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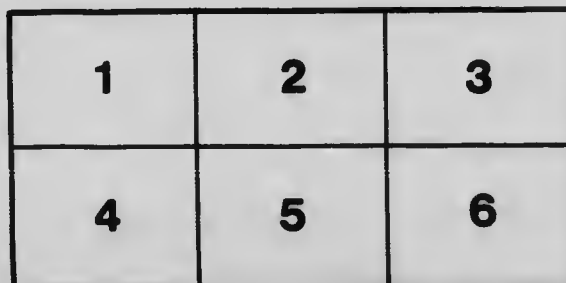
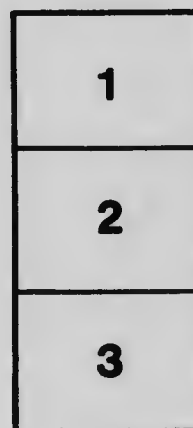
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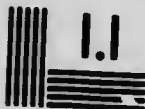
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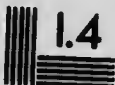
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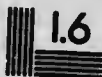
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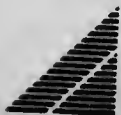
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BULLETIN No. 12.

(Third Edition, re-revised.)

DEPARTMENT OF AGRICULTURE

—OF—

BRITISH COLUMBIA.

INFORMATION FOR FRUIT-GROWERS.

Re-revised edition of Bulletin No. 12, published by the direction of the Honourable R. G. Tatlow, Minister of Agriculture, for distribution amongst the members of Farmers' Institutes and others.

J. R. ANDERSON,

Deputy Minister of Agriculture.

Department of Agriculture,

Victoria, B. C., 28th August, 1905.

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INFORMATION FOR FRUIT-GROWERS.

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LOCALITY.

For a commercial orchard it goes without saying that, for all reasons, localities near lines of transportation should be selected. Economy in shipping and the saving in handling of the fruit must necessarily immediately suggest themselves to intending orchardists.

This is more especially applicable to early and delicate fruits, which require to be handled as little as possible and placed on the market in as short a time as possible after picking. Therefore, if a person is seeking a site for a general orchard, it is of prime importance that locality should be a first consideration.

SELECTION OF SITE.

The success of an orchard largely depends upon its situation, and great care, especially in this country, should be exercised in its selection. I make use of the expression "especially in this country," advisedly, for the reason that the periods of activity and dormancy in plant life are by no means as clearly defined as in many countries, and this applies more particularly to that part of the country bordering on the sea coast, where many plants often remain in bloom through the winter. Fruit trees, owing to climatic causes, do not mature their wood sufficiently early, and the sap often begins rising at a period which endangers the life of a tree from the liability of late frosts. This can be controlled, in a great measure, by the selection of a proper site. Experience has shown that eastern and southern exposures are not well adapted for orchards, such exposures tending to promote early growth, and in case of late frosts the influence of the early morning sun acting injuriously on the trees. A north-western exposure, other conditions being favourable, is, I believe, the ideal site for an orchard in British Columbia. On such an exposure the undue early growth is retarded, the influence of the early morning sun is minimised, and the full effect of the afternoon sun, at the season when it is of the greatest utility, is secured.

An excellent plan to retard the growth of trees, in those parts where the ground gets sufficiently frozen in winter, is to mulch the trees whilst the ground is frozen. Straw, fern, chips or sawdust are all good for the purpose. This serves to keep the ground frozen and, consequently, cold about the roots, and prevents the sap rising too soon. When it is desirable the mulch can be removed, and the ground cultivated and the mulch replaced, or it may be dug in. In the case of pine or fir saw-dust and chips, however, they had better be removed, on account of the acrid principle they contain.

SOIL.

Apples and cherries thrive well on high land with a good fall; pears and plums will do on lower and more humid soils, but in all cases thorough drainage is indispensable. On the Lower Mainland and the Islands the gravelly, fir-covered slopes make excellent orchard sites for the first-mentioned fruits and peaches, whilst the lower lands answer for most other fruits. Light peaty soils are to be avoided for all kinds of fruits.

Whilst it is preferable to select the best available soil, it is not absolutely necessary, especially for apples, cherries and peaches, that rich alluvial bottoms should be chosen; as a matter of fact, low bottoms, alder, willow, etc., had better be avoided. The fruits mentioned thrive well on warm gravelly land, and, therefore, the fir-covered slopes so common in this country are often preferable to the richer low lands, only the land should have those elements of fertility added which in such soils are naturally wanting, and the trees mulched during the hot, dry periods. The lower lands are more suitable to other fruits; nevertheless, low valleys with water lying or streams running through them, are generally cold and subject to frosts; therefore, such situations are not suitable for any kind of fruit, as the cold air, resulting in late frosts, often destroys the buds.

PREPARING THE LAND.

It must be borne in mind that in the Province of British Columbia a great diversity of conditions exists, and it would, therefore, be futile to attempt to describe in a general way what should be done in the way of preparing the land for the reception of the young trees, that would suit all conditions. Land, when practicable, should be well cultivated and, if necessary, fertilised with barnyard manure. A hoed crop is a good thing to prepare the land for fruit trees; it will then be in good condition in the autumn, if it is decided to plant out the orchard at that time; if not, the land can be left rough after the removal of the hoed crop, so that the winter frost may have a chance to pulverise the soil, and it can be harrowed in the spring before setting out the trees. In any case, whether a hoed crop is used or not, the land should be deeply plowed and kept free from weeds. Many small farmers or settlers with small means, who take up bush lands, want, of course, to start an orchard, if only for family use, a very laudable and commendable wish. Such people do not want to wait until the stumps rot out, and the question is often asked: What should I do? I have seen very successful orchards on such lands, the smaller stumps and brush having been cleared off and the trees planted between the large stumps. The bed should be carefully prepared, as described under the heading of "Planting," the land kept well cultivated about the trees and plenty of mulching used during the dry season, in the early stages of the tree's growth, when the land is gravelly and dry, as is frequently the case with fir-covered lands.

LAYING OUT AN ORCHARD.

Having selected a site, the next thing is to lay out the orchard. This should be carefully done and each spot marked by a substantial post. There are several methods of planting, viz.: hexagonal, quinqueux and square. The

latter plan is probably the most common, whereby the land is laid off in lines crossing each other at equal intervals of space. By this method the number of trees per acre is as follows:—

10 feet apart each way	436 trees.
12 " "	302 "
14 " "	222 "
15 " "	193 "
16 " "	170 "
18 " "	134 "
20 " "	109 "
22 " "	90 "
24 " "	75 "
30 " "	48 "

By quincunx planting one tree is set in the centre of four planted as above. To find the number of trees per acre by this method, add one-half to the above given numbers. Thus, to 48 trees per acre, 30 feet apart, add 24, which will give 72 trees per acre.

The distance between the trees depends greatly upon the particular fruit and upon mode of cultivation and pruning. For my part, I would never recommend apple trees being planted closer than 30 feet apart each way in this Province. The following are the distances recommended by Prof. S. W. Fletcher, Horticulturist of the Washington Agricultural Experimental Station, where the conditions, being similar to our own, may be accepted as suitable for this Province:—

Apples	30 to 40 feet.
Pears	18 to 25 "
Peaches	} 16 to 24 "
Apricots	
Plums	
Sweet Cherries	
Sour "	28 to 40 "
"	16 to 24 "

Apples are sometimes planted 24 feet apart, and every alternate tree, after they have become too large, is cut out; or peaches, which are short-lived, are planted alternately. The trouble about this plan is the reluctance, when trees have become large and in full bearing, to cut them out, resulting often, in allowing them to stand, and so reducing the yield of all. On the whole, I do not recommend this plan when land is in abundance and prices of fruit good.

In laying out an orchard a chart should be made in a book kept for the purpose; by this plan the names of the trees can be noted, so that when the tags are lost, as is invariably the case, the varieties can always be identified, and much trouble and vexation avoided later on.

WHEN TO PLANT.

On account of the varied climatic and other conditions existing in the different parts of a Province of the extent and with the topographical

conditions of British Columbia, it is clearly impossible to give any hard and fast rule as to the best time to plant fruit trees. Speaking generally, the early autumn and winter is preferred where the climate admits of it, say on the Islands and that part of the Mainland to the westward of the Coast Range. In the Upper Country or Dry Belt, fall planting is not always practicable. Therefore, it is evident that local conditions must enter very largely into the question. I am certainly of opinion that the better time for transplanting is in the autumn, when possible. Above all, whether your orchard is planted in the fall or spring, the trees should not be kept out of the ground longer than is absolutely necessary; the roots should never be exposed to the weather; always heel in the trees until you place them in the places they are intended permanently to occupy.

PLANTING.

The planting of a tree is an operation that, whilst not requiring much skill, yet requires the greatest care, as on that, the tree being a healthy one, greatly depends the success of it in after life. Having selected your tree, which should be sound and healthy, free from insect pests and diseases, the roots should be carefully looked over, all broken or bruised ends cut off smoothly, and the head cut away proportionately with the roots. Having dug the place (not a hole as if for a post) at least a spade's depth, and a diameter of some four feet, and thrown the earth out, replace the top earth so as to form a sort of pyramid, the centre being the spot where the tree is to stand and about the general level of the surrounding land. On this mound place the tree, inclining it slightly towards the quarter of the prevailing winds; spread out the roots carefully; the tree will then be higher out of the ground than it should be. Fill in with good earth, well pulverised, and tramp down carefully and lightly, so as not to injure the roots, shaking the tree up and down by the trunk every now and then so as to get the earth well settled about its roots. When the place is filled and the earth well settled down, the tree should be about the proper depth in the ground, that is, at the same depth it was when in the nursery, the last inch or two of soil should be left loose, for the well-known reason that it acts as a mulch, preventing evaporation. Young trees, well planted, do not generally require staking. If staking is deemed necessary, a stout stake, well sharpened, so that no injury may be caused to the roots, may be driven close to the tree and the tree bound to it by any soft material, placing a pad between the tree and stake at the point at which they are fastened together. Sometimes the stake is driven diagonally and bound to the tree at the point of intersection. Another way is to use two stakes driven a foot or eighteen inches from the tree on either side, and the tree secured by means of hay rope from one stake to the other. Care should be taken that the bands are loosened as the tree grows.

Downing, in his book on "Fruit and Fruit Trees of America," says: —

"Avoid Deep Planting.—More than half the losses in orchard planting in America arise from this cause, and the equally common one of crowding the earth too tightly about the roots. No tree should be planted deeper than it formerly grew, as its roots are stifled from the want of air, or starved

by the poverty of the soil at the depth where they are placed. It is much the better and more natural process, in fact, to plant the tree so that it shall, when the whole is complete, appear just as deep as before, but standing on a little mound two or three inches higher than the level of the ground about. This, when the mound settles, will leave it nearly on the level with the previous surface.

“Preparing the places.”—Here is the fatal stumbling-block of all novices and ignorant persons in transplanting. An English gardener, when he is about to plant fruit trees, talks about preparing his borders, and an American says he will dig his holes; and we cannot give a more forcible illustration of the ideas of two persons as to the wants of a fruit tree, or a better notion of the comparative provision made to supply these wants, than by contrasting the two phases themselves. The one looks upon a tree as a living being, whose life is to be rendered long, vigorous and fruitful by a good supply of food, and a soil mellow and easily penetrated by the smallest fibre; the other considers it very much in the light of a truncheon or a post, which he thrusts into the smallest possible hole and supplies with the least portion of manure, trusting to what he seems to believe the inextinguishable powers of nature to make roots and branches under any circumstances. It is true that the terms differ somewhat from the nature of the culture and the greater preparation necessary in planting fruit trees in England, but this is not by any means sufficient to justify the different modes of performing the same operation there and here.”

AGES OF TREES FOR PLANTING.

The mistake is often made, especially by amateurs and beginners, of planting out old trees, in the belief that by so doing they are ahead so many years. This is a very grave mistake. Apple, pear, cherry, plum and quince trees, from one to two years old from the graft, the former preferably, are, to my mind, the best age. They are then easily taken up, with the least likelihood of injury to the roots, are easily transported, less likely to die, and more speedily recover from the shock of transplanting. Peaches and apricots are better transplanted at one year from the graft or bud. Whatever you do, reject all weaklings; they are not worth bothering with and you will save money and time by substituting good, healthy, stocky trees.

PRUNING AND SHAPING THE TREE.

This is a subject which I approach with diffidence, inasmuch as opinions differ greatly as to the merits of the various styles of pruning. To enter fully into the subject would be too lengthy for a Bulletin of this description, besides being, possibly, of doubtful utility. As a rule, it may be accepted that all trees when young require very little pruning, and stone fruits scarcely more than is necessary to remove superfluous wood and decayed branches, at any time. For my own part, I incline to the pyramidal or standard form of tree in all cases, as, in the first place, being the most natural and, in the second place, being less liable to split apart from the weight of fruit or other causes, besides allowing a better opportunity for cultivation. This is the opinion of many eminent fruit-growers, whilst very many advocate the low heading tree as being less exposed to high winds, and on account of the fruit being more

easily picked. These systems will always have their advocates and both unquestionably have their advantages. After all, local conditions and other considerations must always be guides, to a certain degree, of the form best adapted for the locality. Downing, than whom no better American authority on fruit trees exists, as far back as 1845, in his excellent work entitled "Fruits and Fruit Trees of America," says in reference to pruning:—

"In this country almost all fruit trees are grown as standards. In this way they develop their natural forms, attain the largest size, and produce the greatest quantity of fruit, with the least possible care. Our bright and powerful sun, reaching every part of the tree, renders the minute systems of pruning and training, which occupy so large a portion of the English works on this subject, of little or no moment to the cultivator here. Pruning is, therefore, commonly resorted to only for the purpose of increasing the vigour of feeble trees, or to regulate and improve the form of healthy and luxuriant trees.

"Pruning has the power of increasing the vigour of a tree in two ways. If we assume that a certain amount of nourishment is supplied by the roots to all the branches and buds of a tree, by cutting off one-half the branches, at the proper season, we direct the whole supply of nourishment to the remaining portion, which will consequently grow with nearly double their former luxuriance. Again, when a tree becomes stunted or enfeebled in its growth, the thickness of its inner bark, with its consequent small sap vessels (which, it must be remembered, are the principal channels for the passage of the ascending supply of food), renders the upward and downward circulation tardy, and the growth is small. By heading back or pruning judiciously, all the force of the nourishing fluid is thrown into a smaller number, which make new and luxuriant shoots, larger sap-vessels, and which afford a ready passage to the fluids, and the tree with these renewed energies will continue in vigour for a long time.

"This treatment is especially valuable in the case of small trees of feeble or stunted growth, which are frequently cut back to a single bud, and a new shoot or shoots, full of vigour, gives a healthy habit to the tree. In the nurseries this practice of heading down unthrifty trees is frequently pursued, and small orchard trees which have become enfeebled may be treated in the same manner, cutting back the head as far as the place where it is wished that new shoots should spring out. Older trees should be headed back more sparingly, unless they are greatly enfeebled, and their roots should at the same time be assisted by manure.

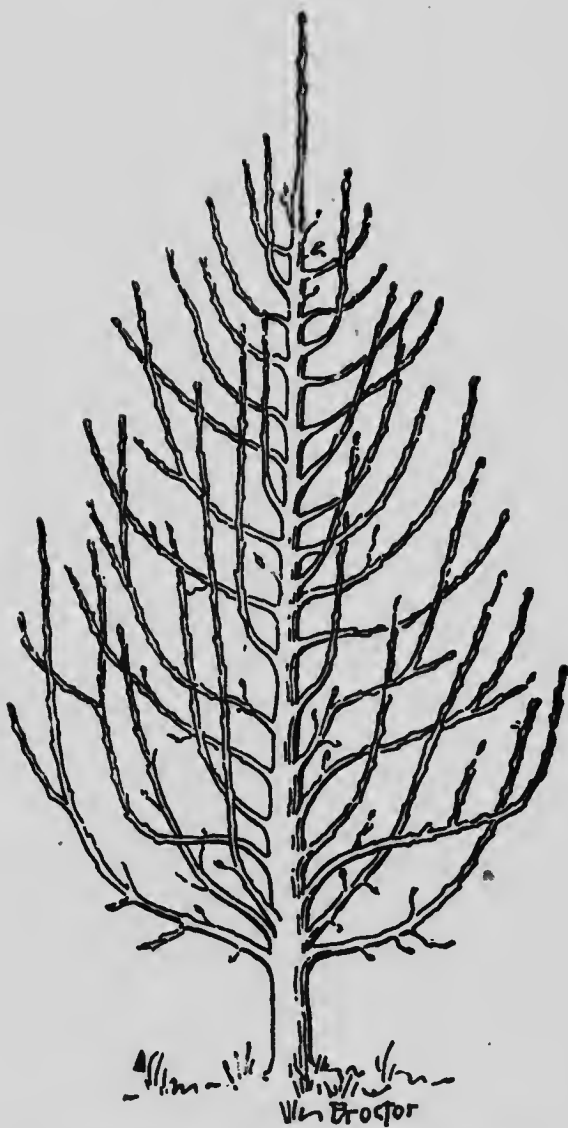
"A judicious pruning to modify the form of our standard trees is nearly all that is required in ordinary practice. Every fruit tree grown in the open orchard or garden as a common standard should be allowed to take its natural form, the whole efforts of the pruner going no further than to take out all weak and crowded branches, those which are filling uselessly the interior of the tree, where their leaves cannot be duly exposed to the light and sun, or those which interfere with the growth of others. All pruning of large branches in healthy trees should be avoided by examining them every season and taking out superfluous shoots while small. Mr. Cox, the best American

author on fruit trees, remarks very truly: 'When orchard trees are much pruned they are apt to throw out numerous (superfluous) suckers from the boughs in the following summer; these should be rubbed off when they first appear, or they may easily be broken off while young and brittle; cutting is apt to increase their number.'

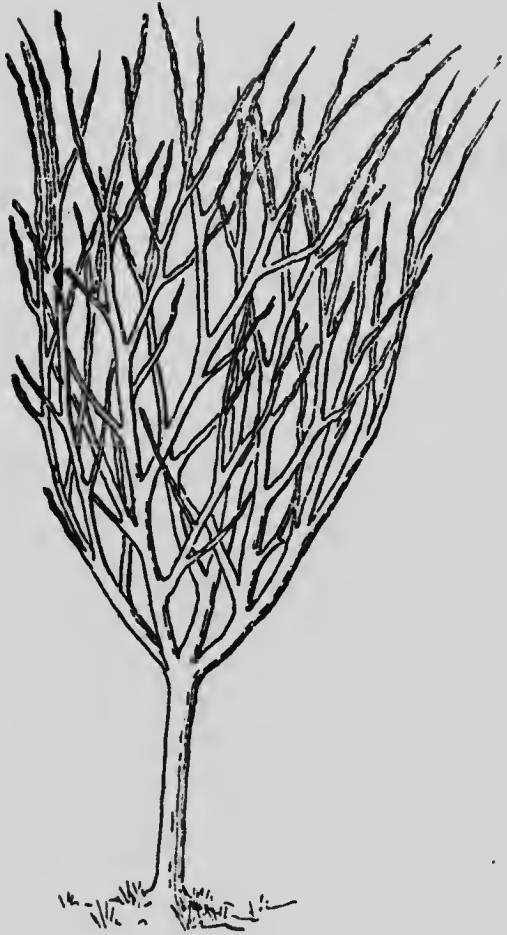
In a general way, young trees should not have their branches cut away from the trunks too soon; they should be allowed to remain until the trunk has attained a sufficient sturdiness to support the head and withstand the effects of wind and weather.

Downing says:—"Ignorant cultivators frequently weaken the energies of young trees, and cause them to grow up with lean and slender stems, by injudiciously trimming off the side shoots and leaves in the growing season. By taking off these shoots the stem is deprived of all the leaves which would attract and elaborate the sap, thus preparing nourishment for the growth of the stem, and the trunk of the tree does not increase in size half so fast as when the side branches are allowed to remain for a time, pruning them away gradually. It is better, in the case of these young trees, to stop the side branches when of moderate length by pinching out the terminal bud."

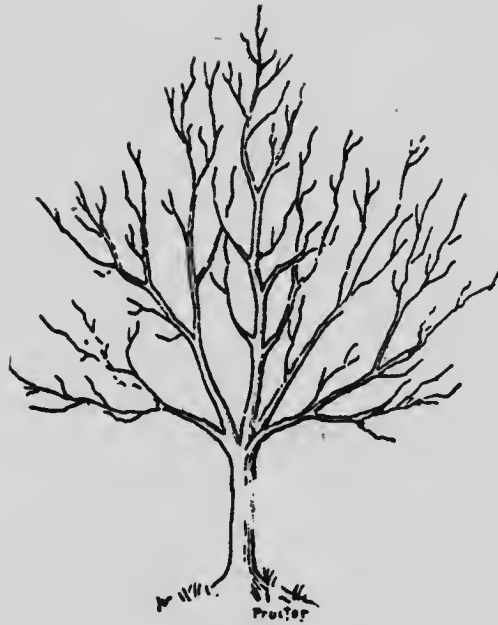
The accompanying cuts, adapted from the United States Bulletin No. 113, "The Apple and How to Grow It," by G. B. Bracket, Pomologist, gives a fair idea of the various forms of shaping the tree:—



1.—Pyramidal or standard form of top.



2.—Vase form of top.



3.—Modified form of top.

After the tree has attained sufficient strength the lower branches may be cut away to a point at which it is intended the tree should head, whether as a standard or otherwise. The pruning of mature trees requires to be done with prudence and care, the object being to keep the head of the tree open so as to allow a free circulation of air and sun, the removal of obnoxious cross and dead limbs, the shortening back and thinning out of fruit spurs, which in time become too numerous and unduly lengthened, with the consequence that there is an over-production of fruit of an inferior quality. The best period for pruning is just after the leaves have fallen, or in winter during mild weather, never after the sap begins to rise in spring. For summer pruning Downing recommends a fortnight before midsummer:—

“Wounds made at this season heal over freely and rapidly; it is the most favourable time to judge of the shape and balance of the head, and to see at a glance which branches require removal; and all the stock of organisable matter in the tree is directed to the branches that remain.”

When it is found necessary to cut off a large limb, the wound should be carefully smoothed with a knife, as indeed all wounds should be, and the part covered over with some composition. Downing recommends the following:—

“Take a quart of alcohol and dissolve in it as much gum shellac as will make liquid of the consistency of paint. Apply this to the wound with a common paint brush, always paring the wound smoothly first with a knife. The liquid becomes perfectly hard, adheres closely, excludes the air perfectly,

and is affected by no changes of weather, while at the same time its thinness offers no resistance to the lip of new bark that gradually closes over the wound. If the composition is kept in a well corked bottle, sufficiently wide-mouthed to admit the brush, it will always be ready for use and suited to the want of the moment."

Rev. F. Walden, an expert fruit-grower in the State of Washington, expresses himself on pruning in the following manner:—

"The question has been asked me as to the best time of year to prune an apple orchard. That depends. If pruning is done in the latter part of winter or the early spring, the result will be a wood growth. But if pruning is done in the month of June, the result is the formation of fruit buds. So the rule is: Winter pruning for wood growth and summer pruning for fruit growth. But we must not be misled by this well-established rule. It by no means follows that when we prune in winter we will have no fruit buds. What the rule means in this case is that there will be no increased formation of fruit buds as the result of winter pruning. Anything that mars a tree at the time of the formation of cambium layer causes the increased formation of fruit buds. A dying tree will have more fruit buds, all other things being equal, than a healthy tree. It seems to be an effort of nature to reproduce itself before dying. Pruning is, in some sense, a war on nature, and if done at the right time results in an effort to reproduce itself. But there is another fact to be reckoned with, and that is that this warring on nature improves the quality of fruit."

ROOT PRUNING.

Is sometimes practised for the purpose of forcing trees of over luxuriance into bearing by retarding the growth of the tree, as regards leaves and wood, and promoting the formation of fruit buds. It is performed in autumn or winter by digging a trench two or three feet deep round the tree from four to seven feet from the trunk, according to the size of the tree, and cutting all the roots off with a sharp spade and then filling the trench with mould. This plan is better adapted for small gardens than large orchards.

POLLINATION.

Many trees and plants are self-sterile and others self-fertile. Some species of plants are naturally so, the self-sterile being called dioecious, that is, having the male flowers on one individual and the female on another. Others called monoecious are self-fertile, that is, having the flowers of both sexes on the same individual. All of the cultivated fruit-trees treated of in this Bulletin belong to the latter class, but, by reason of cross-fertilisation, resulting in the production of high-class fruits, many varieties of apples and pears have become self-sterile, or partly so, amongst which I may mention the following varieties:—

Apples.—Gravenstein, Rambo, Belle Fleur, Northern Spy, King, Talman Sweet, Red Astrachan, Spitzenberg, Roxbury Russett.

Pears.—Bartlett, Howell, Anjou, Louise Bonne de Jersey, Boussock, Lawrence, Clapp's Favourite, Sheldon, Clairgeau, Souvenir de Congres, Winter Nells.

Therefore, it is inadvisable to plant large blocks of any of these varieties alone; every alternate row, or even every second or third row, should be planted with some other variety which flowers at the same time. Any variety, whether it is self-fertile or not, will fertilise any other variety.

Other tree fruits are mostly self-fertile, so there is no need to trouble about them. Strawberries, amongst small fruits, are often self-sterile, in which case it is advisable to plant other varieties in proximity.

VARIETIES RECOMMENDED.

For commercial purposes, a great variety of each kind of fruit is not recommended. It is better to profit by experience and plant only those varieties which are known to be profitable.

Having these facts in view, the Board of Horticulture, after due deliberation, published the following leaflet, which I recommended to intending orchardists:—

“The following list of varieties of fruit was adopted by the Board of Horticulture at a meeting held on the 23rd of November, 1900, and subsequently revised, as one to be safely recommended generally for orchards for commercial purposes. It must be understood, however, that the list does not contain the names of all the varieties which may be safely and, probably in many cases, profitably grown:

FOR VANCOUVER ISLAND AND OTHER ISLANDS.

Apples.

Late Summer	Yellow Transparent.
Early Fall	Duchess of Oldenberg and Gravenstein.
Fall	{ Wealthy, Blenheim Orange, King of Tompkins County, Canada Reinette, Lemon Pippin, Salome,
Winter	{ Grimes' Golden Pippin, Red Cheek Pippin, Belle de Boskoop, Fallawater, Cox's Orange Pippin.

Crabs.

Florence. Hyslop.

Pears.

Fall	{ Bartlett, Beurre Boussock,
Late Fall	{ Louis Bonne de Jersey, Beurre Clairgeau,
Winter	Vicar of Winkfield.

Pears.

- | | | |
|-----------------|---|-------------------------|
| Fall | } | Bartlett, |
| | | Beurre Boussock, |
| | } | Dr. Jules Guyot, |
| Late Fall | | Beurre Clairgeau, |
| | | Beurre Hardy, |
| | } | Louise Bonne de Jersey. |

Plums.

- | | | |
|-------------|---|-------------|
| Early | } | Clyman, |
| | | Peach. |
| | } | Grand Duke, |
| Late | | Monarch. |

Prunes.

German, Italian, Giant.

Peaches.

- | | | |
|-----------------|---------------|------------------|
| Early | Hale's Early. | |
| | } | |
| Late Fall | | Early Crawford, |
| | } | Early Charlotte. |

Cherries.

- | | | |
|--------------|---|-------------------|
| Early | } | May Duke, |
| | | Black Tartarian. |
| | } | Royal Anne. |
| Later | | Windso. |
| | } | Lambert. |
| | | English Morello, |
| Latest | } | Olivet, |
| | | Belle Magnifique. |

FOR UPPER COUNTRY.

Apples.

- | | | |
|--------------------|-----------------------|--------------------------|
| Early | California Astrachan. | |
| | } | |
| Early Fall | | Duchess of Oldenberg, |
| | } | Jersey Sweet. |
| | | Gravenstein, |
| | } | Snow, |
| Late Fall | | McIntosh Red, . |
| | | Wealthy. |
| | } | Blenhelm Orange, |
| Early Winter | | Cox's Orange Pippin, |
| | | Fall Pippin. |
| | } | Vandevere, |
| Winter | | Blue Pearmain. |
| | } | King of Tompkins County. |

Late Winter { Red-Cheek Pippin,
Jonathan,
Spitzenburg,
Wagner,
Northern Spy.

Crabs.

Hyslop, Transcendent.

Pears.

Fall { Flemish Beauty,
Bartlett,
Beurre Boussock.
Late Fall Louise Bonne de Jersey.
Early Winter { Beurre Clairgeau,
Winter Nells.

Plums.

Early Peach Plum.
Mid-Season { Black Diamond,
Monarch.
Late { Pond's Seedling,
Yellow Egg.

Prunes.

Italian.

Grapes.

Concord,
Niagara,
Sweet Water, Moore's Diamond,
Chasselas,
Neuchatel.

Cherries.

Early Black Tartarian.
Later Royal Anne.
Latest { English Morello,
Belle Magnifique,
Olivet,
Late Duke.

Peaches.

Early { Alexander,
Hale's Early.
Mid-Season { Early Crawford,
Early Charlotte.

The following circular letter, which explains itself, is published for the benefit of the purchasers of fruit trees:—

“ November 8th, 1902.

“ Sir.—It having been reported to the Board of Horticulture at its last meeting that a number of Japanese and other plums have been proved to be of doubtful value, if not quite worthless, for cultivation in this Province, the Deputy Minister of Agriculture and the Inspector of Fruit Pests were appointed a committee to deal with the matter, with the object of taking such steps for the protection of fruit-growers as may seem best. Therefore, the committee with this object in view, beg to make the following representations:—

“ Unless a fruit-grower is undertaking experiments—and we do not for a moment attempt to discourage such enterprise—we would strongly urge fruit-growers who are starting orchards for commercial purposes to buy only those varieties of fruit trees which, from previous experience, have proved themselves to be of value, and to avoid all varieties which are unknown, or are not well known to be profitable. Do not trust to the word of a tree pedlar; the chances are that he is more ignorant of the wares he is attempting to sell than the prospective purchaser. In most cases those varieties of fruit trees for which extraordinary claims are made turn out to be worthless, and the unlucky purchaser finds himself out, first in the actual cost of the trees, which, after all, is the least; but, in the second place, that which is impossible to estimate, viz., the loss of years of waiting, to find out at last that the trees are worthless and have to be rooted out; leaving him not only worse off than he was in the first place, but without recourse against anyone.

“ A list of varieties recommended was issued by the Board of Horticulture in November, 1900, copies of which, as well as any other information that lays in their power, can be obtained on application to the Deputy Minister of Agriculture, Victoria, the Inspector of Fruit Pests, Vancouver, or any member of the Board.

“ We have the honour to be,

“ Sir,

“ Your obedient servants,

“ J. R. ANDERSON,

“ Deputy Minister of Agriculture.

“ THOS. CUNNINGHAM,

“ Inspector of Fruit Pests.”

WHERE AND HOW TO BUY.

Whilst in no way depreciating the extra-provincial nurseries, it is a self-evident fact that acclimatised nursery stock is preferable to imported stock, and, therefore, it is recommended that, when possible, trees should be obtained from local nurserymen. The wisdom of this advice is, I believe, sound, for the following reasons:—Being acclimatised, no time is lost in adaptation to the new conditions; being freshly taken up and transplanted, the risk of loss by drying out and by frost are so minimised that very few of the trees die. The principals being on the ground and having reputations

to sustain, it is to their interest to sell only such stock as are true to name, and the substitution of other varieties than those wanted cannot be done without consent. In cases of mistakes, they are more easily rectified; the risk of diseases and pests is minimised; the opportunity of visiting the nursery and inspecting the stock before buying; the necessity and expense of inspection is avoided, for it must be remembered that all nursery stock from any point outside of the Province must be sent to Vancouver and there inspected by a quarantine officer of the Board, and the fees paid before it is allowed to be moved.

Prof. S. W. Fletcher, in Bulletin No. 53, on "Nursery Stock for Washington Orchards," decants as follows on this point:—

"The distinction between nearby and distant nurserymen should not be made on the mere distance of the nursery from the proposed location of the orchard, nor should it be made on state lines. It should be drawn between well-marked geographical and horticultural districts. Thus the Coast region of Washington, Oregon and British Columbia naturally constitute one great horticultural district, the irrigated valleys of Eastern Washington, Oregon, Idaho and British Columbia another, and the unirrigated uplands in these same sections still another. Orchardists in each of these districts will generally find it for their interest to purchase nursery stock which has been grown within the limits of the district. Of course, exceptions rise up on every side. Here are fine orchards in the Yakima Valley which came from Eastern stock; there are profitable Sound orchards which came from irrigated stock, and so on. But the general trend of evidence, and the opinion of some of our best fruit-growers, is that local stock is better. When its other advantages are considered, one comes to believe that in the end it is cheaper."

As I said before, this advice is given, not with the object of injuring the reputation of extra-provincial nurserymen, but with the sole object of giving what I believe to be good sound advice to those of our people who need it. When purchasing from a nurseryman at points without the Province it is well that the point regarding inspection, previously alluded to, should be clearly understood.

Attention is also directed to the provisions of section 17 of the "Horticultural Board Act," which reads as follows:—

"No person, firm or corporation shall engage or continue in the business of selling, as principal, agent, solicitor, or otherwise, within the Province, fruit trees, plants or nursery stock, or of importing for sale fruit trees, plants or nursery stock into the Province, without first having obtained a licence to carry on such business in the Province as in this Act provided."

All persons authorised to sell nursery stock in this Province are required by their principals, or by themselves, to deposit bonds, in the Department of Agriculture, Victoria, for the faithful performance of their obligations. The public is, therefore, warned not to purchase nursery stock except from duly licensed persons.

The following, by Geo. C. Atwood, in "Country Gentleman," is as applicable to purchasers of trees, and to nurserymen and agents, in Canada as in the United States:—

"GOOD ADVICE TO BUYERS OF TREES.

"The agricultural papers for October are repeating their perennial complaints against the 'tree agents,' and nearly every instance mentioned says that the 'victim' bought, as he supposed, valuable varieties, and after they came into bearing they proved to be nothing but scrubs or inferior seedlings—sour apples should have been sweet, red currants white, etc.

"Now, we have much sympathy for the grower who waits for years to get his trees into bearing, only to find that he has been victimised. Such experiences are disappointing, and in some cases attended with serious loss. The ease with which a label may be changed from one tree to another, and the long time it takes for a tree to bear, are inviting to an unscrupulous agent, and some fall into the temptation.

"The majority of trees raised in the State of New York are grown by honourable and responsible nurserymen—men who know their business, and who keep their varieties 'true to name.' Some of these nurserymen employ agents to sell their trees, and are responsible for the acts of those agents. If a stranger calls on you to sell you trees, do not believe anything he says unless he proves it. If he claims to be 'one of the proprietors' of a nursery, take his references and write to them. If he says he is a 'special' or 'general' agent he can show a certificate of his agency, and you are to see that it is of recent date. If you make a purchase, have him give you a duplicate of the order, and see that it is correct and that it has his name written thereon, and then write to the firm who sent him to you, giving a full account of the transaction, and they will acknowledge it.

"Any one who buys trees should be as cautious about it as if he were buying any other commodity. Satisfy yourself that you are dealing with reliable, established and responsible nurserymen, or their accredited agents. Plant freely of varieties of established value, invest but little in new things until you have tested them on your own land, and avoid all purchases of varieties when unreasonable claims are made for them."

MANURING AND MULCHING.

Barn-yard manure is the very best fertiliser that can be used in orchards. If that cannot be obtained, then recourse must be had to artificial fertilisers, if the land is deficient in plant food. Wood ashes is a fine thing about fruit trees, as they promote fruit-bearing rather than wood-forming. Never place fertilisers close against the tree; I have often noticed manure piled up against a tree; this is altogether wrong. A space of about a foot at least for small trees and much more for large ones, all round the tree, should be allowed. It must be remembered that it is the small fibres of the roots that feed and supply the trunk with vigour, and those fibrous roots are at the ends of the big roots. Enriching the land, like everything else, must nevertheless be done judiciously. If a tree is inclined to grow too vigorously and make wood at the expense of fruit, it would, of course, be injudicious to apply stable manure; an application of potash alone might in such cases be allowed.

Mulching is useful sometimes for confining the frost in the ground to prevent too early growth,* but generally for conserving the moisture during the hot, dry season. In districts with a moderate rainfall mulching is seldom required. Thorough cultivation is in every respect far more appropriate. In dry districts it may at times be advisable, but not until after growth has started, and stirring of the surface soil has been given. Mulching requires judgment; unless done lightly it tends to bring the roots too near the surface, and prevents the influences of sunlight upon the soil. It is well to remember that good cultivation—leaving a fine surface soil is generally sufficient to prevent undue surface evaporation—is nature's best mulch.

IRRIGATION.

The importance of applying moisture artificially in those parts of the country where the precipitation is insufficient can not be over-estimated. Albeit there is as great danger attending an over-supply of water as there is of an insufficiency. Water should never be applied after the fruit has attained its full size, or there will be danger of injury to the fruit, impairing its keeping qualities so materially as to render it unfit for transportation. Another evil effect of irrigation after the wood has attained its maturity is the promoting of a second growth, so that the wood is in an unripe state the tree; or in case of an early snow-storm, the tree not having shed its leaves, the breaking down of the limbs, or splitting the tree. As a matter of fact, a very small quantity of water, judiciously applied, *succeeds* better than an over-supply—beware of using too much water; cultivation is often all that is necessary, and when water is applied, use it intelligently.

This is what Mr. F. H. Newell, Hydraulic Engineer and Chief of the Division of Hydrography of the United States Geological Survey Department, says in "Irrigation in the United States," published in February:—

"In the humid regions rainfall is usually from 3 to 4 inches per month during the crop season. In the arid region, where the sunlight is more continuous and the evaporation greater, there should be, for the ordinary crops at least, enough water during the growing season to cover the ground from 4 to 6 inches in depth each month. Carefully tilled orchards have been maintained on far less. In Arizona, where the crop season is longest, being practically continuous throughout the year, twice as much water is needed as in Montana, where the crop season is short and the evaporation is less."

SUBSEQUENT TREATMENT.

As this Bulletin is written with the object of giving advice and information regarding the initiatory steps to be taken in starting an orchard, it is not intended to go into all the details of after treatment, such as spraying, etc. This information can be obtained in other Bulletins issued from the Department. A word, however, on the after cultivation of orchards may not be amiss. It may be accepted as an axiom that two crops cannot be taken off the same piece of land at the same time; therefore, it is unreasonable to expect fruit trees to flourish and bear good fruit if other crops are permitted

*See under selection of site.

in the orchard. When trees are young and the ground is not fully occupied by their roots, hoed crops may for a few years be cultivated with advantage, but grain and grasses never. Clover is useful as a fertiliser, if it is ploughed in at the first season. Sod should never be allowed, especially about young trees. The cultivation in an orchard should never be deep enough to injure the roots of the trees, and it should be continued through the summer with a cultivator, in order to keep the surface in good tilth.

GRAFTING

Is a process by which a scion is inserted on a stock in such a manner and at such a time that they unite, and the scion then forms the head of the tree. Grafting may be done at any time after the leaves have fallen, the best time being about the time the sap is rising, the scions having been previously cut and kept in a cool place, so that the scion is not quite as far advanced as the stock on which it is grafted. The great secret of success is, 1st—The health and vitality of both scion and stock; 2nd—That the operation is performed at the right time; 3rd—The perfect union of the bark (the Cambium layer) of the scion or graft with that of the stock; 4th—The thorough exclusion of air. Provided these rules are observed, there is no reason why every graft should not succeed, but, as is the case with all other matters in connection with horticulture, the rules must be observed or failure will result. Grafting is really a much simpler process than is generally regarded by the uninitiated. Great misconception also, I have found, exists as to what stocks can be used for grafting; like upon like is a *sine qua non*. For instance, an apple cannot be successfully grafted upon a pear stock, or vice versa, nor the cherry on the plum. Such unions may grow, but they survive but a short time. The apple may be grafted upon apple or crab stocks; the pear on pear or quince stocks; the plum and apricot on plum seedlings. As for attempting to graft fruit scions on such stocks as willow or alder, as I have heard it gravely asserted, is purely nonsense.

The first step in grafting is to secure suitable scions. These should be cut after the leaves have fallen; they should be of the same year's growth, healthy and vigorous, and from trees of well-known quality. It is needless to say that all weak, diseased and infected scions should be rejected. Having secured the scions, they should be tied in bundles and labelled, and if not required for immediate use, I have found it a good plan to bury them in the ground, or in cold climate kept in a cool cellar in a damp condition. When required for use, a section of the scion with three or four buds is cut off and used in the manner treated of in another part. It is always preferable that a graft should have a bud near each end; in fact, it should be cut off at the top exactly at a bud.

It is of the greatest importance that scions should be taken from those trees which have proved themselves to be of undoubted superiority. It is always the case that some particular individuals distinguish themselves over their fellows by more vigorous growth, better bearing qualities and finer quality of fruit. Those trees should be selected from which to obtain scions for grafting or buds for budding. L. H. Bailey, the great American authority, in speaking on this point, says:—

"It is probable that many trees fail to bear because propagated from unproductive trees. We know that no two trees in any orchard are alike, either in the amount of fruit which they bear or in their vigour and habit of growth. Some are uniformly productive, and some are uniformly unproductive. We know, too, that scions or buds tend to reproduce the characters of the tree from which they are taken. A gardener would never think of taking cuttings from a rose bush or chrysanthemum or a carnation which does not bear flowers. Why should a fruit-grower take scions from a tree which he knows to be unprofitable?"

"The indiscriminate cutting of scions is too clumsy and inexact a practice for these days, when we are trying to introduce scientific methods into our farming. I am convinced that some trees cannot be made to bear by any amount of treatment; they are not the bearing kind. It is not every mare which will breed or every hen which will lay a hatful of eggs."

There are various ways of grafting, some of the commonest being splice-grafting, tongue-grafting and cleft-grafting. The illustrations which are here given will enable the reader more readily to form an idea of the different methods. They are all pretty nearly equally good, and the particular one to be adopted must largely be left to conditions and choice.

Only in rare instances is it possible to have the scion and stock exactly of the same size; so that the bark joins on both sides this is quite immaterial, as if the bark forms a perfect union on one side it is all that is necessary to success.

SPLICE GRAFTING.

Provided the scion and stock are exactly the same size, splice-grafting can be successfully and expeditiously done. Figure No. 4 shows how it is done. The parts are then bound together with matting or any other suitable substitute—I always use strips of cotton—and the whole covered with grafting-wax or clay.



Figure 4—*a* the stock, *b* the scion.

TONGUE-GRAFTING.

Figure No. 5 is very similar to the former method, only that a tongue is cut in the stock and a corresponding one in the scion, which fit into one another. It is a little more troublesome than splice-grafting, but is better when the sizes of the stock and graft do not correspond. Bind and treat in the same manner as described before.

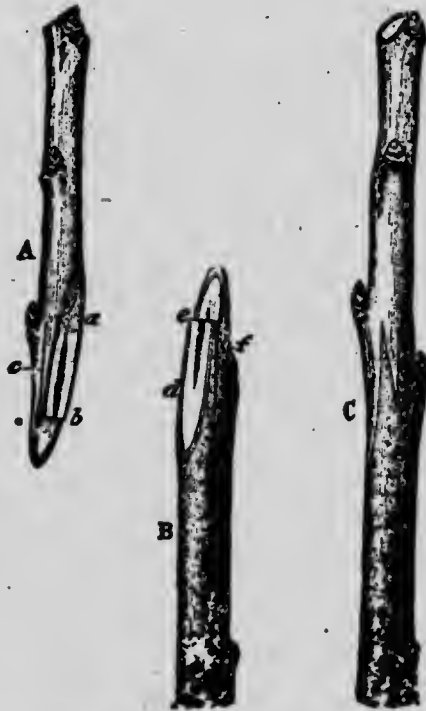


Figure 5.—A, the scion ; a, the sloping cut ; b, the tongue ; c, shows thickness of tongue. B, the stock ; d, the sloping cut in the stock ; e, the tongue ; f, shows thickness of stock from the cut or tongue. C, the scion inserted and ready for waxing.

CLEFT-GRAFTING.

Figures Nos. 6 and 7. Although somewhat clumsy, cleft-grafting is nevertheless very easily and quickly done, and for that reason I have more often employed it than the other ways. By this method I have successfully grafted on roots, stems, branches and trunks, as large as six inches or more in diameter. The process is very simple and is done as follows: the stock is cut off square, the top smoothed off and split across the middle a sufficient distance to accommodate the scion. The scion is cut wedge-shape, the inner side being slightly smaller than the outer, so that the bark may have a better chance of uniting with that of the stock. Having inserted the scion or scions, bind as described and wax over. On large stocks two and sometimes four grafts may be inserted. If more than two grafts are to be used, then the stock should be split across the first cleft. In order to save wax the cleft may be filled in with clay or cotton and then waxed over.

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(For smaller stocks.)



Figure 6.—*A*, the knife as used in splitting; *B*, the point of the split; *C*, length to split; the position (shown at *B* and *C*) shows how cracking of the stocks is avoided. *A*, the scion, showing how it is prepared—wedge-shaped—with a sloping cut. *B*, the stock prepared to receive the graft; *f*, the sloping cut; *g*, the horizontal cut; *h*, the split. *C*, the scion inserted in the stock, showing the close fit of both, and ready for waxing.

(For larger stocks.)



Figure 7.—The stock split ready to receive the scions. *A, B*, the scions inserted, ready for waxing. *A*, the scion; *a, b*, the horizontal cut severing the chip on either side; *c*, the wedge; *d*, pith; *e*, point of scion cut obliquely. Graft inserted in stock obliquely.

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ROOT-GRAFTING.

Figure 8.—In root grafting it has been my practice, and I have found it to answer well, as the graft itself after a time throws out roots of its own, to insert the scion at or about the level of the ground, so that when it is planted the graft is covered up with soil. This is practicable when the work is being done indoors and the grafts planted out afterwards.



Figure 8.—1. The root, showing sloping cut at *A*, and the tongue at *B*. 2. The scion, showing sloping cut at *A*, and the tongue at *B*. 3. The union of scion and stock ready for waxing.

There are various other methods of grafting which I do not consider necessary to describe in this Bulletin, being intended, as it is, principally for beginners in fruit culture.

Note.—Figure 4 is adapted from Downing ; 5, 6, 7 and 8 from California Report.

GRAFTING WAX AND CLAY.

I have found that as simple a way as any, and one that ensures better success in excluding the air, which is really the object of grafting wax, is to apply it warm, in a liquid state, with a small paint brush. Grafting clay is used for economy, but is not as efficient as wax. The following are some of the formulæ given by L. H. Bailey:—

1.—*Common Resin and Beeswax Waxes.*

1. Reliable wax:—Resin, 4 parts by weight; beeswax, 2 parts; tallow, 1 part. Melt together and pour into a pail of cold water; then grease the hands and pull the wax until it is nearly white. One of the best waxes either for indoor or outdoor use.

2. Resin, 4 lbs.; beeswax, 1 lb.; tallow, 1 lb.

3. Resin, 6 lbs.; beeswax, 2 lbs.; linseed oil, 1 pint.

4. 6 lbs. resin, 1 lb. beeswax, and one pint linseed oil; apply hot with a brush, one-eighth of an inch thick over all the joints.

5. For warm weather:—4 lbs. of resin, 1 lb. of beeswax, and from half to a pint of raw linseed oil; melt together gradually, and turn into water and pull. The linseed oil should be entirely free from cotton seed oil.

6. Resin, 5 parts; beeswax, 1 part; tallow, 1 part. To be used warm in the house.

7. Resin, 4 or 5 parts; beeswax, $1\frac{1}{2}$ to 2 parts; linseed oil, 1 to $1\frac{1}{2}$ parts. For outdoor work.

2.—*Alcoholic Waxes.*

8. Lefort's liquid grafting wax or alcoholic plastic:—Best white resin, 1 lb.; beef tallow, 1 ounce; remove from the fire and add 8 ounces of alcohol. Keep in closed bottles or cans.

9. Alcoholic plastic with beeswax:—Melt 6 parts white resin with 1 part beeswax, remove from stove and partially cool by stirring, then add gradually—with continued stirring—enough alcohol to make the mixture, when cool, of the consistency of porridge. In the temperature of the grafting room it will remain sufficiently plastic to permit applying to cut surfaces with the finger.

3.—*French and Pitch Waxes.*

11. Common French:—Pitch, $\frac{1}{2}$ lb.; beeswax, $\frac{1}{2}$ lb.; cow dung, 1 lb. Boil together, melt, and apply with a brush.

12. Common French bandage wax:—Equal parts of beeswax, turpentine and resin. While warm, spread on strips of coarse cotton or strong paper.

13. Grafting clay:—One-third cow dung, free from straw, and $\frac{2}{3}$ clay or clayey loam, with a little hair like that used in plaster, to prevent it cracking. Beat and temper it for two or three days, until it is thoroughly incorporated. When used it should be of such a consistency as to be easily put on and shaped with the hands.

BUDDING.

Budding differs from grafting in several respects, and for some purposes is preferred to the latter. The proper season for budding is when the leaves are fully formed and at a time when the bark can easily be lifted by the aid of the budding knife, say from the beginning of July until the end of August, or thereabouts. An ordinary sharp knife may be used, but one made for the purpose is preferable, as the handle is so constructed that it can be used for lifting the bark.

Buds should be taken from good, healthy, well-grown stocks of the same season. The wood should be well matured, not too young, and the buds, one of which is at the base of each leaf, nice and plump. Having selected your scion or stick, as it is called, cut off the leaves, leaving the leaf stalk, and proceed by making a transverse incision in the bark, preferably on the northern side of the stock, generally as near the ground as convenient. From that incision make another one downward an inch or an inch and a half long, and with the handle of the knife raise the bark on both sides of the downward incision. Then (it being necessary that the knife is very sharp) cut a thin, smooth slice of the wood from the stick, an inch or more long, so that the bud will be about the middle (*See Figure 9*). Insert this slice, holding it by the leaf stock in the incision, and push it downward to nearly its whole length, cutting off the top to fit the transverse cut in the stock; then bind round with matting or cotton strips not very tightly, beginning at the bottom, leaving the bud exposed and finishing at the top. After a short time you will be pretty well able to judge whether the bud has taken, by touching the leaf stalk. If it falls off you may be pretty certain that all is going on well, and in a fortnight or so, if the bud looks healthy and plump, the bandage should be loosened and eventually removed altogether. About the time in the spring that the buds begin to swell cut off the stock a little above the bud, some three inches or so. The portion of the stock serves as a support to the bud as it starts to grow, and to which it should be tied until such time as it has attained sufficient strength, when the support should be cut away quite near the bud in a sloping direction. Suckers and shoots below the bud should, of course, be removed as they appear.

Plate 9, adapted from Downing, gives cuts of budding knife, budding stick; *a*, bud cut ready for insertion; *b*, stock showing incision and the finished operation.



Figure 9.

VICTORIA, B. C.:

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