

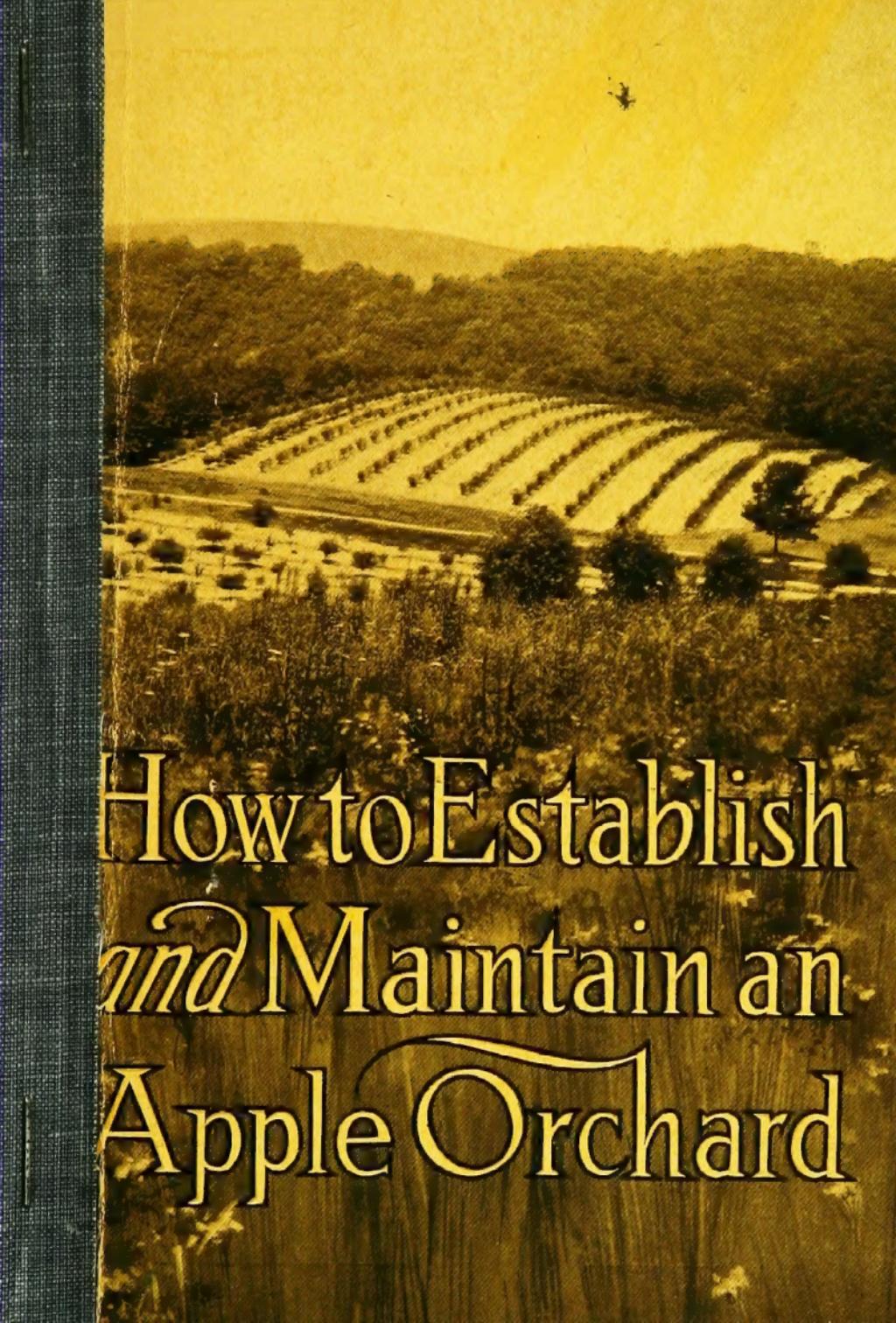
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How to establish and maintain an apple o



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A sepia-toned photograph of a rural landscape. In the foreground, there's a field of tall grass and weeds. Behind it, several rows of fruit trees are planted in a hilly area, creating a series of curved lines. The background shows more hills covered in vegetation under a clear sky.

How to Establish *and* Maintain an Apple Orchard

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George T. Powell.

How to Establish *and Maintain an* Apple Orchard

By George T. Powell

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Longacre Bldg., 42nd St. & Broadway
New York City

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HOW TO ESTABLISH AND MAINTAIN AN APPLE ORCHARD

THE APPLE is the great standard fruit and is in universal demand. It is no longer a luxury, but like bread, has become a necessity throughout the months in which it may now be readily obtained.

It is not only beautiful in appearance and in its many food-forms luscious in taste, but it contributes much to the tone and health of the body. There is no other fruit at the present time that commands such widespread interest, and that is being so extensively planted.

While the apple will grow throughout a large territory and in a wide diversity of soils and under differing climatic conditions, good and high-flavored fruit may be produced only in soils and at elevations that are well adapted to its requirements.

Selection of Site

In establishing an orchard that is to be productive (as it should be), for more than a century, the elevation should be in a range of from 400 feet to 2,000 feet above sea level. The land should be rolling or sloping in character, while the soil should be a strong deep loam of limestone formation.

The elevation is important, for upon this is dependent the health and longevity of the trees. They thrive best in a pure atmosphere where there is always a good air circulation and good soil drainage. On high and sloping land, good natural water-drainage is assured. This is as essential to trees as is pure air.

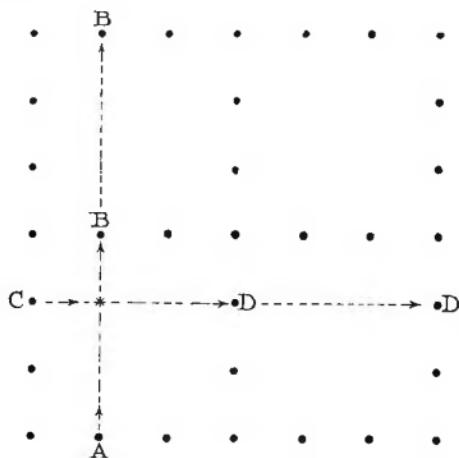
On elevated sites, furthermore, there is less danger from late spring frosts, for when the temperature runs low, cold air moves down to lower levels, just as water flows from springs, to brooks and streams below, which in turn run on to still lower levels. A difference of fifty feet greater elevation will often save blossoms from destruction by frosts.

Good water-drainage is very important. The roots of trees must have good air about them in the soil the same as do their bodies above the ground. On low level land, even with artificial

drainage (which is expensive), the soil often becomes saturated during wet spells, when fungus troubles will develop and trees become diseased and weakened, and fail to produce fine fruit — their life at the same time being measurably shortened.

Preparation of the Soil

Soil that will produce sixty bushels of corn to the acre may be profitably converted into an apple orchard. If the field is in sod, it should be broken up and a crop of corn grown, so that in the year following, the land will be in proper condition for planting the trees.



How to Lay Out the Planting Plan

A map or diagram of the proposed orchard giving the distances the trees are to be planted apart, and the names of varieties, is quite necessary and most valuable for future reference.

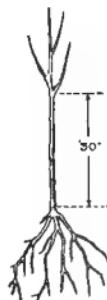
After the land is plowed, set stakes on the four sides of the field at such distances apart as the trees are to be planted. Stake out two rows of trees through the center of the field at right angles to each other as shown above, and locate the holes where the other trees are to be set by sighting across the stakes, as from A to B and C to D. This will secure alignment in all directions, and is as simple a plan as can be devised.

There are two systems of planting that may be adopted — one of planting permanent trees only — the other of inter-

planting with filler trees of early-bearing habit. The latter plan will give earlier and larger profits, and on this plan the permanent trees should be set forty-five feet apart each way, and the fillers midway between them. This will require twenty-two permanent trees and sixty-six filler trees to an acre — a total of eighty-eight trees.



TWO-YEAR OLD TREE
FROM NURSERY



SAME TREE PRUNED
FOR PLANTING

A few varieties such as Yellow Transparent, Duchess, Wagner and Jonathan, that do not grow to large size, may be planted thirty-five feet apart each way. They may be planted in blocks with fillers of the same varieties, but in doing this, they should be given the forty-five foot space.

Planting the Trees

When the trees (which should be two years old), are received from the Nursery, prune the roots by cutting them back one-fourth their length, then prune off all branches excepting four, so leaving them that they are separated from three to four inches on the body of the tree. This will avoid crotches, which would later result in the breaking down of the branches. Prune the ends of these four remaining branches back one-half, and the tree is ready to plant. Form the head of the tree 30 inches from the ground. Trees may be planted in either Spring or Fall.

Vigorous one year old trees are also desirable for planting.



A WAGENER (STANDARD) TREE, FIVE YEARS PLANTED

If the subsoil is of a somewhat loamy character, exploding a half-stick of dynamite two feet under the soil, will open and loosen it admirably. Another method, at less cost, is to plow deep open furrows in line with the stakes, when with a little shoveling out of the soil, the trees may be planted.

The trees should be set three inches deeper than they stood in the Nursery. Roots should be spread, and the earth pressed very firmly over them. Every tree thus planted should grow.

The Propagation of Trees Through Selection

It is of the most vital importance to select trees that have been propagated and grown under scientific principles and methods.

In orchards of the past, there was great want of uniformity in growth, form, vitality and productiveness. This arose from the fact that in the selection of buds for the propagation of Nursery stock, no regard had been paid to the individual qualities of the trees from which the buds were taken, which was usually from the young and immature trees in the Nursery.

Where buds are used from mature trees that have a record for hardiness, constitutional vigor, resistance to disease, and for early bearing, productiveness, and a large degree of uniformity in the character of the fruit, an orchard of trees propagated with buds thus selected, and combining these necessary characteristics, will return far greater profits and yield much greater satisfaction than those not possessing such inherent qualities.

There is existing difference of opinion upon the value of this line of work in the propagation of trees, but with the most satisfactory results from bud selection with orchards of Thompkins Kings, and other varieties running through four generations, and covering a quarter of a century, we consider such evidence more convincing than the theories that may be urged against it.

While it is true that soil, cultivation and fertilization will greatly help all trees, it is nevertheless also true that trees propagated from specially selected quality, will be superior over a long term of years.

To accept the theory that trees are an exception to the general law of improvement through selection in their propagation and development, is not in accordance with the results that are produced in every other line of work.

Varieties of Apples

The success of an orchard is largely dependent upon the selection of varieties that are suited to the locality, in its soil, climate and market requirements. Many of the apples of New England and the Middle States are not adapted to the Southern

apple districts. Likewise most of the apples of the South are not suited to Northern sections.

The Northern Spy, Baldwin, and Rhode Island Greening, (the best standard Winter varieties in New York and New England), are Fall varieties in Virginia and other Southern States, ripening out of season and not developing their inherent fine flavor and keeping quality.

The Newtown Pippin is particularly excellent when grown in the Hudson River Valley, on Long Island, and in the Piedmont Section of Virginia. While this variety grows to a large size and is beautiful in appearance as grown in the Pacific coast territory, it does not have the fine, uniform, high flavor of those grown in these more favored sections of the East. Apples grown in a dry atmosphere have longer keeping qualities than those grown in a more humid climate, but the future demand will be for high flavor rather than for long keeping.

The York Imperial and Winesap are particularly fine and of high quality, grown in Southern Pennsylvania, Western Maryland, and Virginia, but these varieties should not be attempted in a New England climate.

The Spy is not suited to all sections and soils of the North. It is much finer when grown on a light loam or shale-soil, and on high elevations, where its flavor and color will be of the highest. When grown on lower levels in a heavy clay soil, the apples will be large, coarse, and of poor color, while the trees will not begin to bear much fruit in from fifteen to twenty years. In the right soil and elevation they will bear in six or seven years.

For New England the Baldwin is the most valuable commercial variety. It is firm, juicy, of high color, moderately large in size and of excellent flavor. It is in universal demand in home markets, while for the export trade it has no equal.

The Rhode Island Greening is a standard variety of the highest value for New York and New England.

So general has become the use of apples, that Summer and Fall varieties are now very desirable products, as they are increasing in demand, even during the season when peaches and other fruits are in most plentiful use. Autumn apples should therefore be planted in moderate quantity, where long-distance shipping to market is not required.

The following varieties are among the best standard kinds that are desirable for planting, and that are well known in most markets. Those marked with (*) are better suited to the more Southern and Western territory.

For Summer

Red Astrachan	Williams Favorite
Yellow Transparent	*Red June

For Autumn

Duchess	Twenty Ounce
Gravenstein	Wealthy
Fall Pippin	

For Winter

Baldwin	Rome Beauty
Rhode Island Greening	*Stayman's Winesap
Northern Spy	*York Imperial
King	Winter Banana
McIntosh Red	*Huntsman
Newtown Pippin	Jonathan
Esopus Spitzenburg	*Gano
Pound Sweet	*Black Twig
Bailey Sweet	*Grimes Golden
Wagener	*Kinnagell's Choice

Many other desirable kinds for home use as follows:

Early Harvest	Chenango Strawberry	Roxbury Russet
Golden Sweet	Knickerbocker	Gilliflower
Sweet Bough	Delicious	Lady Sweet
Fameuse	King David	Cox Orange Pippin
Richards Graft or Fall Strawberry		

Crab Apples

Hyslop	Transcendent
Large Yellow Siberian	Excelsior (a table variety)

In selecting varieties for commercial orchards, study those of the locality that have been thoroughly tried—plant such and not to exceed two, or at most three varieties for each season. There is far greater economy in the handling of labor and in every operation in marketing to have large quantities of few kinds.



DWARF NORTHERN SPY, FIVE YEARS PLANTED

Dwarf Apple Trees

Except in gardens, dwarf apple trees have not been much planted. There are two types—those propagated on Doucin roots, known as the half-dwarf, and those on Paradise roots, which is a smaller type of tree. Paradise trees may be planted 10 x 10 feet, which gives 435 trees to the acre, while Doucin trees planted 20 x 20 feet, give 110 to the acre.

Dwarf trees require much more labor in every way—in pruning, fertilizing and in high culture. For the more complete control of insects, in thinning and picking the fruit, and the larger number that may be planted to an acre, they are desirable, especially for small places and in suburban gardens.

They may be used for ornamental planting in a border or hedge in landscape work. Nearly all varieties may be obtained in the dwarfs.

They need to be planted deeper than standard trees. The union between the bud (the point where the bud is inserted in the stock), should be four inches under the soil when planted. Dwarf trees are not generally planted deep enough, for later, when bearing fruit, they sometimes break off at the union and frequently blow over in times of heavy wind, especially when the soil is wet and soft. Doucin trees planted twenty by twenty feet, requiring 110 trees to an acre, may have Paradise trees of the same variety planted one way between them which will make 220 trees per acre. The Paradise trees may be taken out later when the space is needed by the Doucin trees.

The cost of planting an acre of apple trees on the inter-planted or filler plan (the permanent trees to be forty-five feet apart and fillers twenty-two and a half feet apart), will be as follows:

88 trees at 30 cents.....	\$26.40
Plowing the land.....	3.00
Laying out planting plan and plowing deep furrows along tree lines.....	1.00
Planting trees	1.76
Harrowing and cultivating trees after planting	3.00
20 pounds of Clover Seed for cover crop	3.00 \$38.16

If permanent trees only are planted the cost for trees will be \$6.50 per acre.

For six years following, the annual cost for cultivation, spraying, pruning and cover crops will average \$12.60 per acre.

When fertilizers are required, add \$6.00 per acre.

If crops of small fruits and vegetables are taken off between the rows, a ton or more of fertilizer should be used per acre, but the crops should pay the entire cost and leave some profit.

All cropping should cease by the fifth year. In the seventh year in the East, varieties like Duchess, Wealthy, McIntosh, and Wagener should produce from \$50 to \$80 an acre, with a steady increase in yield and value thereafter.

Where the sub-soil is somewhat hard or stiff, exploding it with a half-stick of dynamite where each tree is to be planted, will be of value and will aid in more rapid growth of the trees. Where the soil is naturally open or porous this will not be necessary.

Cultivation

When an orchard is planted the work should not end there, though, in too many instances further effort ceases. This is why there has never been overproduction of apples. If all the trees that were planted lived to produce fruit there would be many more apples than could be sold or used, but for the want of proper cultivation and care not 40 percent of the trees mature.

In commercial orchards the soil should be thoroughly tilled. This operation will keep the trees in a vigorous growing condition. If the planting is done in a small or suburban lot, plowing and cultivation with horses may not be practicable but the soil may be spaded or dug about the trees even if for only a distance of four or five feet, and the result will be beneficial. The soil may be raked or hoed frequently throughout the season, thus keeping a dust mulch over the top.

In the commercial orchard it is well to plant corn for the first two years, as this will shade the young trees during the hot months of July and August, and the cultivation given the corn is excellent for the trees. Potatoes may be grown providing five hundred or six hundred pounds of special potato fertilizer is applied to the acre for each crop grown, otherwise

the soil will deteriorate. It is not wise to sow the small grains or to grow grass in young orchards. It is sometimes desirable to grow small fruits such as strawberries, currants and raspberries in the open spaces between the trees, leaving, however, a space of not less than six feet along the row of trees for cultivation. These crops if grown, should also be fertilized annually with five to six hundred pounds per acre of a commercial fertilizer. After the trees begin to bear fruit, especially where they are interplanted with fillers, it is better not to grow other crops, but rather plow the soil in the early spring, and harrow and cultivate it weekly until about the first of July. At that time sow red and crimson clover in equal parts at the rate of eighteen pounds per acre and cover the seed by harrowing the ground lightly.

Clover is a leguminous plant. By the aid of certain soil bacteria, small nodules are produced on the roots which have the power of gathering the free Nitrogen from the air. In this manner, it is therefore possible to add Nitrogen to the soil in a most desirable form. Another object of clover culture is to cover the soil during the winter, which is highly necessary after the fine tillage it has received, to save the washing away of valuable fine particles of soil during the heavy rains of autumn and winter. Still another purpose in sowing clover is for the improvement of the soil texture. Clover roots penetrate deeply and bring up from the sub-soil unused plant food. It also adds to the vegetable matter or humus, which is an important factor in holding and conserving moisture.

The clover should be plowed under, the following spring, the soil again cultivated until the early part of July and then re-seeded with the clover mixture. Crimson clover being an annual will grow rapidly and make a large plant by the latter part of autumn. The red clover having a longer tap-root will stand the winter better and will frequently come through the spring in good condition, while the crimson will be more or less killed by the freezing and thawing weather. The crimson clover, however, did its work the preceding autumn, having left in the soil a good supply of Nitrogen. Do not cut or remove the clover, rather leave it to nourish the soil.

There is much interest and discussion over a system of



mulching the soil by allowing grass to grow, then cutting it and placing it about the trees. While there may be a few favorable instances with naturally moist soil, where this system will work quite satisfactorily, yet in the great majority of locations this plan will not be wise to adopt. Tillage combined with sowing of clover as a cover crop will give far better trees and fruit. In the mulching system there is always greater trouble from insects and vermin. Field mice find this an excellent place in which to harbor, and many trees have been ruined by them. Even though wire protection is placed about the trees a deep fall of snow will permit the mice to girdle the trees above the wire. From these points it will be seen that it is not wise to plant orchards upon land that cannot be cultivated. There are, however, many orchards especially in New England, planted among rocks which live and thrive to a certain extent.

Pruning

After apple trees are properly planted, but little pruning will be required for about five years. The trees having been given the right form at the time of planting, will require only a branch to be taken out from time to time, that inclines to grow toward or across the centre. A study of the future form of the tree will enable one to see when a branch is putting out in a place where it should not be allowed to grow.

The only pruning tool required for the first five years after planting, is a pocket pruning knife. If, due to neglect during the early stages, large branches have to be taken off later, there is not only too much shock given to the tree, but it is exposed to bacterial troubles by way of which diseases are introduced, shortening the life of the tree and reducing its value. When young trees are continuously pruned they are stimulated in making growth of wood, and the bearing of fruit is deferred. Where but little pruning is done, fruit spurs will begin to form on the lower parts or branches of the trees, and orchards will come into profitable bearing several years sooner than where constant annual pruning is done.

For illustration the Northern Spy, one of the choicest of all varieties, as usually pruned, is a long time in coming into bearing, often fifteen years, before it will show evidence of fruit-



SEVEN-YEAR OLD MCINTOSH APPLE TREE — YIELDED NINE BUSHELS IN 1911

ing, yet it is possible to have this very excellent variety bearing freely in seven or eight years from the time of planting.

Allow practically all of the wood to grow, up to five years, then begin gradually to take out entire branches so as to give the right form. Fruit spurs will begin to form, but a few specimens only of fruit should be allowed to remain and mature during the first two or three years.

Each year more fruit spurs will come out, when the trees will begin to steadily increase in bearing tendency and capacity. Removing wood in annual pruning stimulates an excessive growth which retards the bearing period.

Under this system of light pruning during the first five years after planting, the writer has taken nine bushel-boxes or three full-barrels of apples from individual trees, in the seventh year.

For economy of operating, in spraying, thinning and picking the fruit, low trees are better than high ones. The leaders should be cut back once in two or three years to prevent the trees from growing too high. Give an outward form to the tree rather than too much of the upward.

Prune the lower branches to give them an upward growth — prune back their ends and cut off all branches that incline to grow downward from the under side of the lower branches. This will give strength to the low branches near the body of the tree and help to keep them up from the ground.

Under this system of pruning, there is no more difficulty in cultivating low headed trees than in those started with high heads, for the branches hold up well and are made strong and heavy, close to the body of the tree. In pruning, a fine narrow saw should be used, one that will make a smooth cut. Prune close to the main branch. Do not leave stubs one or two inches long. They will not heal and are attacked by bacteria which produce disease, making short lived trees. Paint every wound that is over one-half an inch in diameter. Any kind of paint will answer, although disinfecting paints may now be procured.

After the trees come into free bearing not much pruning will be required, as growth of wood will be checked, and branches will then be carried outward and downward by the weight of the apples, where the sun will reach all parts of the tree and give the fruit good color.

Cut down and make the tops of trees as even and level as possible, as shown on page 16. It is on the long shoots in the tops of the trees that the San Jose scale spreads, and these are difficult to reach in spraying.

The rest of the tree may be well sprayed but the few live scales left on the tall shoots, breed and descend, and by picking-time a large number of apples will be marked by them. Prune the tops down to a level when this loss will be prevented.

A good pruner needs to be somewhat of an artist or architect. He must have a sense of form and be able to keep in mind an ideal of the future shape of the tree that will result from the pruning to be done in a period of five to ten years, during which time the tree is being given proper form, that is to last for a century or more of time.

In pruning dwarf-trees, start the branches down within sixteen inches of the ground and keep the tops down. Allow Paradise trees to reach ten feet in height only, and Doucins not above eighteen feet. Cut back the annual growth one-half, and thin out the branches so as to have the trees well opened, that the sun may shine on all parts of the foliage and fruit.

Pruning as late as possible — the last of May — will have a tendency to check the growth somewhat and keep the tree more easily dwarfed. Pruning when the trees are dormant — in the winter — will promote growth, but when done late in the spring even after the foliage has come out, will check excessive growth of wood, which with dwarf trees is necessary. This will also apply to standard trees but there is usually not the time to do pruning in large orchards in May.

Spraying

With the great increase of insects and of tree and plant diseases, spraying for their control has become a necessity and is now a regular part of orchard work.

There are over three hundred different kinds of insects that prey upon apple trees and their fruit. Some of these cause enormous annual losses but they may be brought under control.

It becomes quite necessary to understand the object of spraying — when — with what — and how it should be done.

There are two purposes for which spraying is done — one,

for the control of insects, the other to eradicate disease. There are two types of insects, each of which requires different treatment. One is known as chewing insects — those having cutting jaws and which eat — the other known as sucking insects — those that pierce the foliage or bark of trees and suck the sap from them. As the first type eats, poisons are used in spraying. For the second type, oil emulsions and caustic preparations are used, which are brought in contact with the bodies of the insects. The Aphides or plant lice, which are of the sucking class, breathe through openings upon their bodies, and in spraying oily substances over them, their breathing places are closed and they are destroyed.

The San Jose Scale is one of the most serious insect pests of the apple, and belongs to the sucking class. For its successful control two sprayings are necessary, using first a miscible oil — one gallon of the oil to fifteen of water — in the early winter or as soon as the foliage is off the trees. The next spraying should be done in the spring — near the time of the swelling of the buds — using one gallon of Lime and Sulphur in nine gallons of water. In the spring spraying, it is desirable to add two pounds of Arsenate of Lead to fifty gallons of Lime and Sulphur, which will destroy the Bud Moth, that works inside of the bud and ruins it. The Blister Mite is another insect that is checked by this spraying. It is encased within the folds of the leaf buds and works inside of the leaves, weakening them and causing them to fall before the apples are fully developed or matured.

In these sprayings great thoroughness must be exercised. Every part of the tree must be covered with the mixtures. The San Jose Scale crawls out to the tips or ends of the branches and if these are not reached, they will hatch during the season, crawl down upon the lower parts of the trees, and before picking-time both the branches and fruit will be covered, and the apples made unsalable.

There are several generations of the scale that increase in a ten-fold ratio, and one pair in the spring will be the progenitors of over 3,000,000 in a single season.

The next spraying will be for the Codlin Moth which is a fruit insect. The moth usually lays one egg upon a young apple, very soon after the blossoms have fallen, and it will lay about

fifty in number. The eggs will hatch in from six to eight days, when the larva crawls to the blossom end, eats its way inside, lives there for several months and eats its way out of the apple, making a hole and a blemish that injures the fruit for sale.

To control this insect the fruit should be sprayed with Arsenate of Lead as soon as the blossoms have fallen, forcing it into the calyx end of the blossoms that the poison may be there when the larva begins to eat its way into the apple, as it does at that point.

At this time also, for the protection of the apples against a fungus that attacks them, and known as the Apple Scab, a fungicide is used, of which there are several kinds. Those in most general use are Bordeaux Mixture, Lime and Sulphur, Pyrox, Sulfocide and some others. Bordeaux Mixture is made by dissolving three pounds of Sulphate of Copper and three pounds of Lime, and putting them in fifty gallons of water. One gallon of Lime and Sulphur is put into forty gallons of water to which may be added two pounds of Arsenate of Lead, and both sprayed upon the trees at the same time. Do not use Arsenate of Lead in the other materials. Another spraying should be made about twenty days later.

In many sections in the South, a second brood of Codlin Moth will appear towards the last of July, when another spraying with Arsenate of Lead without the fungicides should be made. This will also apply to Southern New York, New Jersey, and Southern New England.

These treatments should ensure 95 per cent. of perfect fruit. In using spray-materials which are obtained ready for use, follow closely the directions of the manufacturers.

The Apple-tree Tent-Caterpillars are leaf-eating insects, and many of these will be killed at the time of spraying for the Codlin Moth, but when they build their silken nests they should be taken out of the trees. This may be done by tying a piece of cotton cloth in the form of a small bulb on the end of a fish pole, running it into the nest and by a turning motion roll the nest and caterpillars on the end of the pole when they may be brought down and crushed on the ground. Do not use torches for this work. The burning injures the trees.

The Canker or Measuring Worm appears periodically in

some localities usually in June or early July. These caterpillars, unless checked, will completely defoliate the trees in ten days. On their first appearance one thorough spraying with two and one-half pounds of Arsenate of Lead in fifty gallons of water will destroy them and save the foliage and fruit from injury. These different sprayings will prevent the increase of a large number of other insects that are of minor destructiveness.

Along in July and August will appear the Tussock Moth and the Fall Web-worm. The former may be prevented from doing injury to the foliage by spraying with two pounds of Arsenate of Lead in fifty gallons of water, but the latter, like the Tent Caterpillar, makes a web and should be taken out with the pole. These caterpillars work on shade trees as well as on fruit trees.

The Gypsy-Moth is one of the worst pests of the entire number. This, at present, is confined to New England. The moth lays eggs in July and August, which hatch in the following May. As soon as they begin to hatch, spray thoroughly with a mixture of six pounds of Arsenate of Lead, to fifty gallons of water. If not all killed, spray again in two weeks.

The Brown-tail Moth is another most serious pest and like the Gypsy Moth is of foreign importation. The eggs are laid in July and hatch out in August. Spray with a mixture of three pounds of Arsenate of Lead to fifty gallons of water, as soon as they begin to hatch in August, and again in the Spring for those that may have been missed.

Look over trees for the Apple Tree Borer, and note if there is any "saw-dust" at their base. If so the borers are working in them. Cut away the bark slightly and run a small soft wire into the opening and pull out or kill them in the hole. Bisulphide of Carbon injected in the hole and grafting wax applied to the opening will be found effective. These borers work in the lighter soils and soon destroy the trees unless promptly taken out. Examine the trees in June and October.

Bordeaux Mixture, Lime and Sulphur, Sulfocide, Pyrox and several other fungicides are used with insecticides. Spray according to the manufacturers' directions.

The losses to fruit and other crops from insects amount to \$800,000,000 annually. Thorough and timely spraying will prevent a large part of this loss.

Diseases and Injuries

While trees have much to contend with from the attacks of insects, they are also exposed to fungus infections, and the struggle against disease is constant.

Among some of the most prominent of these which affect the wood and fruit are Blight, Canker, Crown-gall, Mildew, Scab, Rust, Brown Rot, and Bitter Rot. Heavy pruning will check Blight and often save the trees. Blight results from immature wood, the sap of which is frozen in times of low winter temperatures. The blossoms are first affected in the spring through the circulation of diseased sap. Bees in seeking the nectar in blossoms spread the disease among healthy blossoms and in this manner, entire orchards become infected. Prompt pruning on first evidence of the disease will save many trees. Cut back to sound healthy wood and disinfect the pruning tools with a weak solution of carbolic acid, after the pruning of each tree.

Reject trees that are received from the Nursery with marked growth of Crown-gall upon them — an unnatural enlargement close to the union between the tree and the root.

Canker is the result of fungus that develops in the wood of the tree through some wound that has been made upon the bark. As the disease progresses it often encircles a branch, which dies. It also makes deep cavities in the body and large branches of the tree.

Mildew attacks the foliage and new growth of trees in the nursery, as also of the orchard.

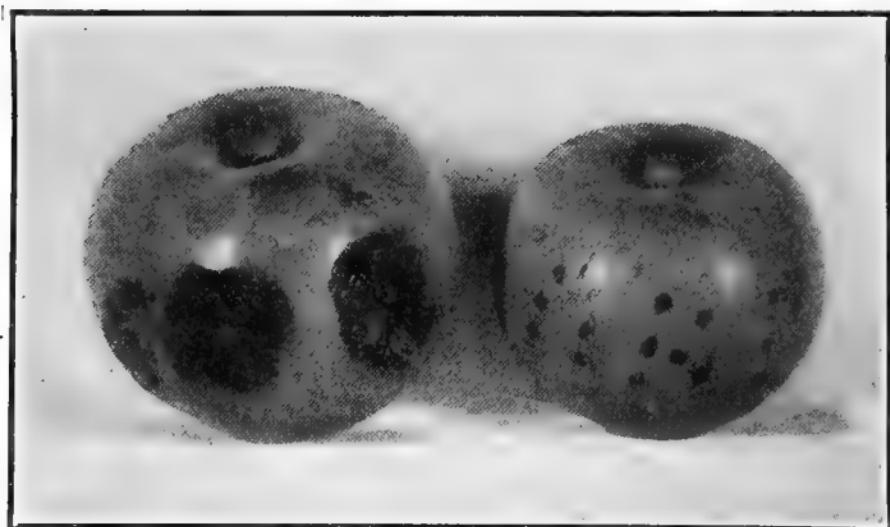
Root Rot attacks the roots of trees. Such trees should be taken out and burned.

Rust is a disease produced from a fungus that develops upon the red cedar trees. The spores of this fungus are carried to apple trees near them, when both the leaves and fruit are covered with dark orange colored spots which injure the foliage and ruins the fruit for sale. Spraying with Lime and Sulphur when buds are swelling, and later the fruit, as before directed, will largely control this disease.

The Rot in apples is the result of Monilia fungus that enters the apple from any bruise or broken part of the skin. The spores of this fungus on gaining entrance to the flesh of the

apple or of other fruits, immediately sets up growth that finally destroys it.

In the illustration is shown the result of an experiment by the inoculation of this fungus spore. The point of a fine needle was thrust *once*, into a rotten spot upon an apple, and then just touched upon a perfectly sound apple, in a number of places, the fine point of the needle penetrating the skin by the lightest possible touch. Eight days afterwards, the apple inoculated by the needle point, showed the growth of the spores at the point.



ILLUSTRATING INOCULATION OF ROT

of each needle prick. Ten days later the growth of these spots had extended to large patches of rot or decay, until finally the entire apple was involved.

This experiment teaches the lesson of the great need of care in every process of handling the fruit, that no bruises or injury to the skin shall occur, for if it does, the apples are certain to decay and cause loss.

Much of the spraying that is done for the control of insects may include the fungicides for the protection of the fruit and trees from disease so that both objects may be accomplished in the same operation.

Injury from mice and rabbits has to be guarded against. Mice eat the bark around the base of trees in times of deep snow, and

banding with wire to keep them out, is very expensive. In spraying the trees therefore, start close to the ground and spray the body and branches up about four feet with Bordeaux Mixture and Arsenate of Lead, or with Sulfocide, before the snow falls. In some instances this has saved the trees. Use one gallon of Sulfocide to one gallon of water, or one gallon of Bordeaux Mixture to ten gallons of water.

Where young trees have had the bark girdled all around the trunk, they may be saved by conducting the sap across the girdled point through grafted twigs. This is done in the Spring, by making openings in the bark close to the roots, as in grafting and budding, making similar openings above the girdled place, and connecting them by inserting small pieces of apple twigs — the annual wood being good for this purpose. The places where the ends of the twigs are inserted should be well covered with grafting wax, and twine drawn about them to prevent their being broken out while work is being done about the trees. Valuable trees may be saved in this manner, the sap going up through the twigs which will eventually support the tree.

When men are working about trees, allowing plows or other implements to break the bark on the body of a tree, cover the wound promptly with a disinfectant paint when it will quickly heal over and no disease follow.

Careful attention given to the above details in spraying, and prevention of injuries, will eliminate losses and add to profits.



ILLUSTRATING THE METHOD OF
SAVING A GIRDLED TREE

Thinning the Fruit

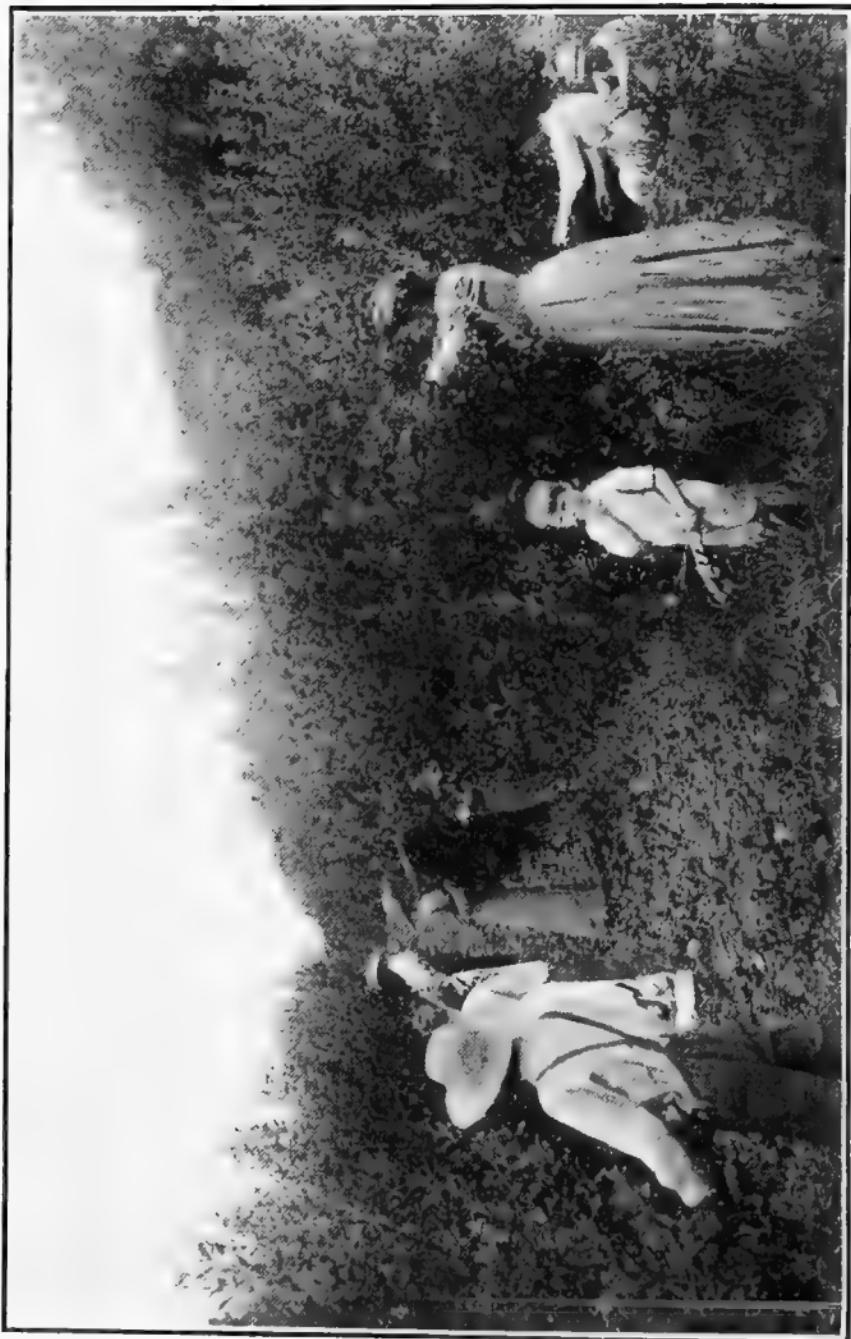
To maintain an orchard to a high degree of productivity it is most essential to conserve the productive forces of the trees. With the soil liberally supplied with the plant food necessary to maintain annual growth of wood and regular production of fruit, supplemented by good culture and right pruning, trees will set more apples than they can properly mature.

Trees do not produce fruit for the benefit of mankind but rather for their own perpetuation, and if there were not a human being on earth, trees would produce fruit just the same. For the purposes of perpetuation nature is always prodigal, and trees will overload with fruit that there may be the greatest possible production of seeds with which to perpetuate the species. Therefore when nature is aided by artificial means through systematic propagation and culture, the productive forces of the trees must be conserved by regular thinning of the fruit.

This should be done first when the apples are one inch in diameter. At this stage men should be instructed how to do the work of taking off the surplus fruit. All apples should be removed that are closer than three inches to each other. Frequently there will be two, three, and four apples in a cluster on one fruit spur—all but one should be taken off. Some skill is required in this operation and great damage may be done through ignorance, for in breaking off a fruit spur as is frequently done, no fruit will ever again be produced in that place.

In thinning, the stem of the apple should be taken between the thumb and first finger and firmly clasped, when the young apple is grasped by the second and third fingers and by a quick drawing movement is pulled or snapped off the stem. This will save the fruit spurs from being broken through trying to pull off the apples by main force. Women are particularly suited to this work, which they do most skillfully, and on low-headed trees requiring only step ladders, they can readily do the work. With the best of care some fruit spurs will be broken but at the most, they should not exceed two or three percent.

In giving instructions to those who do this very important work the principle should be clearly explained. The work will then be done with an intelligent understanding of its purpose,



THINNING APPLES ON DWARF TREES

and will result in a large gain in the value of the trees, and at a minimum of injury in the operation.

A second thinning should be made in about two weeks. At this time every imperfect specimen should be taken off, and a space of six inches left between all large varieties that grow to two and one-half inches or more in diameter, and four to five inches should be left between medium-sized varieties that reach two and one-quarter inches in diameter.

This method will give very much more of the high grade fruit that is most in demand, but most difficult to obtain. It will save the productive energy of the tree, and in time will result with many varieties in an annual production of apples. When a tree is allowed to carry an overload of fruit it cannot perfect the fruit buds the same year that it is maturing a large quantity of fruit. The sole purpose of the tree is to produce seeds. Its beautiful and fragrant blossoms are not put forth for human admiration and enjoyment but rather to attract insects, especially bees, which in going from flower to flower carry and distribute pollen to the blossoms to give vigor through cross-fertilization, that there may be greater certainty in the perfection and development of seeds.

The process of seed-making is exhaustive of the food elements of the soil, and especially of the phosphoric-acid which is highly essential in the formation of seeds. If from fifty to sixty percent of the apples are taken off, in a full setting of the fruit, a very large saving is made in plant food and in the energy and vitality of the tree. A very much higher price will be secured from the sale of the fruit, and with no reduction in quantity, as, owing to its increased size, there will be as many boxes or barrels of fruit as if the thinning had not been done.

The cost of thinning on large trees forty or fifty years old with a heavy set of fruit will be from forty-five to sixty cents a tree. On younger trees from fifteen to twenty years old the cost will range from fifteen to twenty-eight cents a tree according to the variety.

When the advantages and value of thinning are understood, the cost of the operation is not only justified but becomes imperative.

Value in Apple Orchards

In the universal interest in country life which during the last decade has grown and developed to an unusual degree, the culture of the apple has attracted widespread attention. There has been voluminous writing upon the subject, and quantities of literature sent out, some of which unfortunately has been misleading in character.

In another booklet now under way, entitled "Farming as a Business," the subject of markets and marketing will be fully treated.

For the past twenty years the value of apples has ruled so high as to prohibit their liberal use by the average consumer. In 1896 the apple crop of the United States reached 70,000,000 barrels. Since that time there has been a steady decline in production until the range is from 22,000,000 to 56,000,000 barrels annually, and this in the face of rapidly increasing population.

By those who have given orchards the best of care, large value per acre has been received. Facts and figures have been given wide publication concerning instances wherein large profits have been realized. These published statements have given rise to an extensive speculative movement in the purchase of cheap unimproved land, much of which is unsuited to the culture of the apple, or, being located far from markets, without adequate transportation facilities is too difficult of access to be profitably worked. Under such conditions thousands of acres have been planted to trees of many varieties without knowledge of or regard to their adaptability to the locality or to their proximity to markets. Land so obtained has been divided and subdivided into tracts or units of one-half acre — one acre — five — ten — twenty and more, and sold to investors at a high price with an agreement at the end of five years to turn over the orchards on a basis of profit sharing. Millions of dollars have been poured into this channel of investment, by vast numbers of city people who, through attractive exhibitions of fruit put on display in the cities for several weeks, have been made to believe that fortunes may be realized by buying one of these small orchards, that many would never even look upon.

There are Orchard Companies, however, that have secured suitable land in desirable places — that have the capital neces-

sary with which to develop orchards along the right lines — that direct the entire business management of a large enterprise in the interest of all money invested — in which the interests of the small investor will be protected equally with that of others — and such organizations are to be commended, for they are established on right business principles. At the same time there are large numbers of other companies that operate with entirely speculative intent, being organized solely for the purpose of selling land at a large profit with no regard for the investors outside of obtaining their money. Orchards started under these conditions will prove entire failures, and a disappointment to those investing in them.

That the future promises substantial value in the ownership of orchards rightly managed there is no question. There are two lines of policy to be followed — one, that of the development of small orchards of ten to twenty acres within twenty-four to forty-eight hours of large centers of population — with good markets — thereby gaining an important factor in reduced cost for transportation. Any product to be used in a large and constant way, must be supplied to the consumer at the least cost that will give a reasonable profit to the producer. This may be successfully done with the small orchard under intensive culture when the largest yield per acre of good quality may be produced and sent into nearby markets at small cost.

The other line of policy is to invest in a large Holding Company with a good business organization under the management of men of knowledge and experience and backed with sufficient capital to carry the enterprise to success. A company of this character may put in every required facility and equipment that will reduce the cost of operation to the minimum, and on the basis of a fair percentage can handle the interest of the small investor with satisfaction and profit to both. On this large scale the principle of co-operation may be used, with the many advantages which it affords.

An investigation made by the writer in 1898 concerning the value of orchard land gave some interesting facts. Twenty farms in a district in Western New York where the orchards were considered as of secondary interest, and received no special care, gave an average return over a period of five years of \$85

an acre for the fruit at the farms. Another farm in the same locality produced over the same period, an average of \$110 an acre, another, \$140, while still another, containing but five acres that had received high culture, and the best of care, returned \$700 an acre.

These figures show the range of value that may obtain in orchard culture, from that of only ordinary care given, to that of the best management that can be brought to the business.

The profitable culture of the apple in the future will demand of those who engage in it, consideration of the following:

Land located near good markets.

Good soil suited to the growth of healthy trees.

Varieties of apples best adapted to the locality and of the quality desired by the market.

Co-operative organization of those who engage in the business, that grades and packing may be standardized to meet the demands of the trade.

Systematic improvement of the soil. Plant food provided to meet the enlarged demands upon the soil through increased production.

Knowledge of insects and diseases of tree and fruit, that losses from these causes may be reduced and prevented.

Absolute integrity established in the conduct of the business, that the dealer and consumer may have entire confidence in the purchase of products.

Production of apples at less cost, yet with a fair profit.

Quick transportation with better methods of distribution that cost to consumers may be lessened, thereby making possible a large and growing demand through increased consumption.

And above all, with a clear understanding — "That he who plants a tree plants for time" — and that the planting of apple orchards means a long-time investment with several years to carry before profits may be expected — that with patience, persistent effort in overcoming difficulties, with study, good care, and sound judgment, such as must be brought to any successful line of business — the future will bring to those who go seriously into the culture of apples on the basis outlined above, a large measure of satisfaction, enjoyment and value received.

List of Subjects

Treated in the Articles by

GEORGE T. POWELL



The Soil and Its Fertilization
Indoor Plants and Flowers
Garden Clubs—the Kitchen
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Small Fruit Culture
Farming as a Business
How to Establish and Maintain
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Peaches, Plums and Cherries
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