

6 Years Work in the College Nursery.

By,

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In "6 Years Work in the College Nursery" no chronological arrangement shall be attempted; but a simple statement of the work usually done in the College nursery during an "ordinary year" will be given, and the time for doing the various kinds of work will in most cases be incidentally stated.

Collecting Seeds.- Seeds for the nursery are collected as soon as convenient after ripening; there is more or less risk in leaving most kinds of seeds after they have ripened: seed receptacles burst allowing the seeds to drop out, birds ravage some of the fleshy fruits, and nuts are carried away by other collectors and by squirrels.

No method or methods of gathering need be detailed as the best method for the case in hand usually suggests itself at the opportune

time.

Treatment After Gathering.— The seeds of such fleshy fruits as the Mulberry, Winter berry, Barberry, etc., are usually most readily separated from the pulp by maceration in water. Apple seeds are procured by placing pomace from the cider mill in water where the seeds settle to the bottom and the other material is floated away. Nuts, excepting the walnut, usually separate readily from the hulls when dry. Walnuts may be planted with the hulls on or the hulls may be rapidly removed by running the nuts through a corn sheller. Poddled seeds like the Locusts, Caragana's, etc., where the quantity is large are run through a threshing machine. Small quantities may be placed in a bag and beaten with a stick till threshed. Some seeds, as those of the Coffee tree, can only be readily separated by hand.

Storing Seeds.— Seeds matur-

ing early in the season are usually planted as soon as ripe as it is difficult to maintain their vitality by any method of storing. But seeds ripening in the fall must have suitable winter storage if they are expected to germinate readily the following spring. Seeds having hard, thick or horny shells, such as nuts, seeds of the stone fruits, acorns, locust seeds, and many others are stratified over winter, or what amounts to about the same thing are planted in the fall. In stratifying, the seeds are placed in boxes alternating a layer of sand with a layer of seeds. The boxes are then put in a cool place, and where the sand will be kept moderately moist; the north side of a building is a good place, the boxes may be sunk in the ground to prevent drying out.

Some seeds such as Red cedar, Winter berry, etc., if wanted to germi-

nate the spring following gathering must have a part of the hard shell removed. This is accomplished by the use of caustic potash; the seeds are stratified in unleached wood ashes until on examination the thick shell is found to have been largely eaten away, then they are taken from the ashes and stratified in sand until planting time.

The seeds of conifers, catalpa, and a few others, are kept cool and dry; they are placed in bags and stored in a cool dry cellar.

Propagating from Seeds.—Bulky seeds and those that germinate and grow without any especial care are usually sown in drills, in the nursery rows, the distance apart being governed by the length of time the young trees are to remain in the nursery and the per cent of the seed that will probably germinate. The depth of planting varies for different seeds, being for

large seeds two or three times, and for small ones four or five times their own depth. The soil should be only moderately moist as too much moisture is apt to rot the seeds before germination takes place.

Seeds needing especial care are started in seed beds and in the forcing-house. Those most commonly started in seed beds are the conifers, mulberry, etc. Mulberry seeds were germinated and successfully grown in a very dry season by laying over the bed till the young plants began to push through the ground, gunny sacks partly filled with moss and dampened; the sacks were removed as the young plants began to appear and the bed was partly shaded with lath. The shaded bed was kept in good condition for the growing plants in the driest weather by watering once daily and keeping the surface soil well worked. Conifers are grown in the

same way only with more difficulty as the young plants are more tender and their growth is much slower. Some of the conifers require a shade during the second season while broad-leaf seedlings require shade but one season if at all.

Seedlings started in the forcing-house are usually sown quite thick in boxes containing soil, and the larger plants are potted off from time to time to make room for those that start later. If started in this way in early spring they may be transferred to cold-frames in late summer to harden and the following spring be ready for permanent setting.

Transplanting Young Seedlings.-

Many trees grown from seed if left undisturbed form a tap-root system with so few lateral roots that they do not transplant well when of a suitable age for permanent setting; to remedy this trans-

planting is done in the nursery; after the first season's growth the young seedlings, Walnuts, Catalpas, Locusts, Soft maples, Paraguanas, Pines, etc., are taken up in fall or spring, - usually spring, one-fourth to one-third of the root clipped off and again set in the nursery; this promotes the growth of a vigorous spreading root system that is more conveniently and successfully transplanted to the permanent location. Rapid growing trees need but one season's growth in the nursery after transplanting but Conifers, Birches, Hard maples, Ashes, Hackberries, Oaks, Elms, and other slow growers are best left two seasons.

Propagating from Cuttings. - Hard-wood Cuttings: - Many trees, shrubs, and vines are more satisfactorily propagated from cuttings than from seeds; many fruits do not come true to seed, and some seeds are difficult to handle on account of their small size

or the manner in which they are produced. Hard-wood cuttings are usually made from the season's growth of wood, but Cottonwood, Willow, etc., "strike" readily from older wood. Cuttings are made at any time after the leaves drop in the fall till just before growth begins in the spring; they are cut at various lengths, - from six to twelve inches, the six in. cuttings being of convenient length for the forcing house, and the eight to twelve in. cuttings are used for nursery setting. They are cut into lengths with common pruning shears, and tied into bunches of fifty or one-hundred for convenient handling. Until time for setting they are stored in sand tops down, in a cool cellar or in a pit. The sand must be permanently moist but care must be taken not to get it too wet. If buried a sufficient depth to prevent sprouting a temperature as high as 50° will

hasten calousing.

Setting Cuttings in the Nursery.- Cuttings are not set in the nursery in the spring until conditions are favorable for growth to begin at once. A rapid and satisfactory method of setting them is to plow a furrow where the row is to be, set the cuttings six to eight inches apart along the land side, draw the dirt against them with a hoe, and pack it firmly with the feet leaving about two inches of the cutting above ground. Cuttings are usually set slanting so they will settle with the soil.

Cuttings that are very difficult to start in the open ground are started in the forcing house where bottom heat can be supplied. The bench in the forcing house in which cuttings are to be started is filled with clean sand. The cuttings are set quite close, - one to two inches apart in the rows and the

rows four to six in. apart;— as they are potted off as soon as the roots are well started. After the cuttings are set the sand must not be allowed to dry out. The bottom heat is supplied by steam-pipes running lengthwise under the bench.

Green Wood Cuttings.— The Hydrangeas and Syringas are propagated from green wood cuttings when propagated from cuttings. The green tips five to eight inches long are taken about mid-summer and all the leaves removed except two or three at the tip; these are set in sand in a shaded frame, one to three inches deep, and kept well supplied with moisture. With proper care the roots should be far enough advanced so they can be transferred to the nursery the following spring.

Root Cuttings.— Raspberries, Blackberries, Dewberries, and some of the

ornamental shrubs are propagated from root cuttings. Root cuttings are made from roots one-fourth to one-half inch in diameter; these are cut into pieces two to three inches long. The berries mentioned start readily when the cuttings are planted two to three inches deep in the nursery rows; others, however, require bottom heat.

The time for making and planting, and the manner of storing root cuttings, is practically the same as for hard wood cuttings. In collecting root cuttings, however, roots should be taken from one side of a plant only if the plant is to be left growing, and only those should be removed that are of a desirable thickness.

Propagating by Grafting.— There are only two methods of grafting commonly employed in the College nursery: the Whip graft and the Cleft graft methods.

The Whip Graft. The whip graft method is used to the exclusion of all others for in-door work. The bulk of the grafting is done in-doors during the fall and winter.

The material for whip grafting which consists of stocks and scions is usually gathered quite early in the fall. The stocks should be dug before freezing weather sets in, and scions should be gathered as soon as the leaves have dropped from the trees in the fall. Scions may be gathered at any time during the winter, but those gathered late do not work so satisfactorily; the bark is harsh and brittle and is apt to break loose from the tongue of the graft when making the in cut.

The stocks are the roots, usually of the first but sometimes of the second season's growth from seed. Scions are the mature season's growth of wood, usually taken from the tips of branches of bearing trees. After

gathering, stocks and scions alike are packed with damp hay, straw, or excelsior in a cool cellar until used. The ventilation of the cellar should be good and the temperature not higher than 40° ; poor ventilation is conducive to fungus growth, and a temperature higher than 40° may cause sprouting.

To make the graft only one tool is necessary, - a grafting knife (Fig. 1). Knives similar to the one represented in the cut are supplied by several cutlery firms at a cost of about twenty-five cents each. The blades are finely tempered so that they "hold an edge" well, a necessary qualification of a grafting knife; a knife with a keen edge is absolutely essential for successful grafting. Both scion and stock are cut across diagonally beginning one inch to two in. from the end and bringing the knife out anywhere from just beyond the pith to the opposite side (Fig. 2). An in cut beginning one fourth in. or less

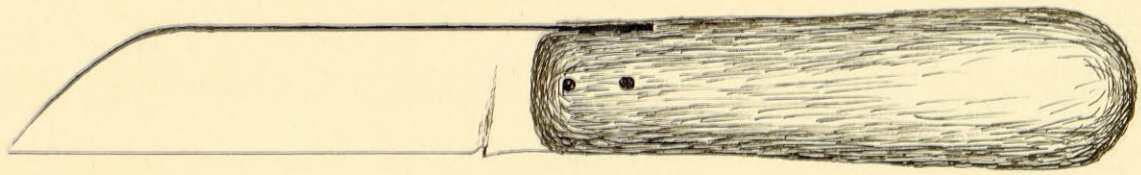


Fig. 1.

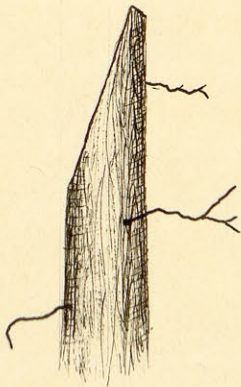


Fig. 2.

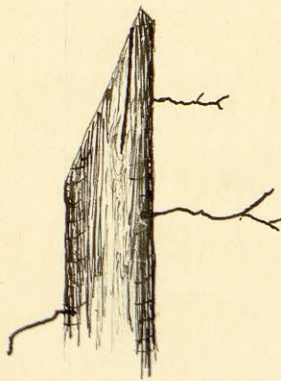


Fig. 3.

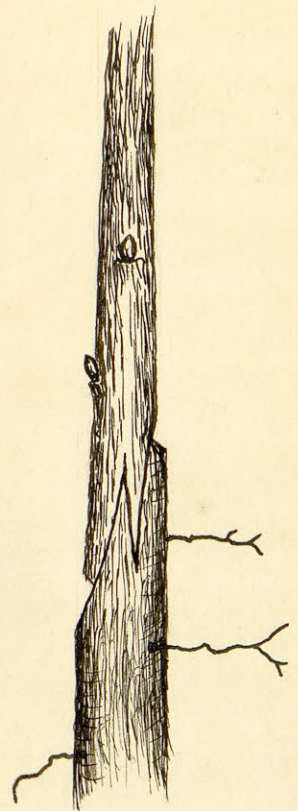


Fig. 4.

from the out end of the slant cut is made, nearly following the grain, care only being taken that it cuts instead of splitting (Fig. 3). The stock and scion are now ready to be placed together with the cambium in contact on one side at least (Fig. 4). The graft is then firmly bandaged with waxed cloth or paper to keep the parts firmly in place.

Where cloth is used for wrapping, thin, easily torn, - usually old, - cotton cloth, is torn into strips a couple of inches wide, wrapped on the end of a stick for a hand-hold, and placed in a vessel containing boiling grafting-wax until thoroughly saturated.

On cooling it is ready for use, being unrolled from the stick and torn into strips of suitable width for wrapping as needed. Where paper is used tough flexible paper is selected and the wax applied while hot with a brush on one side of the paper only. After the wax

has cooled the paper is cut into strips
suitable for wrapping, with a sharp
knife.

The wax used is made as follows:

Gallow 1 part

Beeswax & Paraffine 2 parts

Rosin 4 parts,

melted together.

Piece root and Whole root grafts, -
differ in that for the whole root
graft it takes a whole root for a single
graft while for the piece root graft
one root will furnish stock for two
or more grafts.

Advantages and Disadvantages of
Piece and Whole Root Grafting the Apple.-
Experiments in the College nursery and
orchard have shown that whole root
grafts make a more rapid growth for
perhaps the first two seasons, but
after this the difference is hardly
noticable. The cost and inconvenience
of handling the whole root graft
is decidedly against it, so much so
that whole root grafting of the apple

is no longer practised. The piece root grafts early in their growth, root above the union, which is favorable to a uniform growth. It might seem probable that whole root grafting would favor tap root growth but such is not the case; tap root growth of the apple is only conspicuous during a few seasons even in undisturbed seedlings; the tap root ceases growth or nearly so while the side roots become so much larger that the apple, after the third year cannot be classed as a tap root growing tree.

Where the Whole Root Graft is Used. Some of the stocks used in grafting ornamental shrubs have such finely branched roots that it is not practical to make more than one graft from one root; this is true of pivot stocks which are sometimes used for grafting syringas on.

String Grafts. - As fast as the in-door grafts are made they are

tied into bunches of convenient size for handling, usually fifty or one-hundred in a bunch, and stored in sand in a cool cellar. Here the process of calousing usually begins and in some cases is quite well advanced by the time the ground is in condition to receive them in the spring. The only care they require from the time of storing till they are set in the nursery is to see that they do not dry out.

Setting Grafts in the Nursery.— Grafts are set in the nursery in the same manner as cuttings only great care should be taken in handling not to rupture the partially caloused parts.

The Cleft Graft.— The cleft graft is chiefly employed in renewing the tops of old trees, vines, etc. It is sometimes employed in a small way when a few scions are received too late for in-door grafting that

we particularly wish to save. To make the graft the stock is cut squarely across with a sharp, usually a fine toothed saw, and if time will permit the surface is smoothed with a sharp knife. A split is then made through the center with a grafting chisel (Fig. 5), the split is pried open with the wedge shaped end of the chisel and the scion or scions inserted (Fig. 6). Where the stock is large a scion is usually placed at each side so that the cut surface will be sooner healed over. The scion is cut wedge shaped and slightly thinner on the inner edge to insure close contact of the cambiums. The wound is then entirely covered with grafting wax. The same wax used for indoor work may be used for cleft grafting if it is pulled like taffy.

Care of Grafts After Setting. - After growth has well started grafts should be gone over occasionally to see that not more than the desired number of

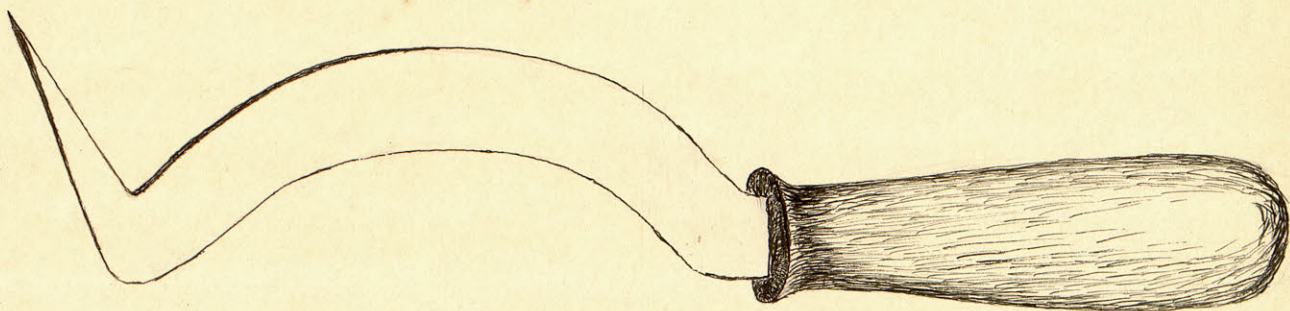


Fig. 5

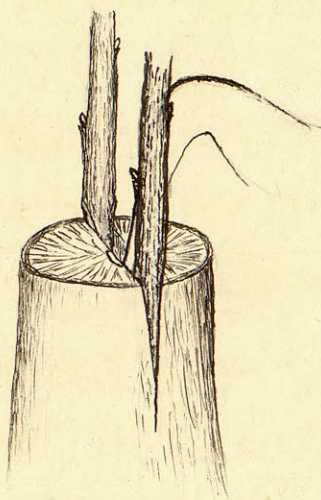


Fig. 6

buds have started to grow and to remove any undesirable growth.

Propagating by Budding.- The stone fruits and sometimes the apple are propagated by budding. Bud stocks are seedlings one and two years from seed and should not be less than one-fourth inch in diameter for convenient working. The buds are taken from well matured shoots of the season's growth and should be of the desired variety. Only one tool, the budding knife, is used in the operation of budding; it is similar to the grafting knife only the end of the blade is rounded in the opposite direction. Buds are removed from the bud-stick by cutting through the bark crosswise one-eighth to one fourth inch above the bud then beginning one-fourth to one-half inch below the bud and cutting upward just beneath the bark or removing only a small amount of wood (Fig. 7). A shield-shaped piece of bark is re-

moved with the bud and the process is called Shield Budding. The bud is placed on the north-east side of the stock and near the ground as this gives the best protection from sun and wind. If any loose soil has been worked up around the stocks by cultivation it is pulled away so as not to interfere with putting the buds well down. A vertical and a transverse incision is made through the bark (Fig. 8), the corners are lifted a little with the point of the budding knife (Fig. 9), and the bud is pushed downward into place (Fig. 10). The bud is held firmly in place by wrapping with raphia or wrapping cord (Fig. 11). The wrapping is cut into pieces so that one piece is sufficient for wrapping one bud. The string is started below the bud the lower end being fastened by lapping the second course over it and the upper end by passing it under



Fig. 7

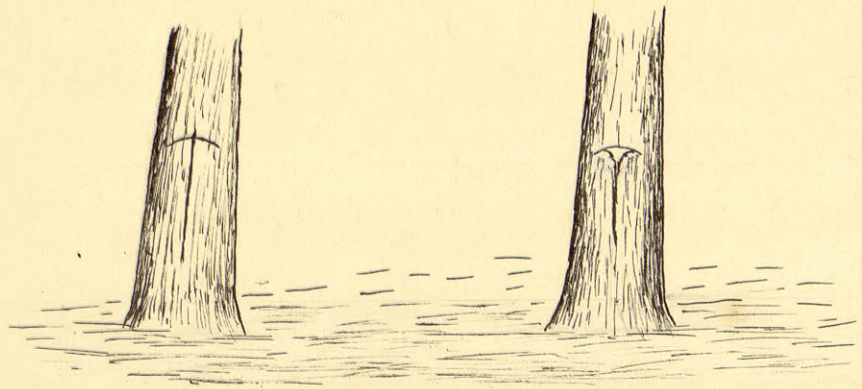


Fig. 8

Fig. 9

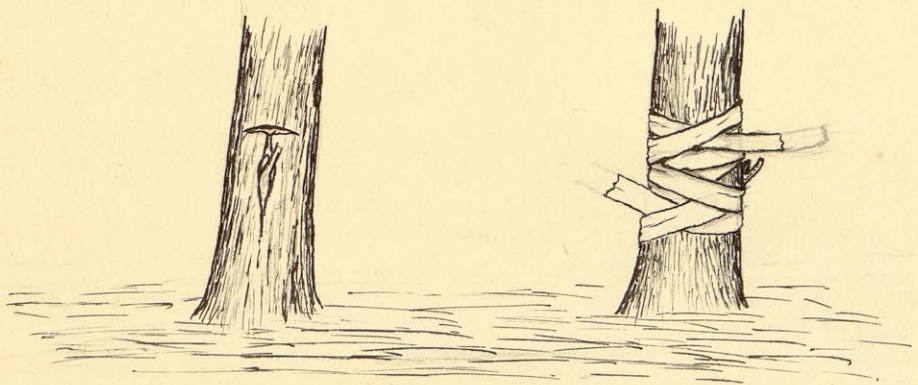


Fig. 10

Fig. 11

the last course and drawing it tight. Two to three courses are put below and an equal number above the bud, care being taken that the string does not pass directly over the bud.

In two or three weeks after the buds are set the strings must be removed or they will restrict the stem and perhaps kill the bud. And by checking the flow of sap they may cause the buds to start to grow; the buds should lie dormant till spring as fall growth rarely survives the peering of winter. The strings are removed by drawing the edge of the budding knife across them severing them on the side opposite the bud and allowing them to drop off as they will.

In the spring the tops of the stocks are removed, at first a few inches above the bud with a pair of large pruning shears, and later

just above the bud with a sharp knife. Any shoots thrown out by the stock are removed from time to time during the first growing season to prevent their usurping the energy that should go to the bud.

Winter Protection of Buds.— It is sometimes necessary to provide for the young buds some protection from the severe cold of winter. This may be easily and rapidly done by taking a small plow with one horse and throwing the dirt against the base of the trees completely covering the buds. One furrow on each side of the row is all that is required if properly done. In the spring after all danger from severe weather is passed the dirt is drawn away with a hoe.

Pruning Nursery Stock.— Most of the tree fruits and some ornamental trees and shrubs require pruning before leaving the nursery in order that a desirable head will

be formed.

In pruning fruit trees the end in view is to secure stockiness, with the branches starting at a proper distance from the ground. If branches start too near the ground they should be removed, and if a height of more than three-and-one-half feet is reached without branches the tree should be cut back to where it is desired to have the branches start. Apples are cut back to from three-and-one-half to three feet; cherries when they require it a few inches higher; peaches are rarely cut back until set in the orchard as they usually branch profusely without it.

Ornamental trees and shrubs are pruned to promote stockiness; in these the growth is so slow that pruning is rarely done the first season with the formation of a head in view. Pruning for the desired form of head is usually done after permanent setting.

Propagating by Layering.- Layering is in most cases a slow method of propagation and is not extensively practised except with plants that are propagated with difficulty by any of the more expeditious methods. All vines and most trees and shrubs may, however, be propagated in this way. Strawberries, black raspberries and dewberries propagate themselves by layerage so also do some of the roses, but most plants require the assistance of the cultivator. A common method of layering is to bend a branch to the ground and cover it with two or three inches of dirt leaving the tip end out of the ground. Rooting is sometimes induced or hastened by cutting one-third to one-half way thru the branch at the point where the roots are to be thrown out. One good strong plant is produced by each branch so treated. But another and more rapid method that works especially well on some much branched

ing shrubs as gooseberries, privets, etc., is what is known as "mound layering". The shrubs are cut back to induce branching near the ground, and after one season's growth the earth is pulled up around the base to a height of three or four inches leaving the branches in their natural position; roots are thrown out by the covered portion of these branches. After one season's growth in the mound the plant may be taken up and cut apart so that each branch that has rooted forms a new plant.

Cultivation of the Nursery.- Clean culture and the maintenance of a soil mulch are found to be essential if the best results are to be obtained. Experiments have shown that in no other way can the soil be kept in so good condition for the growing plants. In the dryest seasons the subsoil can be kept fairly moist if capillarity is arrested a few inches below the surface

by the soil mulch provided there is no other crop to draw on the supply. In wet seasons clean cultivation insures good surface drainage, so in either case a uniform condition most favorable to plant growth is maintained.

The tools used in cultivating the nursery are very simple: between the rows a five-shoveled one horse cultivator is used. The shovels of this plow are small and are so set that the surface is left as nearly level as possible and evenly covered with the loose soil. The soil is worked in the rows with an ordinary garden hoe. If the plowing is well done hoeing is not necessary unless there are weeds, or there is danger of the ground getting too much packed at the surface.