keeping qualities. The spores or seeds of this pest are so minute as to be invisible except by the closest observation, and may be carried long distances by the wind. The only preventive is to have the copper solutions on the leaves and fruit to prevent the growth of these spores whenever there is moisture on them.

Remedy—Spray with the bordeaux in the early part of the season and after the fruit is nearly grown with the solution of copper sulphate.

Cedar Apple Fungus (Roestelia pirata)—This fungus appears in small yellow clusters on the under side of the leaves and sometimes on the fruit, and when very abundant both leaves and fruit fall off and the tree is seriously weakened.

Remedy—If the trees are sprayed as per spraying calendar issued by each State experiment station, little or no injury will come from this fungus.

Black Rot (Sphaeropsis malorum)—The dying of the end branches of the apple and pear, and the dead patches of bark also found on the large branches and trunk, are caused by this disease. The injured parts are nearly black in color and studded over with pustules or bead-like projections in which the spores are borne. It also attacks the fruit in large black masses or sometimes infests the entire apple. When attacked in the young stage the fruit hangs on the trees until the following season.

Remedy—Spraying as for the cedar apple fungus is effective.

Powdery Mildew (Podosphaera oxyacanthae)—This fungus attacks young apple seedlings in the nursery in the early summer and often so checks their growth that they cannot be budded, but is seldom injurious to large trees.

Remedy—The dipping of the seedlings in the bordeaux mixture before they are planted and one or two sprayings during the summer will generally prevent any injury. Trees planted in good soil on high land in full exposure to light and air, are less likely to be attacked than those in low places or moist soil.

FUNGOUS PESTS ATTACKING THE PEAR

The Apple Scab and Apple Rust, previously described, are also injurious to the pear, but not to so great a degree, and the remedies are the same.

Leaf Blight or Leaf Spot (Entomosporium maculatum)—This appears first as minute red dots that increase to from one-sixteenth to one-eighth of an inch in diameter, and when in large numbers cause the leaves to fall off in the middle of the summer, seriously weakening the tree, or if the fruit is attacked, causing it to crack. Sometimes a second set of leaves comes out late in the summer, or even blossoms appear, and

the wood fails to ripen, in which case the tree is very liable to injury during the winter or to the attack of the fire blight the following summer.

Remedy—Spraying as per the spraying calendars of the stations will entirely overcome the disease.

Fire Blight (Bacillus amylovorus)—This is a bacterial disease similar to the yeast plant in habit of growth that develops rapidly in moist hot weather. The minute cells (it is a one-celled plant) or spores enter the tree through some soft tissues, possibly the pistil of the flower, or some broken place where the bark has opened by the growth of the inner cells, when, if the weather is hot and the tree in the proper condition, it grows very rapidly, requiring but a few days to spread through an entire tree. The first appearance of the disease may be the wilting of the leaves of the branch or branches attacked. Sometimes only a small branch is attacked, while in others the attack may be on the main branches, which cuts off circulation, and large portions of the tree die.

Remedy—All diseased branches should be cut off as soon as the disease appears, as far back as the wood seems to be injured, and burned, and everything be done that is possible to give the tree a vigorous, but sound and hard growth of wood. Few trees will be injured by this disease if they are properly protected from the leaf blight during the summer.

FUNGOUS PESTS ATTACKING THE PEACH

Peach Scab or Black Spot (Cladosporium carpophilum)—In seasons when there are frequent rains and close moist weather this fungus is often destructive to many varieties of peaches. It is more prevalent on low land than where it is high and in full exposure to air and sunlight. When the fruit is attacked early in the season the growth of the parts affected is checked

and it becomes one-sided, falls off, or often cracks open. Even if only spotted the quality of the fruit is so injured as to be worthless.

Remedy—Spraying before the leaves appear in the spring with the strong bordeaux (4:4:50), and when the leaves have opened with the dilute bordeaux (4:4:200), will prevent its attack. It is best also to spray once after the leaves have unfolded and at least twice the last of July and early August. Paris green should never be used on peach foliage, but arsenate of lead may be safely used.

Brown Rot, Fruit Rot, Twig Blight (Monilia fructigena)—This is one of the most destructive of the fungi attacking the peach, causing the rotting of most of the early kinds and often some of the later kinds. It also attacks the twigs in the hot, moist weather of summer, often doing serious harm. The fruit is first turned brown and soon is covered with myriads of light gray or almost white spores. The branches attacked are killed, while the fruit drops off or dries on the tree, often remaining through the fall and winter. Such varieties as the Alexander, Triumph, etc., very seldom escape unless the ripening season is dry and rather cool.

Remedy—All dried or mummied fruit should be picked from the trees in the winter or spring and be burned and the branches sprayed with the strong solution of copper sulphate just before the leaves begin to unfold in the spring. Otherwise the treatment is the same as for the black spot. This fungus also attacks all of the stone fruits, and none of the dried fruit should be allowed to remain on the trees after new growth of leaves begins, as the spores are sure to increase the amount of this disease on the peach and other stone fruits.

Peach Curl (Exoascus deformans)—In seasons when the weather comes on very hot in May so as to

cause an early and rapid growth and is followed by very low temperature, the growth of the leaves is so checked that this fungus finds the right conditions in which to develop; the leaves become thickened and distorted and after a time drop off, to be followed by another set of leaves a little later. If the trees are vigorous and healthy the growth will be but little checked by this attack, but if the trees are not vigorous the injury is often very great. It is not often seriously injurious in orchards in rather light land and on high elevations. In the orchards of the Massachusetts agricultural college, which the author has had charge of for thirty years, no serious injury has occurred, but two seasons, and none to speak of for fifteen years, or since the practice of spraying has been a part of the routine of the care of the orchards.

Remedy—Spraying before the leaves unfold with the standard bordeaux, and again soon after they are well developed with dilute bordeaux (4:4:200), is a certain remedy.

Peach Yellows—This is an obscure disease, or condition of growth, of which no specific fungus or bacterial germs or growth has been discovered. It shows itself in many different ways. When it attacks the tree it may be known by a smaller growth of leaf, narrow, of a lighter color in its first stages, and as it advances they grow in clusters or tufts and are often of a reddish color; sometimes only one branch is affected, but sooner or later the whole tree will die unless it be severely headed back and fertilized abundantly. The fruit ripens prematurely, is of a more brilliant color than is usual, and often bitter to the taste. It is also of small size. Most old trees as they approach maturity show all of the symptoms of the yellows. The disease is probably of a physiological nature and may be brought on by any cause that

weakens the tree, as severe weather in winter following a season of coarse and immature growth, overbearing, injury from insects, etc., etc.

Remedy—The disease being of so obscure a nature it is not profitable to spend much effort in trying to doctor sick trees, especially as young trees can be grown to bearing size in three years' time, and when trees show unmistakable signs of the disease it is best to pull them out and burn them at any time during the summer, fall or winter, and plant young trees in their place. This is the practice in the large peach growing sections of Michigan and other States. Anything that can be done to increase the hardiness and firmness of the wood and bud growth will tend to protect them from this disease, as frequent cultivation, or the application of an abundance of potash and phosphoric acid, with only nitrogen enough to produce a moderate amount of wood, etc.

Peach Rosette is a disease somewhat of the same nature of the yellows, but appears earlier in the season and is characterized by a more leafy growth, and should be treated the same as the yellows.

Powdery Mildew (*Podosphaera oxycanthae*)—See under the apple.

Leaf Rust (*Puccinia pruni-spinosa*)—See under the plum.

FUNGOUS PESTS ATTACKING THE PLUM

Black Knot, Black Wart, etc. (*Plowrightia morbosa*)—More of the plum trees of both the European and Japanese varieties are destroyed by this pest than by any other causes. It is known by the large black excrescences seen on neglected plum trees, and is a fungous growth, the spores of which enter the tissues at some soft place, and, growing rapidly, soon cause the death of the tree unless checked in its early development.

Remedy—If the trees are sprayed with the bordeaux mixture (4:4:50) as per spraying calendar of the stations, this fungus will be kept under control. If any warts appear they should be cut off and burned in the winter or spring before growth begins.

Shot-hole Fungus (Cylindrosporium padi) (Septoria cerasina Peck)—This fungus attacks all of the plums, and in very moist seasons is very destructive unless the trees are thoroughly sprayed. It first appears as small red spots in the leaf which soon increase in size and turn brown. After a time the brown part of the leaf drops out, leaving small holes, which gives the name to the disease.

Remedy—Spraying as for the last named fungi.

Leaf Rust (Puccinia pruni-spinosa)—In its effect upon the tree and in general appearance this fungus is very much like the last; the spots, however, are smaller and as a rule, more numerous, and cause the leaves to fall in the same way. In some sections of the country it is more prevalent than the shot-hole fungus and in others less so. Both are readily controlled by spraying as above described.

Plum Pockets, Plum Bladders (Exoascus pruni)—This fungus attacks the fruit while young, causing it to swell until it often reaches full size in a few days, first light green or yellow, then as the spores develop on the outside, it assumes a grayish color and then a dark brown. The American varieties are more subject to its attack than are the European or the Japanese.

Remedy—Spraying as for the last two fungi will be found effectual in keeping this pest in check.

Brown Rot (Monilia fructigena)—See under the peach.

Powdery Mildew (Podosphaera oxyacanthae)—See under the apple.

FUNGIOUS PESTS ATTACKING THE QUINCE

Black Rot (*Sphacropsis malorum*)—Previously described under the apple.

Fire Blight (*Bacillus amylovorus*)—This disease, previously described under the apple, rarely attacks more than the twigs of end shoots, sometimes destroying all of the fruit, but I know of no instance where the whole tree has been destroyed, or even permanently injured.

Remedy—Cutting off the diseased shoots and keeping the trees in a healthy condition are the only preventive measures thus far known.

Leaf Blight (*Entomosporium maculatum*)—The leaf blight of the pear is often as destructive to this fruit. See under the pear.

Quince Rust (*Roestelia aurantiaca*)—This rust is similar in growth and appearance to the cedar apple fungus described under the apple. It attacks the fruit and also the branches, and when in the fruiting stage gives the parts attacked a golden yellow color. During the fall and winter the injured parts are black.

FUNGIOUS PESTS ATTACKING THE CHERRY

Brown Rot (*Monilia fructigena*)—See under the plum.

Leaf Blight (*Cylindrosporium padi*)—See under the plum.

Black Knot (*Plowrightia morbosa*)—See under the plum.

Powdery Mildew (*Podosphaera oxycanthae*)—See under the apple.

FUNGIOUS PESTS ATTACKING THE GRAPE

Anthracnose, Scab, Bird's-Eye Rot (*Spaceloma ampelinum* DeB.)—This is one of the most destructive

diseases that we have, growing as it does on all parts of the vine, and in its early stages so difficult to distinguish. In its first stage of growth it presents minute circular brown spots on the fruit and larger dark gray or reddish-brown areas on the stems and leaves. Some varieties are more subject to the attack of the anthracnose than others, those containing European blood, i. e., those originating from crosses of European and American varieties, being more likely to be attacked than pure native seedlings like the Concord, etc.

Remedy—Spraying with the bordeaux mixture before the leaves unfold and two or three times in May and June, as per spraying calendars, is effectual in keeping this disease in control.

Black Rot (Guignardia Bidwellii)—This disease is called the black rot from the fact that the fruiting pustules and the fruit, in its last stages of disease, are black, though when it first appears it is grayish in color. In the center of all the diseased spots, whether on the leaves or fruit, may be found numerous black pustules which contain the spores of the fungus. It appears most abundantly and does the most injury when the berries are nearly full grown.

Remedy—Thorough spraying must be done throughout the season to prevent injury when the disease has once become established. See spraying calendar.

Downy Mildew, Brown Rot, Gray Rot (Peronospora viticola)—The stems, leaves and fruit are attacked by this fungus, which in moist, hot weather is likely to do serious harm unless spraying is practiced. On its first appearance the leaves are of a lighter green on the parts attacked, which is soon followed by a whitish powder, the spores of the fungus, that are scattered by the wind and are sure to grow when the weather is hot and moist. Leaves, fruit and canes are subject to attack.

Light rains or misty weather are especially favorable to its growth, but heavy rains wash off the spores and are therefore preventive. Such varieties containing foreign blood as the Delaware, Brighton, Rogers Hybrids, etc., are especially subject to this disease and the next.

Remedy—First, do everything possible to insure a vigorous, strong vine, then spray with the bordeaux according to the calendar.

Powdery Mildew (Uncinula spiralis)—This fungus is similar to the last in its effect upon the leaves and stems of the grape, and sometimes attacks the fruit, but it does not appear, generally, until late in the season. It is darker gray in color and often covers over every part of the leaf and young cane.

Remedy—Where this pest is abundant spraying must be done the last of August and early September with the simple solution of copper sulphate, four ounces to fifty gallons of water, and repeated once or twice if heavy rains wash it off. The bordeaux mixture cannot be used at this time, as it would disfigure the fruit by adhering to the stems.

FUNGOUS PESTS ATTACKING THE RASPBERRY

Anthracnose, Cane Rust (Gloeosporium venetum)—Similar to the anthracnose of the grape, appearing in June and July and attacking the new canes principally, but sometimes the leaves also. On old plantations it is more destructive than on those recently planted.

Remedy—The free use of the bordeaux mixture once before the leaves unfold and once or twice after the leaves have opened, but before the fruit has set, will control this disease.

Leaf Blight, Leaf Spot (Septoria rubi)—This disease appears the latter part of summer in the form of small, light brown spots, attacking the lower leaves first and working toward the top of the canes, so that

at the end of the season only a few of the upper leaves remain uninjured. If this loss of leaves occurs early in August, as it sometimes does, the canes are very seriously injured.

Remedy—Spraying as for the anthracnose will also overcome this disease.

Spring Orange Rust (Coema luminata)—This disease first appears in the spring, the leaves and canes attacked being light green in color, which is followed by large masses of golden yellow spores, and the final drying up of the parts attacked. The spores probably germinate during the summer and fall and grow in the tissues near the ground, to start into vigorous growth with the new growth of the canes in the spring.

Remedy—The spraying done for the anthracnose and leaf blight has but little effect upon this pest, as it is growing inside of the plant, but if the plants are thoroughly sprayed two or three times after the fruit is gathered in the summer, the spores will be prevented from germinating and becoming established in the new growth during the latter part of the summer. Also, as soon as the disease can be detected in the spring, all affected canes should be removed and burned.

Fall Orange Rust (Phragmidium albida)—This disease appears during the latter part of summer and early fall on the under side of the leaves of many varieties of the raspberry and blackberry. The clusters of spores are bright orange yellow and are much more scattered than those of the spring orange rust.

Remedy—If spraying is done as soon as the fruit has been gathered, as for the last disease, it will prevent serious injury.

FUNGOUS PESTS ATTACKING THE BLACKBERRY

Leaf Spot (Septoria rubi)—See under the raspberry.

Spring Orange Rust (*Coema luminata*)—See under the raspberry.

Fall Orange Rust (*Phragmidium albida*)—See under the raspberry.

FUNGOUS PESTS ATTACKING THE CURRANT

Anthracnose, Leaf Blight (*Gloeosporium ribis*)—A fungus that appears first in rather fine dots on the leaves the latter part of June or July, and when in large numbers causing the leaves to fall in a few weeks, leaving the canes bare until the following spring. The result of this is that they make but little growth and bear very small or very little fruit the season after being attacked.

Remedy—Spray with the bordeaux mixture thoroughly just before the leaves unfold and again just before the blossoms open, using Paris green the second time for the currant worm. A third spraying with a weak bordeaux (4:4:200), having it well strained so as not to disfigure the fruit, about the first of July, will be beneficial.

Rust, Leaf Spot (*Septoria ribis*)—Similar to the last in general appearance, but producing larger spots and coming later in the season. It attacks the lower leaves first and works toward the top of the canes, until only a few leaves are left on the canes.

Remedy—Same as for the last.

FUNGOUS PESTS ATTACKING THE GOOSEBERRY

Mildew (*Sphaerotheca morsuvae*)—The foliage and fruit of the gooseberry are often covered with a light gray powder early in the season that stops growth of the bush and destroys the fruit. In dry, rather cool seasons there is little of this disease.

Remedy—If abundantly sprayed with the bordeaux mixture early in the spring and before the fruit is full

grown, and with the dilute bordeaux as it approaches maturity, the injury will be largely prevented.

Rust, Leaf Spot (Septoria ribis)—See under the currant.

FUNGOUS PESTS ATTACKING THE STRAWBERRY

Leaf Blight, Rust (Sphaerella fragariae)—The reddish or brown spots that come so abundantly on the leaves of the strawberry in the spring or summer are caused by this fungus. It grows most abundantly in warm, moist weather, and when the plants are in a weakened condition from any cause.

Remedy—To insure the best results from the use of the bordeaux mixture, the leaves of the plants should be dipped in it before they are set in the spring, and the growing plants sprayed several times during the summer. In the spring, before fruiting, the beds should be sprayed once or twice before the blossoms open.

Mildew (Sphaerotheca castagnei)—The fungus produces a light grayish growth on the surface of the fruit and leaves in the spring that seriously checks the growth of the plants and injures the berries.

Remedy—A vigorous growth of plant should be produced by an abundance of plant food in the soil, and the use of the bordeaux for the leaf blight will do the rest.

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