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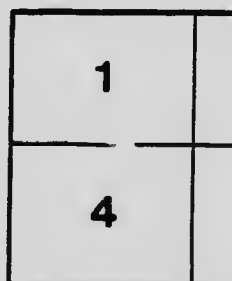
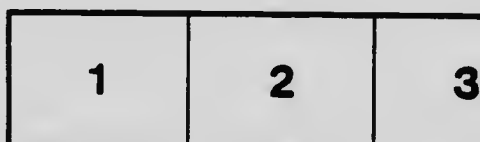
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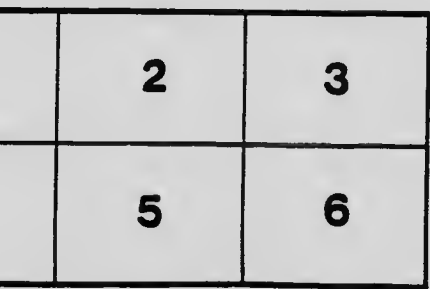
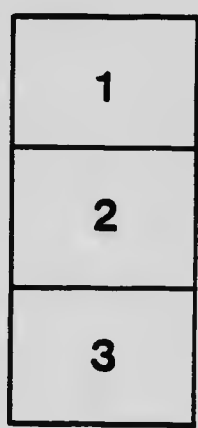
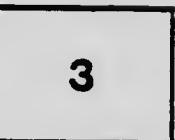
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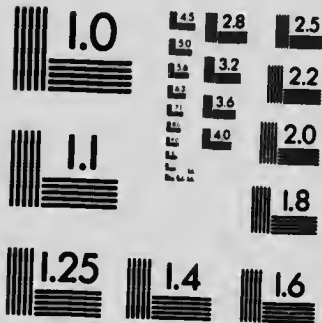
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PROVINCE OF BRITISH COLUMBIA

DEPARTMENT OF AGRICULTURE (HORTICULTURAL BRANCH).

THE TOP-WORKING OF FRUIT-TREES.

BY H. THORNER, B.S., ASSISTANT HORTICULTURIST.

MANY orchards in British Columbia, as in other sections of the Pacific North-west, contain trees which are not productive. This condition is usually due to neglect on the part of the owners, the planting of unsuitable varieties, or to old age. Where land is as valuable as it is in the fruit-growing sections it does not pay to have these "boarders" in the orchard. Every tree should be made to produce returns. Trees which for some reason are not productive, or produce fruit for which there is no demand, should be removed and replaced by other trees, or, if conditions justify, top-worked to a desirable variety. Top-working is a quick way of making a tree productive. While the majority of fruit-trees do not produce their first commercial crop until the seventh year, a top-worked tree should, under favourable conditions, bear a fair crop the fourth year after being worked over.

Before attempting to top-work an orchard or a number of trees the owner should know why they have failed. If their failure is due to an unsuitable location or a poor soil, they should be removed and the land used for other purposes. If the soil is satisfactory or can be made so, and the trees are merely of the wrong variety and have good root systems, are not stunted, decayed, badly sun-scalded on the trunk, or too high-headed, the chances are favourable for top-working. However, it must be remembered that top-working is not a panacea for all the ills of a neglected or otherwise unprofitable orchard, and cultivation, spraying, and pruning must be practised along with top-working to assist the trees to regain their normal vigour. The treatment necessary for top-worked trees is similar to that given to a young orchard.

TIME FOR TOP-WORKING.

Top-working is done in the spring of the year. No exact date can be set which will apply for all sections, but as a rule it may be done between the middle of March and the middle of April in the inland sections and a little earlier on the Coast. Good results may be obtained any time after the buds begin to swell and before they burst, which usually gives from four to six weeks for the work. If the scions are set too early they are in danger of drying out before growth starts, and if set too late they may form leaves which will exhaust the food-supply before the cambium layers unite. However, it is better to be a little late than too early.

### SELECTION AND CARE OF SCION-WOOD.

Since the bad as well as the good qualities of a parent tree may be transmitted through the scions, great care should be taken in their selection. The trees from which the scion-wood is taken should be healthy and vigorous, and should produce annual crops of well-coloured fruit of good quality and shape. The best time to select and mark these trees is during the fall before the crop is harvested; one can then see what may be expected in his future orchard.

The wood used for the scions should be selected from the past summer's growth. Select only well-matured wood, not too large nor too small, always avoiding water-sprouts. Terminal shoots which have made a growth of from 16 to 20 inches make good scions. The wood on the south side of the trees will be found to be more uniform in development than that on the north or shaded side. The selector will find great variation in the vitality of the different trees and also in the different branches of the same tree, but after a little careful observation will be able to select the best material. A careful study should be made of the size and ripeness of the buds, as well as of the general appearance of the scion.

The switches or scion-wood from which the scions are to be made may be gathered during the late fall or early winter, and stored in a cool cellar in damp sand, moss, or sawdust, or they may be left on the trees until spring and then collected and stored until needed. Where the winter temperature is severe enough to injure the young shoots on the trees, the scion-wood should be gathered in the fall and stored. Good results have been secured by taking the wood directly from one tree and placing it on another, but as top-working is usually done as piece-work, it is a much safer plan to collect and store the wood where it may be kept dormant until time permits for the work.

### TOOLS NEEDED FOR TOP-WORKING.

Only a small number of tools are needed for top-working fruit-trees. In addition to a saw and a pair of pruning-shears, which every fruit-grower should own, a grafting-chisel, a pair of thin-bladed knives, a mallet, and a small paint-brush complete the necessary equipment. A grafting-chisel may be made by a blacksmith from an old file. The blade is about 3 inches long, 1½ inches broad, and about ¼ inch wide at the back. The "rib" on the end is used for a pry when opening the clefts to insert the scions, and the curved handle permits its being hung on a hub when the operator is not using it, thus preventing it from being misplaced. (See Fig. 1.) Two thin-bladed knives should be secured, one to be used for making the cuts on the scions and the other for paring the ends of the stubs smooth. The knife used for making scions should not be used for other purposes, because a smooth cutting-edge is necessary for successful work. These knives may be secured at a hardware store for about 25 cents apiece. An ordinary mallet can be used, or a very handy one may be made from a hub of a tree; a loop fastened to the small end permits it to be hung on the operator's arm when not in use. The paint-brush is for applying the melted wax and can be secured for a few cents; the 1½-inch brush is the best for this work. Fig. 1 shows a collection of the tools necessary for top-working.

Besides the tools shown in the above picture, some device should be made for softening the wax. In past years a soft wax was used and was applied with the hands, but as it was a very disagreeable task and did not seal the grafts as tight as it should, the use of melted wax was adopted. Of the



Fig. 1.—Grafting-tools: (a) Saw; (b) mallet made from branch; (c) grafting-chisel; (d) pruning-shears; (e) wax-brush; (f) scion-knife.

various devices used for melting wax within the orchard, the writer has found either one of the two shown below to be very practical. The one on the right consists of a galvanized-iron can made especially for this purpose, and fitted with a lamp with a tin chimney for supplying the heat, and a quart stewpan set in the top for the wax. This is a very useful arrangement, but is rather elaborate for a few trees. The picture on the left side shows a home-made grafting-stove which was made from a 5-gallon oil-can. A circle of tin has been removed from the top to admit the wax-pan, and the side cut down and bent back for the admission of a lamp. A wire handle completes this at a cost of 45 cents in contrast to \$4.05 for the other.

#### OPERATION.

While the operation of making the scions and placing them in the clefts is very simple to most people, the greatest difficulty seems to come in the selection of the branches to be worked. The main thing to be kept in mind is that the selection must be made so as to secure a desirable distribution of branches which will form a well-balanced head for the tree. On a tree of three years or under the entire top may be removed and the tree worked over the first year, but on an older tree only one-third or one-half of the work should be done in one operation. It is better to distribute the work over three years if possible, because if too many branches are removed in one operation the result will be a large number of water-sprouts to contend with the following summer, and also danger of sun-scald. Limbs not needed for grafting should not be removed unless interfering with the grafts, for they



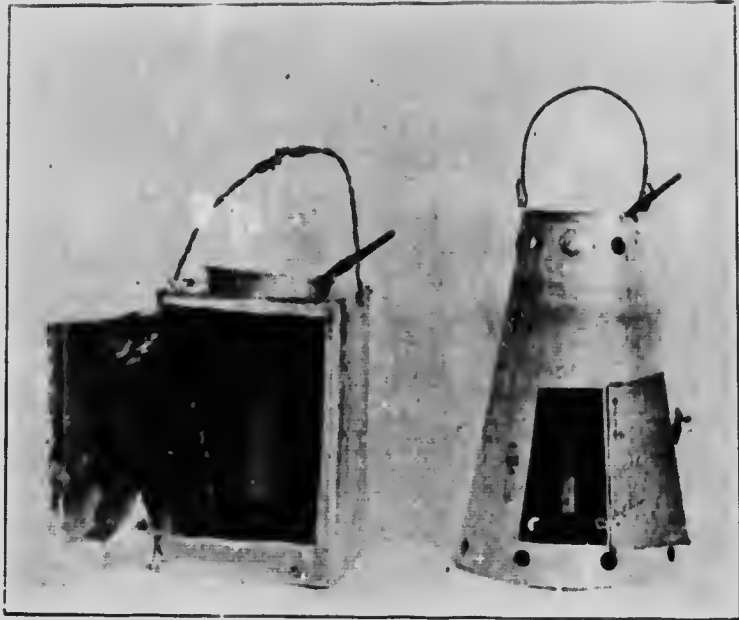


Fig. 2.—Grafting-stoves for melting wax in the orchard.

will help to take up the surplus food and may be used for grafting into later in case any of the first year's work meets with accident or has not been successful.

Whenever possible, select limbs which are not over 2 or 3 inches in diameter; larger ones take too long to heal. If these cannot be secured reasonably near the ground, small lateral ones may be selected which will take the place of the larger ones later. It seldom pays to graft a tree where the scions must be placed at a distance of 8 or 10 feet from the ground, as the cost of curbing for the fruit is too great under such conditions.

In general the selection and working-over of four branches the first year will be sufficient, the second year three or four more, and the third year the removal of the remaining branches which were left from the second year's work, and the setting of a scion here and there where one has fallen or to complete the framework of the tree. The branches in which the grafts are placed should be cut off squarely, leaving a stub from 10 to 12 inches long. The stubs may be cut shorter with a young tree, but if cut too short on an old tree the result is often a close-topped tree. It must be remembered that a top-worked tree grows more upright than does a tree under natural conditions.

After the branches to be worked are removed and the stubs pared smooth on the end to facilitate healing, the bark on either side of the stub should be split down about 3 inches. This permits the stub to be split without tearing the bark on the sides; hence a perfect union may be made between the stock and the scion. After splitting the bark, place the blade of the grafting-chisel so that it corresponds with the two cuts made in the bark, and drive down slowly until the stub splits for about 3 inches; then remove and insert the

end of chisel in the centre of the cleft, to be used as a pry when inserting the scions. Do not place the scions directly over each other, nor yet level, but have one in the upper left-hand side and the other in the lower right-hand



Fig. 3.—A three-year-old tree top-worked; single cleft-grafts used on upper three branches and whip-grafts used on lower three.

side, or vice versa. A quantity of the cut scions may be carried in a wet sack, but it is better to make them as needed, and then there will be no chance for them to become injured in any way. If the scions are to be cut in the field, which is the most satisfactory way, the scion-wood should be kept in a moist sack and only enough removed at one time for one tree. In cutting the scion, the switch is taken in the left hand and an inch or more removed from the lower end to ensure fresh wood; then select a good bud and cut a long slant on either side of the scion, leaving this bud near the top of the cuts. The side of the chisel-shank on which the bud is left should be a little wider than the other to act as a wedge when in position. The cuts should be about 2 inches long and the scion itself not over 6 inches; this will leave about 4 inches of the scion projecting beyond the end of the stub when it is in position. Not over two scions should be made from each switch, as the wood near the tip is not so good for this work. In placing the scions in the cleft, the operator should be careful to have the inner edge of the bark of the scion come in contact with the inner edge of the bark on the stub. In case one is not sure of the location of the cambium layer, the scions may be set slanting outward a trifle, and then the two layers are sure to come in contact in one place at least. After a scion is inserted in each side the graft is ready for waxing. This should be done as soon as possible after the graft is completed; rub the wax into the cracks on the sides and cover the end of the stub, being careful not to displace the scions, and not forgetting to place a little wax on the ends where they were cut off. Use plenty of wax, but do

not smear it over the upper buds or they will not be able to break through. As an extra precaution the graft may be wrapped with a strip of cloth, which prevents the wax from coming off in case of very hot weather, and also marks the location of the graft, thereby decreasing the chance of being injured by passing teams. Muslin torn in strips  $1\frac{1}{2}$  inches wide makes good wrapping material, and if placed on the graft soon after it is waxed does not need to be fastened, as the soft wax will hold it in place.



Fig. 4.—Cleft grafts: (a) Scions cut; (b) graft with side removed, showing scions in position; (c) ready for waxing; (d) waxed; (e) waxed and wrapped; (f) a single cleft.

In practical work the limbs to be worked on one tree are removed, the stubs pared smooth, and the side cuts made in the bark before any stubs are split. The clefts are then made and the scions cut, placed in position, and waxed immediately, so there will be no chance for them to dry out. Two men can work to advantage in this work, one removing the limbs and inserting the scions, while the other applies the wax, wraps the grafts with cloth, and clears away the brush from around the trees. The time between the removal of the limbs and the application of the wax should be as short as possible, because more than a few minutes' exposure of the cut surfaces of the tree to the air may result in the failure of the work.

#### OTHER METHODS FOR TOP-WORKING TREES.

##### THE SINGLE-CLEFT GRAFT.

The single-cleft graft is used where the branches to be grafted are too small for the insertion of two scions. In making a single-cleft graft the branch is cut off on a slant and only one scion inserted; the waxing and wrapping are the same as for the other grafts. The final result of the single-cleft graft is the same as the cleft-graft, only the latter has a double chance. If both scions do grow, as is often the case, the weaker one must be removed or a weak crotch will be formed.

## WHIP OR TONGUE GRAFTING.

This method is employed especially with young trees whose branches are too small to be worked by the preceding methods. In making this graft a longitudinal cut is made on the stock, followed by a second cut down the centre of the stock; similar cuts are now made in the lower end of the scion and the two put together as shown in Fig. 5, then waxed and wrapped. The single-cleft and the whip graft were used in working the young tree shown in Fig. 3.

## BUDDING.

Budding is also employed in working over young trees. The buds are set near the base of the branch to be worked, and the portion of the branch extending beyond the bud removed the next spring. This work is usually done in the month of August, when the bark slips easy; no wax is necessary, merely tie them with cord as shown in Fig. 6.

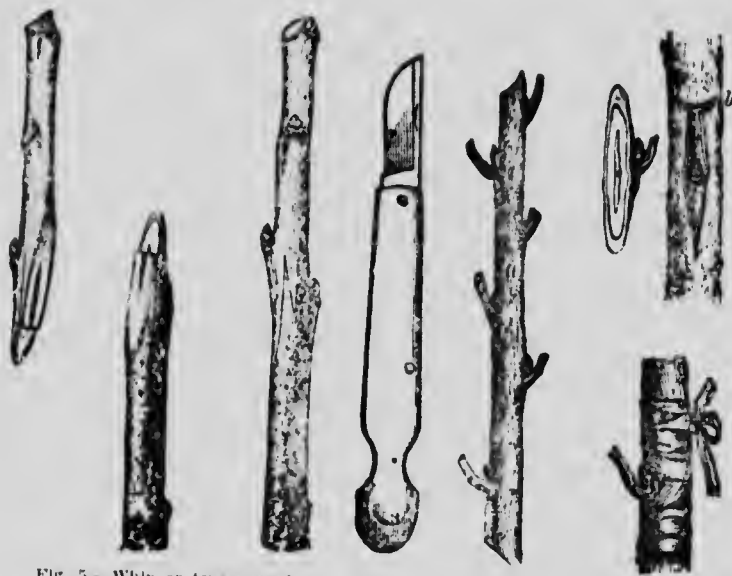


Fig. 5.—Whip or tongue graft.

Fig. 6.—A bud cut, in position and tied.

## GRAFTING-WAX, WAXED STRING AND CLOTH.

Grafting-wax is a preparation made for covering cuts and wounds of trees, its purpose being to prevent infection of the wound and exclude the air and water. There are several different kinds, but the following preparation is the best for all-around work:—

*Formula for Grafting-wax* (L. H. Bailey's Rule-book).—Resin, four parts by weight; beeswax, two parts by weight; tallow (beef), one part by weight. Melt together in a large kettle until thoroughly mixed and then pour into a pail of cold water, and when cool enough to handle, grease the hands and pull till nearly white. This preparation keeps indefinitely and large quantities may be made at one time and stored away until needed.

In making waxed cloth the wax is spread on the cloth with a brush, and the cloth torn into strips later as needed. For waxed cord place balls of knitting-cotton, preferably No. 16, in melted wax, and let them remain a few minutes and hang up to drain; when cool they are ready for use.

**SPECIAL POINTS TO REMEMBER WHEN TOP-WORKING.**

- (1.) Top-working is successful only where conditions are favourable.
- (2.) All common tree-fruits may be top-worked, but it seldom pays to top-work an old peach or plum tree; it is better to remove it and plant a young tree in its place.
- (3.) Secure and use only the best scions.
- (4.) Do not graft a strong-growing variety on a weak stock; at best it can only form a poor union which will break with the first heavy wind after it comes into bearing, if not before.
- (5.) Keep the scion-knife very sharp, as smooth cuts are essential.
- (6.) See that the cambium layers are in contact when the scions are set.
- (7.) Do not let the fingers come in contact with the cut surfaces of the scions or buds; the moisture which is ever present on the hands is very harmful to them.
- (8.) Apply the wax as soon as possible after the graft is made, but do not have it hot, just melted.
- (9.) Apples, pears, and quinces may be intergrafted, or cherries, plums, apricots, peaches, etc., intergrafted, but it is better to keep each kind of fruit on its own stocks unless the change is made for some special reason. Stone fruits like the peach or cherry cannot be made to grow on pome fruits like the apple, pear, etc.

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