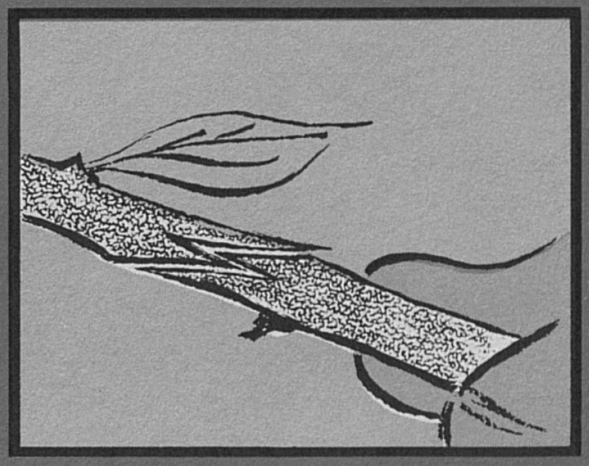
REPRODUCING FRUIT TREES



BY GRAFTING & BUDDING

By James K. Stacey and Carl E. Chaplin

UNIVERSITY OF KENTUCKY
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CONTENTS

Reproducing Fruit Trees By Grafting and Budding

By JAMES K. STACEY and CARL E. CHAPLIN

The art of grafting and budding (a form of grafting) is a necessity for the nurseryman and the commercial fruit grower. It is also a source of pleasure and usefulness for the hobbyist.

The four grafts—whip, bark, cleft, and bud—described here are the ones most used among fruit growers to increase plant population, change the variety of a tree, and/or preserve a variety or mutation not found in nurseries.

Since most fruit trees will not reproduce the characteristics of the variety through their seed, vegetative or asexual propagation must be used. Also, cuttings from the majority of fruit trees are usually difficult to root. This leaves grafting as the most employable means of reproducing a variety.

The principal reason for grafting or budding is to multiply the plants of a desired variety. But while this is being done the use of rootstocks that are hardy, disease resistant, insect resistant, nematode resistant, vigorous, and/or dwarfing should be considered.

The kind of graft to use is determined by the kind of plant, environmental conditions and the plant materials at hand. Under Kentucky conditions budding is the usual means of propagating peaches, plums, and cherries. Apples and pears, with the exception of dwarfs, are more often grafted although they may also be budded.

The tree resulting from a graft or a bud is essentially the same, only the procedure differs. The graft is made by joining a cion (bud or shoot) of the variety to a stock that will develop the root system. The most important factor in this union is to join the cambium layers and hold them in place until the two pieces have grown together (Fig. 1). Grafting is done in winter or early spring with dormant cion wood.

Budding is accomplished by inserting a single bud of the desired variety underneath the bark of the stock in contact with the cambium. This procedure is usually done during the late growing season—July, August, or early September.

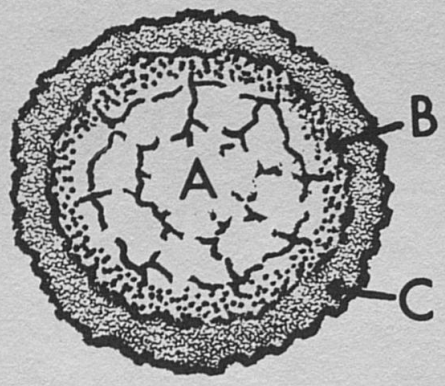

Fig. 1.— Cross-section of cion or stock showing—(A) Wood cells. (B) Cambium (thin layer of growing cells). (C) Bark.

GRAFTING

The Cion Wood

Cion wood is collected during the dormant season from shoots that grew the previous year. Vigorous growth that grew a foot or more makes the best cions. Water sprouts from up in the tree usually make good straight cions. Do not collect cion wood while it is frozen or wood that has been damaged by cold. After the cion wood has been cut from the tree it should be tied in bundles, labeled, and stored under moist conditions in a temperature range of 40-45 degrees. The bundles may be stored in moist sand or moistened sphagnum moss and placed in a cool cellar. Bundles wrapped in moistened brown paper, covered with black plastic and placed in the bottom of the refrigerator will store well. Outside storage in a sand pile or a well-drained pit works well if the cion wood is placed deep enough to prevent extreme cold or the heat of the sun from affecting the condition of the wood.

When ready to make into a cion, cut off the tip and discard, leaving the lower sections 5 to 8 inches long.

The Stock

Apple

Some desirable characteristics of apple stocks are: adaptable to local growing conditions, resistance to diseases and insects, vigorous and compatible with the cion variety. Seedlings or trees that make good stocks, in order of their vigor are: Delicious, McIntosh, Jonathan, Duchess, Winesap, Wealthy, and Rome. The seeds of these varieties germinate well and have a high degree of compatibility with most of the apple varieties.

Dwarfing rootstocks are produced by layering the Paradise, Doucin or various crosses of their descent. However, if you are considering dwarf propagation it is better to obtain the stock from a nursery specializing in dwarf stock production.

Pear

In areas where pear blight is a problem every effort should be made to use both stock and cion that have resistance. Cold hardiness is also desirable in Kentucky. Though the French pear (Pyrus communis) has hardiness it is not resistant to blight. The more recent Chinese pear (Pyrus calleryana) has great resistance to blight but is more likely to be injured by sub-zero weather. One of the most satisfactory methods of propagation to get resistance to both blight and cold is to stem bud the Old Home variety onto a French seedling (Bartlett, Anjou, or Hardy). In 3 or 4 years after this combination has developed a framework, it is top-worked with the desired variety. Old Home can also be used as a seedling rootstock.

Most of the important varieties of pears will graft satisfactorily on each other and on seedlings of their own variety.

Perhaps of more interest to the small grower or hobbyist is the dwarf pear. Dwarfing stocks are produced from the quince. Angers quince (East Malling 'A') appears to be the most satisfactory. Old Home can also be used on quince as an intermediate stock to provide blight resistance.

The Whip Graft

The whip graft (also known as the tongue or bench graft) is particularly desirable on species that unite easily, such as the apple and pear. It may be used in making a root, stem, or top graft so long as the stock and cion are near the same size. Cions and stocks the size of a pencil to ½ inch in diameter are the best to use.

ROOT GRAFTING

The root graft is done when the apple root and cion are dormant. The pear is not normally root-grafted. Either whole roots or pieces of roots 3 or 4 inches long and as large or slightly larger in diameter than the cion may be used (Fig. 2).

Prepare the cion by making a diagonal cut on the lower end about 1½ inches long. Use a sharp knife that has a stiff straight blade. Hold at an acute angle (Fig. 3), and pull the cion through the blade with a swift smooth stroke. Make the tongue as shown in Fig. 4A by starting the cut ⅓ of the way down from the tip of the cut surface and ending ⅓ of the way from the bottom of the cut surface.

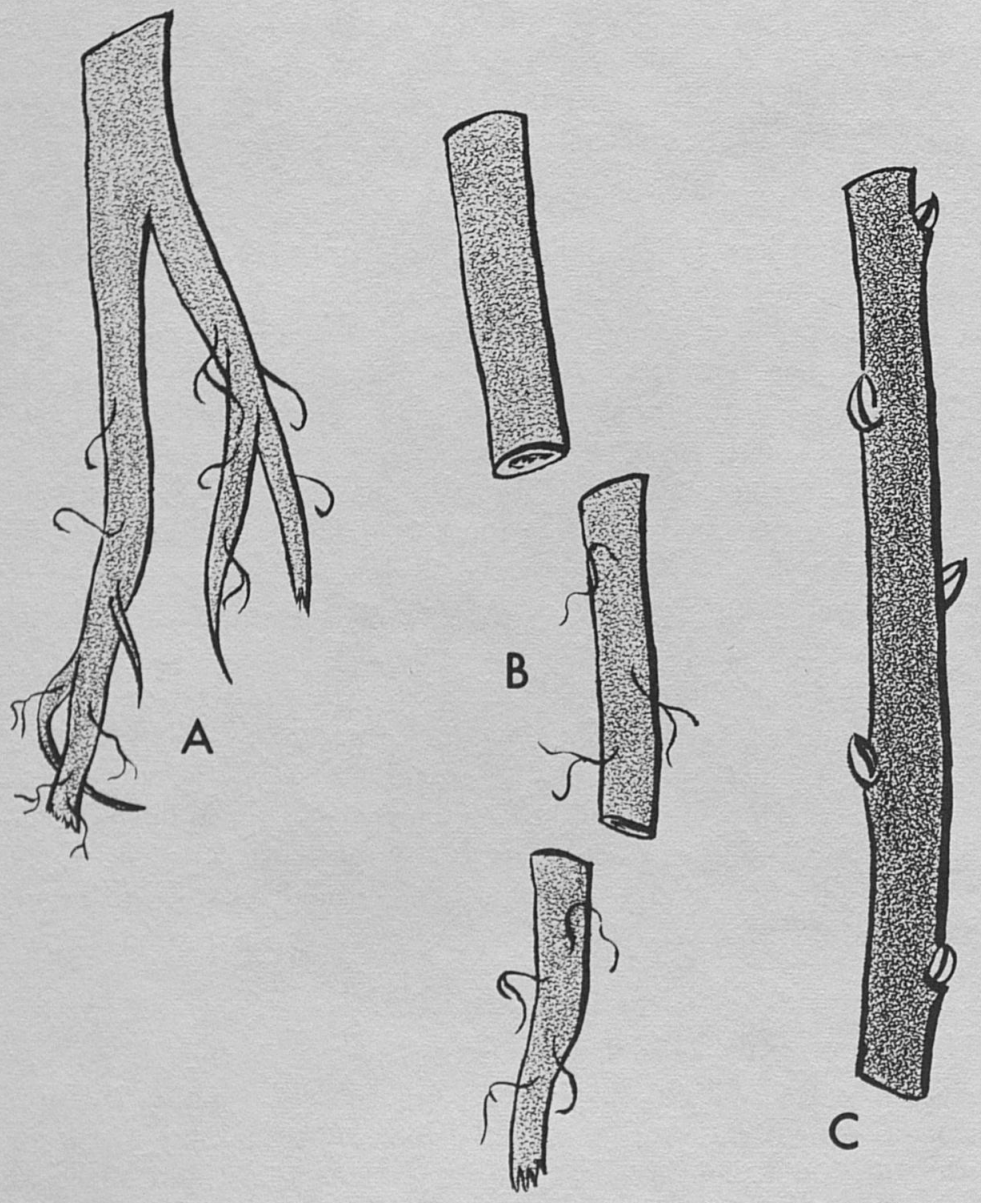

Fig. 2.— (A) Short or branched roots make better whole-root grafts. (B) Long straight roots may be cut in sections for piece-root grafts. (C) Cion with tip removed ¼ inch above top bud.

To keep down infection, disinfect the root by dipping it in mercuric chloride solution. Prepare the top part of the root section the same as the bottom of the cion. Do not touch the cut surfaces with the hands. Oil from the skin may inhibit union of the parts.

Join the two pieces as shown in Fig. 4 making sure that the cambium layers are in contact at least on one side. Grafting tape is the preferred material to bind the union. When it is spiraled on tightly and in such a way that the edges overlap very slightly the

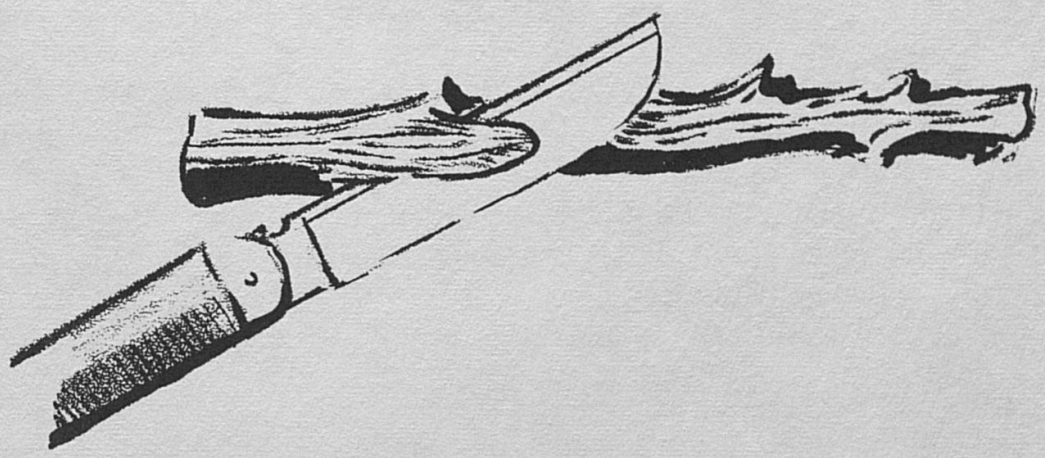

Fig. 3.— Making the diagonal cut with the knife held at an acute angle rather than at a 90 degree angle.

union will be held in place, protected from infection. The tape will disintegrate shortly after the two pieces have grown together. Rubber budding strips or waxed, light twine also work satisfactorily.

Bundle, label, and store the grafts before they have time to dry. Storage conditions may be the same as described for storing the cion wood.

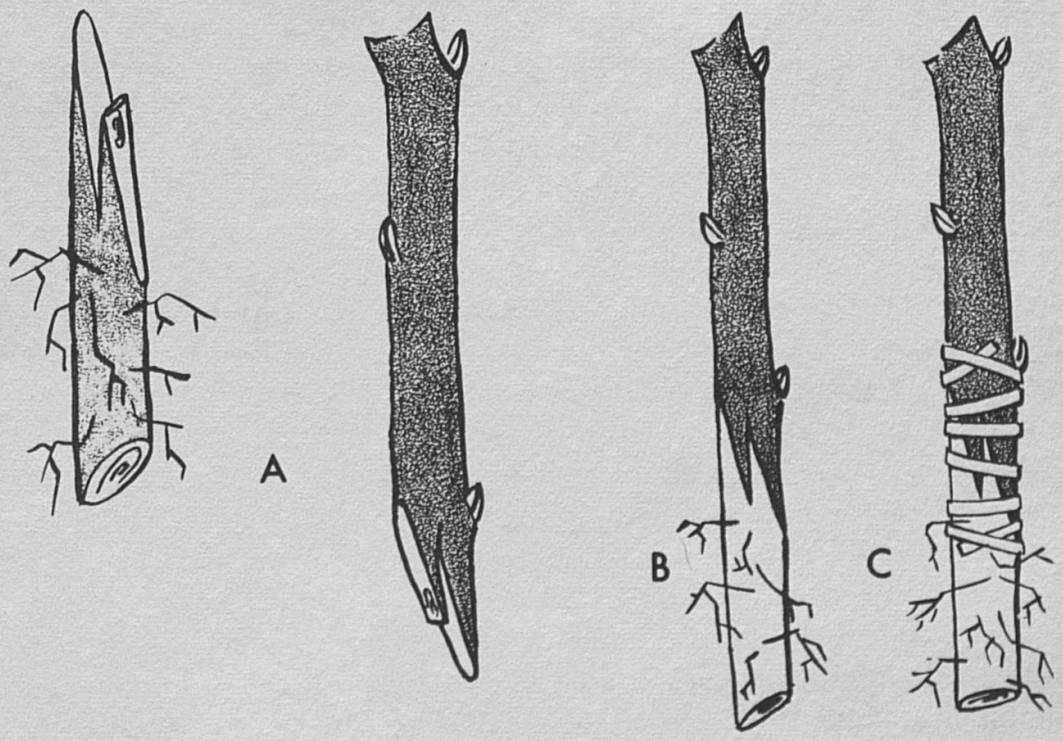

Fig. 4.— The whip graft showing—(A) Stock and cion prepared. (B) Joined. (C) Tied in place with waxed twine, rubber budding strip or wrapped with grafting tape.

Examine the grafts from time to time. Note the callus growth along the edge of the union. If mold is present the grafts should be aired for a time and then stored under drier conditions. If growth has started, store in a cooler place or else plant.

Prepare fertile, well-drained soil and plant the dormant grafts in this bed 1 foot apart (March is a good time in Kentucky) and to a depth so that only the top bud is above the soil line. Grow for 1 year in the bed then transplant to the field.

STEM OR TOP GRAFTING

Timing is important when the whip graft is placed on the stem or the branches. The danger of cold injury should be past, but the graft must be made before the bark of the stock begins to slip. This would be about the time the buds on the stock begin to swell. The cion is dormant. Keep all buds below the graft removed. Spurs may be left on to provide the needed leaf surface until the shoots from the cion have a sufficient number of leaves to do the job.

Bark Graft

The bark graft is often employed when the stock is too large for the whip graft. This graft is used mainly on pears and apples. Dormant cion wood is used but the stock is not ready until the bark begins to slip. Prepare the stock by cutting square across with a fine-toothed saw at a point where the diameter is from 1 to 2 inches.

Prepare two cions 5 to 6 inches long by making a sloping cut ¼ inch above the top bud and a 2-inch-long-diagonal cut on the lower end. Use a sharp blade so the cut will be straight. Wavy cuts are usually the result of a dull knife.

Place the cut surface of the cion against the side of the stock. When viewed from the opposite side, ⅛ inch of the cut surface should be showing above the top of the stock. Hold firmly in place and with the point of the knife outline the cion on the bark. Finish cutting through the bark. Remove this sliver of bark and insert the cion. Use ½- to ¾-inch wire nails to hold the cion in place. Place the other cion on the opposite side. Study Fig. 5.

Tree wound dressing of asphalt water emulsion is a good material to cover all exposed surfaces. This material is applied cold. Melted grafting wax is often used. Care should be taken to avoid wax so hot that it will injure the tissue. One of the latest methods is to wrap aluminum foil over the exposed areas. A plastic freezer bag with both corners cut off is then slipped over the cions and the aluminum foil and tied in place with rubber budding strips or heavy twine. The

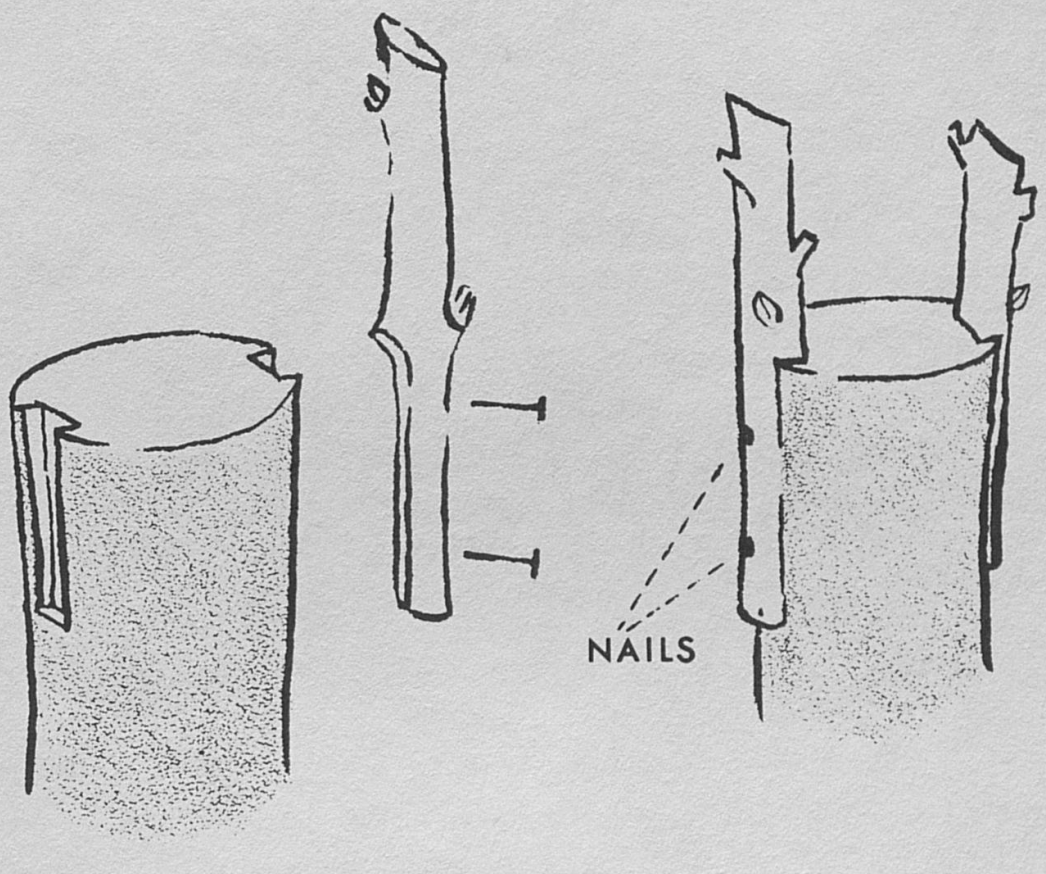

Fig. 5.— The bark graft.

idea in all of these methods is to keep the moisture in. A small bottle of orange shellac can be useful in covering the exposed area of the sloping cut at the top of the cion.

Bark grafts are easily loosened by birds, animals and winds. Give them all the support and protection needed for at least the first year.

Aftercare of the graft is important. Keep shoots and sprouts below the graft removed. If both of the cions live the weaker one should have the bud nipped a couple of times during the summer. Both cions should continue to grow the second summer, thus gradually reducing the development of the weaker one. At pruning time of the next year, the weaker cion should be completely removed. During the first and/or second summer the strong cion may need to be topped to encourage branching.

Cleft-Graft

The cleft-graft is one of the older methods of grafting. It is also one of the most successful when good technique is used. It is suited mainly for top-working apple and pear trees. The process is merely

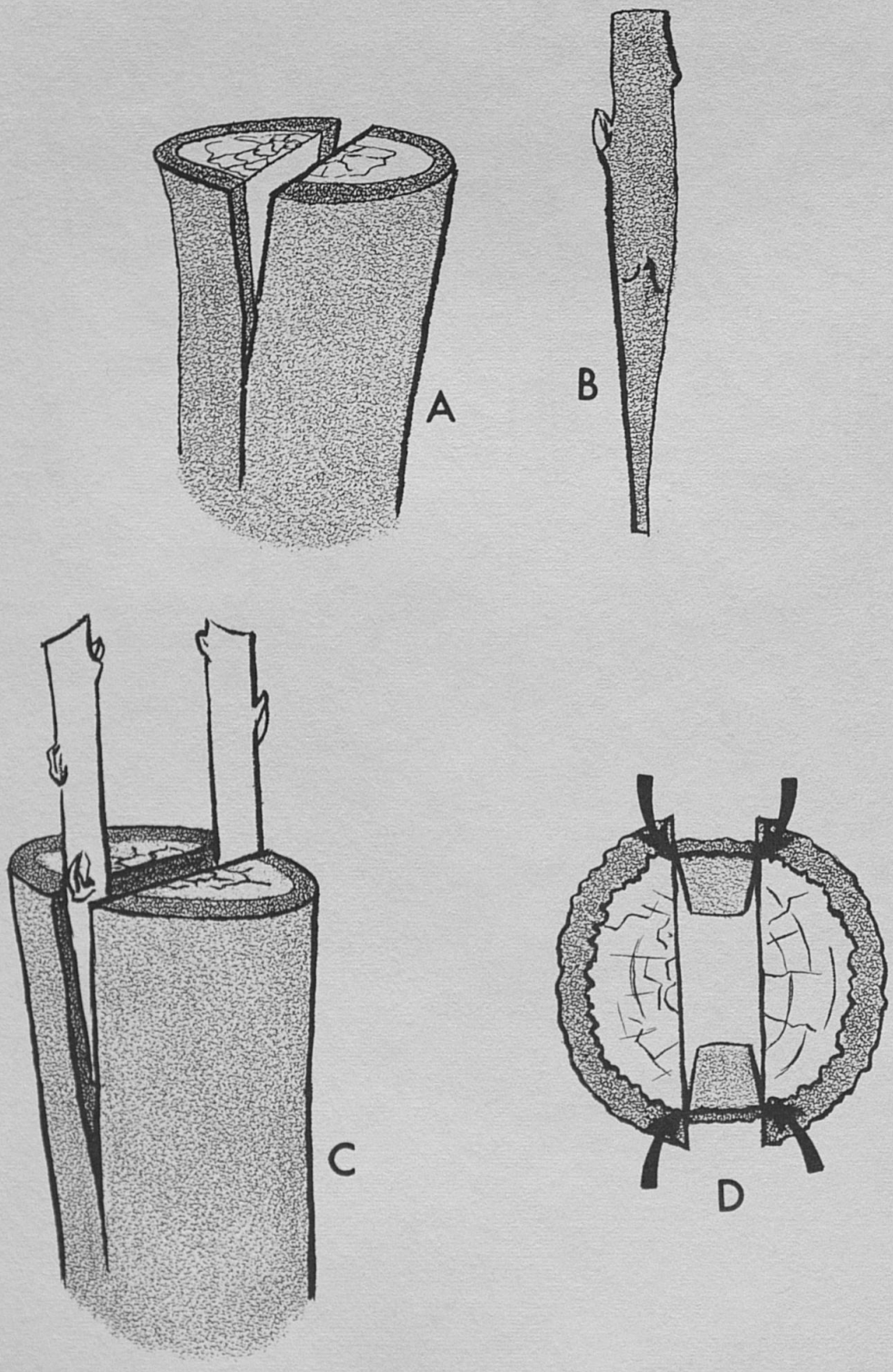

Fig. 6.— The CLEFT-GRAFT showing: (A) Split stock, (B) Cion with tapered lower end, (C) Cions fitted into stock, and (D) Most vital points of contact are the cambium layers of stock and cion (note arrows).

fitting a cion into a split stock. The best time to perform the cleft-graft is just before the bark begins to slip in the spring.

When preparing the stock for the cleft-graft look for: (1) scaffold limbs or trunks from 1 to 2 inches in diameter, (2) areas on limbs that have straight grains for at least 6 inches below the amputation point, this area should also be free from spurs, knots, and cankers, and (3) limbs that grow more toward the vertical than horizontal position. Grafts on horizontal limbs will likely "take" just as well but the resulting sharp-angled upright growth is very undesirable.

After locating the point of amputation, make the cut with a fine-toothed saw. Care should be taken to prevent the limb from splitting or the bark from peeling. Using a chisel and mallet, split the stock across the center and to a depth of about 6 inches. A small hatchet may be substituted. The split may be held open by inserting a screwdriver.

Prepare two dormant cions for each split on the stock by making a sloping cut on each side of the cion. The slope on the cion should coincide closely with the slope of the split (Fig. 6). The cut on the cion should start slightly below the bottom bud. There is no need to bring the cuts to a point; a length of 2 inches is sufficient. The inside of the wedge should be slightly thinner than the outside (Fig. 6D).

In joining the stock and the cion, keep in mind that the bark of the stock will be thicker than the bark of the cion. This is important to remember in placing the cambiums in contact with each other. The top of the cut surface of the cion should be flush with the top of the stock, and it is most important that the cambium layers touch at this point.

If the cion is loose in the stock, wrap the split with waxed cloth for 3 months. To prevent constricting the limb cut the cloth after 3 months but do not remove it.

Seal all cut surfaces with grafting wax including the split in the stock. Be sure there are no pinholes in the wax that will permit moisture to escape.

BUDDING

Budding is a method of grafting employing a single bud as the cion. It is a fast and economical way of propagating many species of woody plants which includes peaches, plums, cherries, apples, and pears. Most budding is done in the nursery on stock being grown for this purpose. However, it is also used for top-working peaches, plums, and cherries in the field.

Preparing stocks of apple, pear, cherry, and plum for budding includes planting 1-year-old whips in the spring which have had their roots trimmed to 6 or 8 inches and the tops cut back to 12 inches above the soil line.

Peach stocks come from pits planted in the fall or early spring. Pits from peaches that ripen after August 1st germinate better than those from early maturing varieties.

At budding time all growth up to 10 inches above the ground is removed. A bud is placed from 2 to 8 inches above the ground on the shady side of the stem. When top-working a tree select 1-year-old side shoots to receive the bud. Since budding is done during hot weather, it is a good practice to pick a cool day or perform the operation late in the afternoon.

Collect "bud sticks" from vigorous current season growth. Generally the middle buds are the best to use since the tip buds are too immature and those near the base may have a cluster of buds or weak buds. These buds should be used immediately. Store on ice if they are to be kept up to 2 days. In removing the leaves leave ¼ to ½ inch of leaf stem (petiole) with the bud.

Before starting a budding operation, check the bark on the stock to see if it peels easily. (Irrigate if dry; bark will then slip in a few days.) If it does not and the cambium layer appears dry, the result will be disappointing. Often the French pear and mazzard cherry will stop growth in mid-summer, making their budding season short.

Always keep the "bud sticks" moist and out of the sun and wind as much as possible while working.

The "T" cut on the stock is made first by selecting a clear area on the bark and making a vertical slit 1½ inches long. Across the top of this slit make a cut through the bark ¼ to ⅜ inch long forming a "T". Open up the bark with a wooden wedge or butt of the budding knife.

The bud is cut from the stick by starting the cut ¾ inch below the bud coming up underneath and exiting about ½ inch above. The depth of the cut is such that only a very small amount of wood appears directly under the bud. Wood underneath the bud need not be removed. Hold the top part of the shield between the blade and thumb and insert the bud into the "T" cut on the stock. If part of the bud sticks out above the "T" it should be removed so the flaps can be closed tightly. Start at the bottom of the slit and with a rubber budding strip wrap firmly. Take care not to injure or cover the bud. Study Fig. 7.

In about 3 weeks the rubber strip will likely loosen and some-

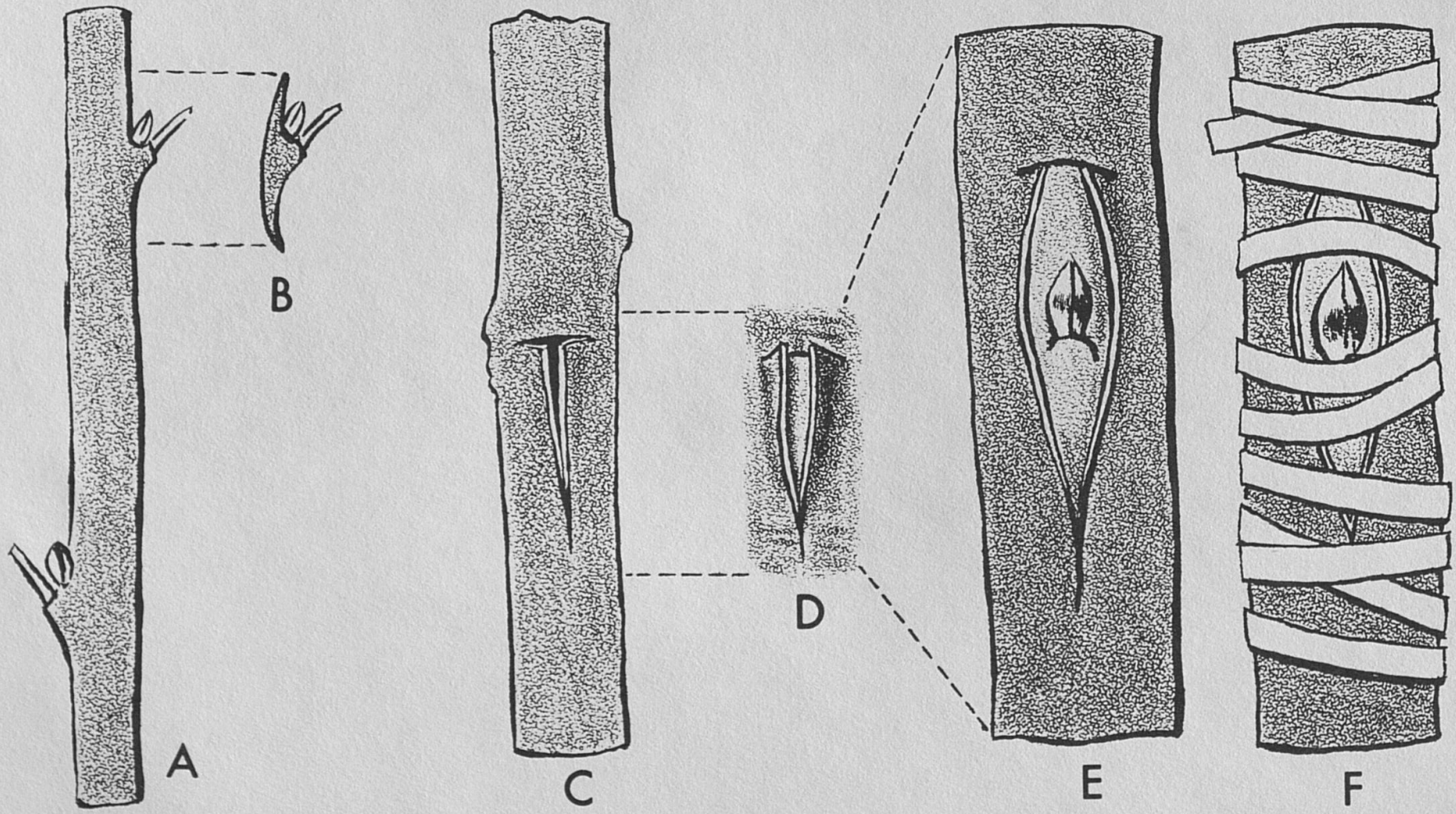

Fig. 7.— (A) Bud stick with short leaf stems, (B) Shield bud, (C) "T" cut in stock, (D) Bark opened and ready for bud, (E) Bud inserted and flaps closed, (F) Rubber budding strip holding flaps and bud firmly in place.

times fall off. This is what it is supposed to do. If this does not happen, cut the binding to prevent constriction. If the bud is alive it will be plump. If it is shriveled the bud is dead and the job will have to be done over. Buds usually do not grow after they are inserted until the following spring.

It is a good idea to mark the bud placement with paint so it will be easy to see the next spring when pruning time arrives. Wait until there are definite signs the new bud will grow before removing the top of the stock to within ½ inch of the bud and all buds below. This will force the new bud into growth.

IMPORTANT POINTS IN GRAFTING

It makes no difference what method of grafting is used these points should be foremost in your mind:

(1) The cambium layers of the stock and cion must be in contact with each other. And do the job quickly.

(2) Bindings should not be so tight or left on so long that they impair or stop the function of the cambium cells.

(3) Use only good, properly stored cion wood with healthy buds.

(4) Do the job at the proper time.

(5) Use sharp tools.

(6) Provide physical protection for the graft until the union is strong enough to maintain itself.

(7) When larger trees are top-worked do the north and east sides the first year and the south and west sides the second year. This will help to prevent sunscald.

Grafting Wax

Melt 10 parts by volume of resin and 2 parts Bee's wax. Stir in 1 part talc (Celite) after resin and wax are melted. Pour in paper drinking cups for storage. When ready to use melt and apply with brush.

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