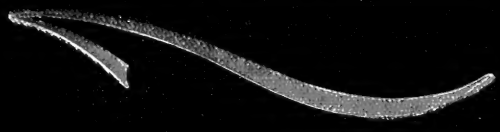
NORTHWESTERN POMOLOGY



NORTHWESTERN POMOLOGY

A TREATISE ON THE GROWING AND CARE OF

TREES, FRUITS AND FLOWERS

In the Northwestern States

BY

C. W. GURNEY

CONCORD, NEBRASKA

TWENTY-EIGHT YEARS A NURSERYMAN AND ORCHARDIST

"The first glad tones that rang for me
Were Woodland whispers, soft and mild;
The Woods sang me a lullaby
As sings a Mother to her child."

CONCORD, NEBRASKA
PUBLISHED BY THE AUTHOR
1894

Press of Skeen, Baker & Co., 334 Dearborn St., Chicago.

DEDICATION.

To the man or woman who loves a tree or flower, the green grass, or the voices of nature, the singing birds, "The complaining brooks that make the meadows green."

To the man or woman of whatever nationality who has become the landed proprietor of a part of this glorious free Northwest and who is willing to work to make a beautiful home, and to "Make Home Beautiful," this little work is respectfully and warmly dedicated by

THE AUTHOR.

PREFACE.

In presenting this little volume to my brother Horticulturists and Orchardists I shall make no apologies, neither shall I make any great claim especially to literary merit. The work is not prepared to show how much the author knows, for the wisest of us know but little, but for the sole purpose of giving such careful, practical information as the author in his earlier experiences stood so much in need of, and for which he has frequently spent on a single trivial matter, many times more than the cost of this volume entire.

This work will, as its name implies, be restricted to the "Northwest." There are very many and very excellent works upon Horticulture, but, with one exception, none have been restricted to any particular locality. The exception named is "Warder's American Pomology." This is a most valuable work, and will, while there remain upon the earth lovers of trees, plants, flowers and fruit, be an indispensable text book. But, although it purports to be restricted and dedicated to the Northwest, Dr. Warder lived in Cincinnati, Ohio, and this locality was, at the time the book was written, pretty well Northwest. But the "Northwest" of to-day is a very different territory, with very different wants, which must be met with very different

practices. This work will be confined in a general way to the states of Iowa, Wisconsin, Minnesota, Illinois, Nebraska and the Dakotas. Even this is a large field, and one which I enter upon with many misgivings. No information is better than that which is erroneous. It shall be my constant endeavor not to mislead, but to tell that which is the most necessary, in the plainest and fewest words. I know that in some matters I shall be compelled to differ from other authors, but when I do so, shall endeavor to give their views as well as my own.

After twenty-eight consecutive years of hard work, study and observation, even a very ordinary person should have acquired much information. I do not claim to be other than ordinary, but, if a sincere love of the work, and close observation, together with a reduction of theory to experimental knowledge in numberless cases should fit me to be an instructor of those not so situated, or conditioned, then I have the right to claim that privilege and refer you to the following pages without further comment.

C. W. GURNEY.

CONCORD, NEB., Nov. 28, 1893.

INTRODUCTION.

THERE was a time when to advocate the cultivation of fruits as a specialty in this country, would have subjected the author to ridicule. Especially is this true of the Great Northwest. Within twenty years the author was told that to advocate the growing of fruit in this territory was "flying in the face of Divine Providence." The Almighty, they said, had made this country for the growing of live stock and grain, and other parts of the country for growing apples. Within the past few years this non-apple producing territory has sent hundreds, probably thousands of cars of apples to the eastern market, and even across the waters to Europe. This will be repeated, and many times before the eastern part of this country appreciates her true condition: that she is depending upon the old plantings, and not making a proper provision for new ones when they are gone.

The most convincing proof of our ability to grow fruit here is the fruit itself. There is practically no considerable part of the territory which this work is intended to cover where the people may not have an abundance of fruit for every month in the year. There is practically no part of this territory where Dent corn will ripen, and can be profit-

ably grown where it is impracticable to grow apples.

Where these cannot be grown there is the alternative of small fruits, berries, and in most cases plums and cherries; these, with the cheap and simple facilities for canning, will, with little labor, supply the table during the year.

There are many now engaged in growing these and other fruits for the market, and making a fine profit; but it is the *farmer* and *home-maker* who is constantly in our mind as we write these pages.

We want to see the desolate, dreary-looking farms transformed into homes. You who till the soil have a right to the best that the soil will produce. You have a right to as good and beautiful a home as your town or city brother.

Is there not some unnecessary envy given by the farmer and his wife, as they drive into town and see the more beautiful homes of many of these people? Do they not frequently jump at the conclusion that the difference between these and his dreary looking place is only another proof of the advantages of town over country life? Instead of imbibing these discontenting ideas, why not say that you can have just as pretty a home in the country, and then bend all your energies toward making it? In many cases, probably the most, the envious one is better able to afford these buildings and grounds than their owners. It is too common for the farmer to become "land poor." He owns many acres that he cannot till nor use; he goes into debt

for land, and as soon as he can see out, buys another quarter.

What is life for if we spend it in accumulating that which we cannot use, cannot take with us, but which makes a slave of its possessor?

It is a most commendable ambition to make a good home. Not necessarily a fine and expensive house, but the best you can afford; a lawn with some shrubs and flowers; a fruit garden and orchard. Try for a while a little different diet from the regulation kind: meat, bread and sometimes potatoes. See how the color will come to the cheeks of the wife and children, when there is spread upon your table the lucious strawberry, raspberry, grape, the acid cherry that comes at the time when, tired and dusty, you come in from corn plowing. Use more fruit and less meat, and see how the world will grow brighter; how much healthier and consequently happier you will be.

Some are deterred from planting fruit trees by a mistaken idea that it takes too long for young trees to come into bearing. Plant the trees as soon as your ground can be got ready, and see how little there is in this idea. You do not "wait" for the fruit. Time will go on just the same, whether you have planted a tree or not. But if you will call it waiting, then plant at the same time strawberries, raspberries, blackberries, grapes, etc. The strawberries and raspberries will bring you a full crop the second year, the currants, gooseberries, blackberries and grapes will come in the third, and by

that time the cherries and plums are in good bearing. So before you know that you have been waiting, or have lost any time, the apples begin to beckon you from their tossing boughs.

It gives pleasure to acknowledge kindly assistance rendered me in this work by Prof. Bessy, of Nebraska; Prof. Budd, of Iowa, and J. Wragg, E. R. Heisz, C. G. Patten, also of Iowa; H. A. Terry, Samuel Edwards, J. V. Cotta and D. Hill, of Illinois; Peter M. Gideon and A. W. Latham, of Minnesota.

TABLE OF CONTENTS.

CHAPTER I.

The Nursery.

AS this book is not intended as an instructor or guide for the advanced nurseryman, little attention will be paid to this, except as the growing of a tree affects it in the hands of the planter.

There has been much controversy since my recollection regarding the proper methods of propagating the apple. The old fashioned way was to plant out seedlings and graft them "standard height" or let them remain till in bearing and then graft in the smaller limbs such as did not produce desirable fruit. This has been held up by one of the parties to this controversy as proof that this was the proper manner, as trees made in this way in the eastern states grew to immense size and were long lived and productive. This is one of the positions taken by the advocates of grafting upon the whole root at the collar (point just at the ground surface) or at a point higher up. They claim that only one natural tree can be made from one root, and that the attempt to make more than one, by dividing the seedling root into several pieces, is pernicious and produces only an inferior tree. In support of this, they bring photographs of trees

propagated on what *they claim to be the "whole roots"* and compare them with others claimed to be grafted on pieces of roots greatly to the disadvantage of the latter.

While these advocates bring considerable excellent authority to prove the correctness of their position, there is not an honest nurseryman who does not know at a glance that these photographs are unfairly selected, or that their section root grafts are not at all similar to those grown in the north. If these specimens are fairly chosen it is not strange that they have condemned them.

On the other hand the advocates of the use of sections instead of the whole root, claim that for the north, or for rigorous climates, a good tree cannot be made in this way, for the reason that, as seedlings as a class are most universally tender, they must be deeply inserted in the ground for protection, and that the tree or cion which is to make the tree, will simply use this piece of a root until it can throw out a system of roots of its own from its own body, which will have all the qualities of hardiness or otherwise, possessed by the cion.

Hundreds, perhaps thousands, of pages have been written pro and con upon this matter. It has been the text of not only the tree peddler, but the wholesaler and propagator, through which they dispose, or try to dispose of their goods. The matter seems to us to be very simple.

First—the word "whole root" is only a catch word to sound well, for not one of them in their

arguments claims to use only a piece of the root, but they claim that the piece is longer than a shorter piece used by others, and that but one tree is made from one seedling. So the question is really as to the merits of "crown grafting" or making the splice only at a point where the root and top meet, or by the other system, using not only this cut of the seedling but one or two others below it. Even the Hon. Secretary of Agriculture has, in a paper on "Early Nebraska Horticulture" made the mistake of attributing the short life and inferior productiveness of Nebraska apple trees as compared with those of Michigan, to the root grafted trees of the former and top grafted of the latter. While it is true that trees of most kinds as grown in Nebraska are inferior to those grown in the humid climate of Michigan, and that apple trees are shorter lived here than there, it is not true that our trees are less productive than theirs. The opposite is true, and especially is it true that our trees come into bearing much earlier. If there were no other conditions that might be urged to explain the shorter period of life but the manner of propagation, how shall he explain the fact that peaches are grown in Michigan nearly 200 miles further north than his home in Nebraska? Ex-Governor Furnas has declared that peaches cannot be raised practically any where in the State of Nebraska. The south line of Michigan runs through about the center of Nebraska. If we are to find an explanation for this, we must look for it in some

other influences, as peaches are propagated the same the world over.

In this paper he says that, although the nurserymen declare vehemently that root grafting is the best, he (who is not a propagator, and has given no great part of his life to exclusively horticultural pursuits) is "confident" that they are wrong. The nurserymen, who have given their lives to the work, as specialists, who have read, studied and experimented, have, in the north, all come to a different conclusion, and are not only "confident" that he is wrong but absolutely know it, and can demonstrate it at any time.

He also makes the statement, "Tap roots are indispensable for long life to orchard trees in Nebraska." This may be true, and we do not object to this except as it is intended to be his conclusion that a root grafted tree has no tap roots, which is an error. He also says that his theory is rebutted by some who declare that some varieties have no tap roots; naming the Jonathan. He answers that there never was but one original Jonathan, and that no one can tell whether it had a tap root or not. This is an error. Show me the roots of the Jonathan of to-day, propagated in any manner whatever, grown under the same conditions as surround the parent tree, and I will show you a type of the roots of the original tree. The top controls every characteristic of the roots, except identity. Let us take a common seedling and make two root grafts of it; we will give one-

half, I care not which, to the Jonathan or Winesap, and the other half to the Tetofski. After three years we will dig them and find either of the former system of roots diverging downward and in side directions, while the latter has made a spike tap root probably 5 to 8 feet long, or at least twice as long as the height of the tree.

It would be an anomaly if Nature should in this instance fail to provide for just the roots she wanted in case she was disturbed by an injury from an accident or otherwise.

The inference is intended to be conveyed by him that we should abandon root grafting and top work instead. This is theory, entirely unsupported by actual practice, and is a wholly unfit manner of propagating the apple in the northwest. It is so extremely impracticable as to verge closely on the impossible. Any one who will can satisfy himself upon this point by an experiment which is better than all the theory one can formulate in a lifetime devoted to it. This top working is the system formerly pursued in the eastern states and the old countries, in which the seeds of seedling trees were planted where they were to grow and grafted a year or two after at the ground surface or at some point higher on the stock. There is no possible objection to this method where it can be successfully done, but it is not better theoretically nor practically than root grafting.

Plant a row of apple seeds of 100 or more, let the young trees stand in the ground over one

winter, and we shall find that nearly all will be dead. There may be a few alive, but it will be strange if there is one that would be fit to use as a stock to graft upon. If there should be any showing no discoloration or "black heart" there could be no objection to using it to top graft, but, in order to carry out the idea perfectly, we must not remove it from where it stood, otherwise we shall lose the bottom of the tap root. This being severed we have exactly the conditions as in a root grafted tree so far as the roots are concerned. T. T. Lyon, of the U. S. Pomological Division, which is a part of the Department of Agriculture, and who has devoted a long life entirely to horticulture, not only in its scientific aspects, but as a practical propagator, says: "My observation would be that every tree has its own peculiar way of making root growth, and that it would not change it in the least whether it was grafted on a whole or piece root. I am in favor of that system which the soonest gets the tree upon its own roots. However there are with us a few exceptions, which you may not notice out here. I refer to the Canada Red in particular. There seems no way to induce a good growth on it except by top working. To grow it from either whole or piece roots would be impossible with us, as it is such a slow grower. I can hardly see that there would be any advantage in using whole roots, so far as root system is concerned. Each variety of the apple has its own peculiar way of rooting, and the cion most surely

influences the root growth. As I said before I am in favor of that system which gets a tree on its own roots in the least possible time."

If a whole seedling root is used it is evident that to get the point of union deep enough in the ground to make it reasonably safe to go through the winter without becoming diseased, the root graft must be planted from 1½ feet to 2 feet deep. No nurseryman will ever do this and if he did the tree digger when run under the trees before lifting would cut it off, say 15 inches below the surface, and this is deeper than these implements are usually run.

Those who claim to propagate trees exclusively upon what they call "whole roots," in their arguments seek to leave the impression that in the north the short root and long cion is used solely for the purpose of economy. Nothing could be further from the truth, and the attempt to leave such an impression is not creditable. Seedling apples suitable for grafting are usually worth about $3.00 per 1,000 and the cions such as will make about two to three cuts are worth $1.00 to $2.00 per 1,000. The little difference in the value of the top and bottom of the graft will make it a small matter whether the splice is made a short distance further upward or downward. Even if a great part of the root is thrown away (which it is not) in the "whole root" system, the difference in the cost of the trees by the two systems, after two years could not be more than one-fifth of a cent.

It will be noticed that without a single excep-

tion all the authorities favoring the whole root system, who are practical propagators, are from the south or from the border states, while those taking the opposite view are almost as invariably from the north. Both sides are right and both are wrong. We will take the words of our southern brethren, they are supposed to know better what they want than we do, but they are wrong in condemning a different practice in the north, by which alone we can grow a thoroughly good and sound tree.

Prof. McAfee states that not more than ten seedling apple trees in 100 are hardy enough to go through a test winter uninjured, especially when young. This is my experience, or, I would say he has set the proportion of the hardy ones very much too high. Should we attempt to make a sound tree with one of these tender seedlings, however hardy the cion we use might be, we should fail in the north, if we depended upon making the union at any point very near the ground surface. This has been demonstrated so many times that there is no longer a question left concerning it. By using a short section of root and a long cion, and setting the whole entirely in the ground, we make the union 5 to 6 inches under ground, where it is so protected as to generally go through the hardest winter uninjured, and serves its purpose until the tree gets "upon its own roots," which it will always do in a few years, frequently making a fine strong system of its own the first season, and nearly always by the second season. If I were propagating trees

in the south probably I should adopt the so-called whole root system for southern orchards, as these propagators claim that such trees give better satisfaction there, but the proof is all wanting that such trees do better in the north, or give better satisfaction where thoroughly and intelligently tried. My own opinion, based upon several experiments is that such trees introduced into the North would be unsafe unless when replanted they were set very much deeper than grown in the nursery, even then the proof is all wanting to maintain the proposition that such trees and only such, are natural, and make better or longer lived trees in the north than those propagated under our northern system. The fact that trees propagated in a certain manner lived longer in Massachusetts or Michigan than those differently propagated in Dakota, is not proof of anything, but is only an incident, and may be explained by a dozen different conditions as well as this one.

When we carefully investigate this claim of superiority for the "whole root" system, and then learn that no claim is made that the whole root is really used, and only a very small proportion of it, there will be a suggestion of the good faith of the advocates. Why not call it by its right name which would be crown graft or collar graft?

Prof. Burrill in speaking of this point in the seedling that is known as the collar says: "There is a name often heard in discussions upon our topics which calls for a moment's notice: What is the

collar? The place of juncture of the stem and root. I say the name calls for attention. The thing signified need hardly take our time, because in a structural sense there is nothing of it. We have only stem or root according as we exactly locate the place. The collar is no organ, it is the juncture of by no means very dissimilar parts. There is no special vitality here, no peculiar seat of vitality nor of vulnerability.

"The parts of a tree grown above ground exposed to the air have harder tissues, not because it is stem as opposed to root, but from condition of growth. The root tissues are softer only because kept continually in the moist earth. Witness the hardened texture of the brace roots of Indian corn above the surface of the earth.

"The collar therefore as most commonly located is simply the place of the stem or root coinciding with the level of the soil—this and nothing more.

"Now let us see what the results are when two living parts are joined by grafting or budding. Practical men know that to succeed in these operations the inner bark of these two pieces must be placed in contact.

"In the case of root grafting in the winter this is not so critically imperative, because the callus spreads somewhat between the two pieces. But in any case what is absolutely essential is to secure the meeting of cells capable of growth on the one side, with those similarly conditioned upon the other side. The old wood does not in any sense whatever unite.

"If an examination is carefully made, even years after the graft has successfully grown, the old cut surfaces in the heart of the structure will be found. * * * A cion is no more modified by the stock in essential character then one human being is changed in personal identity, and personal responsibility because of his association in business with another human being. The partnership may indeed be a profitable one for both parties and the two men may agree perfectly between themselves, and may each succeed better than he could have done alone, yet A remains A and B remains B. Just so with the stock and cion. While each keeps its own inherent qualities, the association may be mutually beneficial or harmful according as the activities of each suit those of the other, or the reverse.

"In the matter of *union between cion* and *stock* there is another thing upon which a word is needed. The microscope may always detect the line of contact of the two, if there is any visible difference in the cellular structure; but neither the microscope nor any other instrument, or thing, except experience can inform us concerning the physiological union between two pieces joined by grafting. We all have seen swellings upon grafted or budded trees at or near the splice. These enlargements are much more common just above the place of union. They do not disappear with age, but remain as evident in a tree forty years old as at the end of the first season's growth.

"Such swellings indicate faulty physiological unions. The nutrient juices are impeded in their movement of distribution. The barrier is like a dam in a river above which the struggling waters press out in every direction. The amount of such trunk enlargement may be taken as the measure of inadaptability or of physical incongruity. * * *

"First it must appear that the so-called collar means nothing. If there is any foundation for the claim made for grafting in the "collar" or "crown" it simply and only can be that it is better to graft into the stem instead of the root for as heretofore asserted the place popularly designated by these terms is only that part of the tree stem which happens at the surface of the ground.

"Secondly, it is a decided misnomer to speak about using 'whole roots.' This is indeed usually recognized, despite the common use of the term.

"But few probably are aware how far from the truth the expression really is.

"Look at these poorly grown one year old piece root grafted apple trees (exhibiting three specimens). They were dug from the end of a nursery row, without selection of any kind, but care taken to take up whole roots. The fine roots are *over three feet long*, and the center one descended to that depth in the soil. Here again is a one year budded cherry. The stock is the red wild cherry. Here are roots *four and a half feet long*, with a spread as they grew of about 6 feet, and a depth almost the total length.

"We have seen that the only peculiarity in the structure of a root in the course of its length is at the very tip, with its wonderful provision for growth through hard soil. No one can pretend for a moment that this is preserved in the so-called whole root trees. If this is destroyed there does not appear to be any special difference whether 1 inch or 1 foot is removed, so far as manner of growth is concerned.

"Here are a series of specimens of piece root grafts of six kinds of apples furnished me by Mr. Augustine. I asked for one year trees without telling him what was to be illustrated by them. All are well grown, but some are larger than others. Can any fault be found with the amount or direction of these roots?

"But fairness demands the mention that in the excellent samples shown by whole root advocates there is more evidence of the unhealthy swelling on the piece roots.

"It would seem that a tree upon its own roots is ordinarily better than any combination can be, except when special result outside of the best good to the tree itself is desired. In other words when we propagate for fruit and not for apple trees."

We have quoted thus largely from Prof. Burrill to give the best scientific and impartial views, and will only add that the specimens of piece root grafts shown were not selected, while those on the other side were with this special point in view.

We still take some exceptions even to the excellent authority quoted. It is noteworthy that the Ben Davis is the most cosmopolitan in its habits upon other stocks, seldom showing the point of union at three years old; still it is not noted for hardiness or longevity, while the Duchess and Haas make the poorest unions, and show the greatest enlargements, are very hardy and long lived.

The Duchess does not show this enlargement to so great an extent as the Haas, but shows a cracked, rough condition, from which we get a flood of sprouts, showing a bad union. For this reason we fully agree with him in his conclusion that the tree upon its own roots is best, and the shorter the root and longer the cion, the sooner we shall accomplish this. If we could grow the trees from cuttings like currants, it would be still better.

Dr. Warder says: "If the young trees are earthed up in the nursery, and set rather deeply in the orchard, they will soon establish a good set of roots of their own, emitted above the junction of the cion and stock, which is very preferable to the imperfect union and consequent enlargement that often results from using uncongenial stocks."

Again, one of the simplest methods of multiplying varieties consists of increasing and encouraging the suckers thrown up by the roots; these are separated and set out for trees. We have been told by some physiologists that there was an absolute difference in structure between the root and the stem, that they could not be substituted the one for the

other; and yet the oft quoted marvel of the tree which was planted upside down, and which produced flowers and leaves from its roots, is familiar to every one.

Here, as in other cases, our teachers have led us into error, by attempting to trace analogy with animal anatomy and physiology, and by directing our attention to the circulation of plants, as though they, like animals, had a true arterial and venus current of circulating fluids. The cell circulation is a quite different affair, and can be conducted in either direction as every gardener knows who has ever layered a plant or set a cutting wrong side up. So with the roots they are but downward extensions of the stem; under ordinary circumstances they have no need for buds, but these may be and often are developed, when the necessity for their presence arises.

Buds do exist on the roots—especially those near the surface—and from them freely spring suckers, which are as much a part of the parent tree as its branches, and may be planted with entire certainty of obtaining the same fruit, just as the twigs when used as cuttings, or cions when grafted, will produce similar results.

High manuring the nursery is objectionable, and a tree is better for having a moderate, and not an abnormal, growth. Such trees are much more apt to become discolored or black hearted than those having made a more moderate growth; they are also less liable to bark bursting in nursery.

Planting root grafts. The ground should be plowed as deeply as practicable, if a foot it will be better. A subsoiler attached to the plow has been found to be of great value, as the young plants in such ground have not dried out like those on ground prepared in the ordinary way. There is no implement better to follow the plow with than the planker or clod crusher. In plowing, the furrows are all thrown the same way, frequently called "carrying the lands." This leaves no dead furrows. The planking is kept close to the plowing, and the planters close to the planker, so that there may be moist earth at the top which prevents the earth from falling back as the dibble is withdrawn, and filling the hole. Many plant without dibbles, by throwing out a heavy furrow and planting in this and drawing the earth back with the hands, to hold the plant in position, which is thereafter filled by rake and hoes. This is as good as the dibble, but no better, and it is not thought that anything is gained in time. For the amateur a dibble may be made of wood. Cut the handle from an old spade, keeping a piece of the shank one foot long besides the hand part; sharpen it to a point, but not by a true taper; it should be narrowed faster near the point. Such dibbles will answer the purpose nearly as well as those made of steel.

The ground being plowed and smoothed, throw a line across from north to south and stake it tightly and pull it straight. The grafts are carried by the planters in shallow vessels such as wash

basins or common pans. The grafts will be set all the time on the same side of the line, and about two inches from it, the planters all being on that side the line. The hole is made with the dibble, and the graft carefully inserted, the greatest care being necessary not to break the joint. Set it to its top in the ground, holding it in this position with the left hand resting upon the ground, when the dibble is thrust down beside it, and very close to the first hole, which will, if done properly, firm the earth about the roots to the bottom. This work should not be entrusted to boys, it requires good judgment and mature intelligence to do the work correctly. Place them about 10 inches apart in the row, and the rows 4 feet apart. Some leave one bud out of the ground, but it is not necessary when the ground is smooth, as it will soon settle so as to expose one or more of them.

Keep them cultivated and clear of weeds, and it is not believed that late cultivating induces late growth.

In the north there is great loss frequently in winterkilling the first winter, especially in the loess soils of the Missouri valley. This was not the case in the black soils of the Mississippi side.

There are many ways to prevent this. Some take them all up in the fall, cover or cellar them and plant out again in spring. This is advisable where there is but a poor stand, as the ground will be better occupied. There is the objection to this, however, that the tree is retarded in growth,

and may by reason of this delay make too late a growth the next year and be in condition to damage the second winter. If this does not occur, and the work is done carefully so as not to be a severe shock to the tree, there can be no objection to it. Another way is to lay them down and cover with earth. Three persons are required to do this fast; one goes ahead and presses them down with a spade or fork and two others follow and cover. It is said that three men will put down 10,000 in a day.

Another plan is to cover the field with straw, hauling on something like ten loads to the acre. This is the plan we have pursued, but it is laborious and expensive. Another plan is to sow oats thickly in the fall, soon after they are harvested, sowing about 6 bushels to the acre. Some use buckwheat, which is better in fall as it grows taller, but does not make so good a mulch for winter as the oats.

If we wish to make hardy long lived trees we must send them to the planters sound, and we cannot do that in this latitude, except in a very few varieties, without in some way protecting the trees the first and generally the second years.

Should the trees prove to be discolored in the spring the tops should be cut off and a new tree grown from the sound wood below, as there is no way to cure a tree that has become discolored. This has been described in another chapter.

It is of the utmost importance that the trees be

sent out sound, as has been said, and must be fully decided upon. A black hearted tree should not be sent from the nursery, and it is not necessary. By the practice here described we can know positively that the trees are sound, as well as if they were transparent. It is not so serious a matter if the tree should in its later growth, when established in orchard, become so in its shoots, as it will in most cases any way, but the trunk and larger limbs of the tree are its life, and these should be sound and strong to the heart.

All nurserymen doing any considerable business will dig their trees with the tree plow or digger, as the work is done well and quickly. If to be dug with a spade great pains should be taken to get a good proportion of roots and not in a mangled and bruised condition.

Do all the work in nursery at the right time If this is not done, in many cases the work is doubled, and is then not done properly. This is particularly true of keeping the small trees clean. The proper time to kill a weed is before it grows.

If workmen go among them with hoes they should be instructed to be very careful not to scrape over the grafts, as it is liable to break them, or in any case greatly damage them. A pronged hoe that will straddle the tree is of use. We have had a common four-tined pitchfork straightened and the tines, about 3 inches from the end bent to a right angle or less, making it somewhat hooking, and found it a very good tool for this work.

Where the tree digger has been run under the trees and the best grade only taken out, the ground which has been displaced and loosened should be immediately firmed again upon the roots. This is done by the use of a heavy one-horse roller between the rows, or it may be done by pressure from the foot if by a heavy man and the work well done.

Evergreens may be root pruned in this way, which is nearly as good as once transplanting. It should be done just before the beginning of growth, or if the season is favorable it may be done just at the end of the growing season, as the roots will continue to grow nearly all summer while the tops are at rest.

CHAPTER II.

Hardiness of the Tree, and its Adaptability to Latitudes.

WHEN we speak of the hardiness of a tree, we mean its ability to withstand all the vicissitudes of the climate where the tree is to be grown. Under certain conditions one tree will be hardy while under a changed condition in the same climate it will have all the characteristics of a tender variety. In the black loamy bottom soils of the Mississippi valley, even in the southern part of Iowa and Illinois, the Wagner is too tender for practical uses, while on the loess soils of the Missouri valley, and on the highest lands in northern Nebraska and Southern Dakota, it is among the hardiest. These black mucky soils are not adapted to apple growing in great variety. There is an element lacking in these soils necessary to the most perfect ripening and developing in the tree, those qualities which underlie hardiness. I am of opinion that there are at least 50 varieties of the apple that, so far as intense cold is concerned, would thrive under other favorable conditions at least as far north as latitude 44°. I

believe that the peach could, under similar conditions, be successfully grown up to 41° and probably 42°. The trouble is to compel or control these conditions. I have, during several winters, kept a careful record of the condition of my Russian apricot trees, and, while they were in tree perfectly hardy under any conditions of this climate, the fruit buds killed at about the same degree of cold that killed the peach buds. My conclusion was that the tree was an anomaly, being prepared for arctic winters in wood, but wearing tropic fruit buds. Nature does not make many anomalies, and this proved not to be one either. As the trees attained size and age this weakness disappeared, and the buds have for two winters endured lower than 30° below, and then been followed by bountiful crops of very excellent fruit. Peaches have also been occasionally grown in this latitude, and in southern South Dakota, and it is a significant fact that these crops have not as a rule followed mild open winters, but more nearly the reverse.

In considering this subject, I shall confine myself mostly to that monarch of all fruits—the apple.

Small fruits of great variety can be almost compelled to obey us. We can, if we cannot control the elements, so protect these luxuries as to ward off all harm from them.

Cherries and plums afford us but little trouble. The pear is an enigma. When we have apples we have fruit enough. To take a common sense view we must conclude that when the tree has, during

the summer and fall, been favored with all the best conditions, those that the tree would if it could select for itself, such as just rainfall enough and not too much, proper cultivation, a season just long enough to thoroughly mature its every part, but not so late and warm as to induce a second growth. With these conditions, any tree, of whatever kind, would surely be in the best possible condition to resist the extremes of heat and cold through which it must pass before it can again fortify itself for another siege of winter war. Many of these conditions we can control or supply, and it is our duty if we expect to deserve success to control or supply them so far as is in our power, and is practicable. It is much the same with a tree as with a domestic animal. Some are more hardy than others, but none are quite capable of taking care of themselves in this climate without man's assistance, and whosoever plants a tree under the impression that he has performed his whole duty and has nothing further to do but to wait till it bears fruit and then gather it is only wasting his time and sowing the seeds of disappointment.

Why will farmers and tree planters persist in this most blameworthy course? They give no such treatment to any other crop, nor to the care of their domestic animals. Surely a good, sound and productive orchard is very desirable, and among the most profitable acres of the entire farm.

Happily the neglect of this industry is rapidly decreasing; but is still very much too prevalent.

How often men say of a newly planted orchard: "My trees got awful weedy in the forepart of the summer, then it got so dry I didn't dare disturb the ground for fear of drying them out too much." Or, "I thought it better to leave the weeds and grass to shade the ground and keep it moist."

In place of this desired effect, exactly the opposite one is compelled. The weeds pump all the water from the soil, and the tree is stunted and cannot fortify itself to the best advantage, consequently will be liable to injury or death, that with proper cultivation would have been avoided. This most importart truth has been stated several times, and may be repeated hereafter. It cannot be too strongly impressed. We plant the trees for a purpose, and as we expect them to fill that purpose there is every reason why we should give them such care and attention as will enable them to do the best they can for themselves, but if we fail in these simple plain matters, which are so necessary, and the trees do not succeed we should blame ourselves, and not the trees nor the country.

While it is true that the condition of a tree at the close of active growth in the fall is a potent factor in determining that which we call hardiness, it is also true that there are a number of certain varieties that have such inherent qualities as enable them to fortify themselves under unfavorable circumstances to resist the attack of the elements, and come through with a bright clean "bill of health." These we make a list of and call "hardy."

It is the general impression among horticulturists that these varieties may be put put into two general classes, namely, those very finely organized apples, having the best quality, as the "tender" ones, while those of coarser organisms and poorer quality are generally the "hardy" ones.

There may be, and doubtless is, some foundation for this classification, but no one is capable of drawing the lines that will exactly divide these two classes. There are so many variations from this rule that it is of little value. Of the first class we would cite the Michigan Swaar and the R. I. Greening; and of the second class the Duchess of Oldenburg, Wealthy, the crabs, and perhaps some of the Russian varieties.

On the other hand we have practically hardy trees of excellent quality to destroy the absolute application of the rule, such as Grimes Golden, Iowa Blush, Yellow Bellflower, Am. Sum. Pearmain, Wagner and others.

Another element which will figure largely in the determination of the character of hardiness of a tree should not be overlooked; that is the history of its removal from the nursery to the orchard. This may be properly called the crisis in the life history of a tree, especially an apple tree, and on the success of this operation will depend almost wholly the future usefulness of the tree. Not that this will, if successfully done, assure this usefulness, but if it is poorly done so that an unnecessary shock is given the subject from which it does not

practically recover before the close of the growing season, the injury is irreparable. Under such a condition hardiness has little to do in restoring the tree to its normal condition. A Duchess of Oldenburg may be killed as easily by bad handling as a Baldwin.

The relationship of latitude to climatic conditions which effect the vitality and longevity of a tree is a subject upon which there is great misapprehension. Without investigation how many have not concluded that there is a perfect gradation of fruits and trees from wild cherries and plums of Baffins Bay to the orange groves of the Gulf. When we take so large a range of latitude as this there is such an apparent gradation, but there are in fact sectional exceptions. There are latitudes where for more than 100 miles this may be counter balanced, or even reversed by other causes. This has no reference to isothermal lines, these only mark the average temperature, and do not necessarily, nor do they generally, determine conditions upon which we may safely predicate our opinions of the adaptability of varieties to different latitudes.

The average or mean temperature in certain lines or zones is recorded by these isothermal lines, from data extending through longer or short periods, sometimes embracing but a few certain months in a period of years, or they may be the record of the mean temperature for all the months. In either case they are of little value to us for our

purpose. Even if they recorded the lines of minimum temperatures across the country, they would then be evidence of this condition only and might not even approximate those larger conditions which govern the adaptability of varieties. We know it to be true that certain varieties of plums are tender in northeast Nebraska that are successfully grown much further north in South Dakota, and the same is true of varieties of apples that are tender or half hardy in central and southern Iowa that are successfully grown in northern Nebraska. Some of these are Wolf River, Pewaukee, Northwestern Greening, Iowa Blush, Ben Davis, and others of about this class of hardiness.

The larger conditions which control, or balance those of latitude, or even of minimum temperature, are many, such as soil, altitude, humidity (such as proximity to water, or rainfall) wind currents or maximum temperatures. These are general causes, and may, singly—or when combined to a still greater degree—move the fruit belt north to its advantage through two or more degrees of latitude.

Then there are local causes in which the removal of the tree but a few miles may have a greater effect upon it than the removal of 100 miles under different conditions, such for instance as the removal from the south to the north side of the hill or from the top to the bottom of a bluff.

The manner of pruning the tree, too, will exert much influence upon its hardiness; as in the case of the Wealthy, which is very close to the Duchess in

this, which fails quicker than the Pewaukee, much tenderer, when pruned up to a high trunk unless artificial protection is given. The former is very sensitive to sun scalding the trunk, while the latter is less so but more liable to injury to its forks

To sum up: First, latitude does not establish an inflexible law for our guidance in the selection of varieties, neither do the thermal conditions, but both are, or may be, overcome by other more important conditions. Second, as we can only control these conditions in part we should do this to the fullest extent, thus reducing the chances of loss to the minimum.

CHAPTER III.

Making the Orchard.

IF we begin right and continue with such ordinary care and prudence as would be bestowed upon any other industry upon a farm for the first year or two, the orchard should, and generally will be, an established success. This beginning right, and keeping right, at the start, is all important. However careful we may be, and however much work we may bestow upon it after the first year, failure is generally assured if the work was begun wrong.

To make a good home orchard, one large enough and good enough to supply the entire wants of the family in fruits for every day in the year, is not a play spell. Before undertaking this, determine that you will in the first place buy your trees of some reliable nurseryman, who, if he does not live near you, has an established reputation for honesty, intelligence, and of being a thorough nurseryman.

In these days nurseries spring up and grow into magnificent proportions at a distance, that are entirely unknown where they are located. Nurserymen too jump into notoriety at a bound, and are

after a few months or a year's experience entirely confident and capable of giving the most explicit and positive information upon the most abstruse problems in horticulture. A little (or much if necessary) labor and investigation carefully applied before buying is time well spent, and will never be regretted. Deal only with those in whom you have confidence, and that confidence should be well rooted in your best and most impartial judgement.

It is not safe as a rule to deal with "dealers". These are what the retail merchant is to the wholesaler. The nursery through which they obtain their stock may be of the best, but in giving this dealer, or one of his (the dealers) agents your order, you are not dealing with the proprietor of the nursery, he does not even have your name upon his books. If you are wronged and write him he will tell you (and justly too) that he merely sold the stock to the one you have named to him as his "agent" at wholesale, who in turn sold to you what was his own, and you have him alone to look to for your redress.

In giving this advice concerning dealers, it is not intended to condemn them all, I have met those who were thoroughly honest and capable, fully as much so as the nursery, but as a rule the opposite is true, and the exceptions are rare.

If a traveling salesman or agent really represents the nursery as an agent he will carry a certificate under seal from the nursery stating just what his powers and duties are.

There are swarms of so called "agents" infesting every crook and corner of the land, who are not agents and whose only object in making a canvass is to make money, and whose only care is to buy stock that will deliver good, get their money and then seek new fields.

The highwayman who robs you, or the sneak who burns your buildings or steal your horse, is a gentleman to the slick tongued fraud, who, by plausible lying wins your confidence sufficiently to induce you to invest in something that, aside from robbing you of your money, steals your precious time for years and for all your time and care, for all the golden visions of a fruitful orchard, under the spreading trees of which you have so often in pleasureable anticipation seen your wife and children gathering the mellow fruit, he gives you only a sure legacy of disappointment and despair.

This may not be always the case, indeed it is not, but those who read these pages will testify that it is the rule and not the exception.

In considering all these problems, and hundreds of others not yet even named, underlying all of which is lack of knowledge on the part of the planter, and in a less degree on the part of many nurserymen, it has been suggested that the proper way to get an orchard and take the fewest chances of failure is to let the contract to an expert whose pay shall depend upon his success or his fulfilling his contract. This has been put in practice by but few, and, financially at least, has in most cases been

unsuccessful, but in some cases successful. So far as making a success of the orchards is concerned I know that in one case at least where the parties have planted nearly 2,000 orchards success has been phenomenal, even far beyond their expectation. The principle that the orchard maker should make the orchard the same as the wagon maker makes the wagon or the carpenter the house, is undoubtedly correct. The success above alluded to as well as the failure which has so often attended the old way is alone proof of this, if proof were needed. There are many, however, who have orchards more or less valuable who do not care to start again from the beginning, and many others who deem themselves competent to make the orchard unassisted. It is for the benefit of these as well as for the guide of all who are interested in fruit culture, that this book is made.

Even if we should all adopt the system of making the orchard by the orchard maker, there would still remain great need on the part of the person for whom the orchard is making for concise, correct instruction through which alone he can intelligently and successfully second the efforts of the maker; for, practically, the maker is little more than a superintendent, and, in a great extent of business cannot visit each orchard very frequently. The interest of the owner will impel him to use all reasonable efforts to make a success, and practical knowledge will enable him to better apply those efforts.

The varieties and the age and form of the tree will be the first consideration.

A chapter will be devoted to varieties, to which the reader is referred. It is generally better to plant a small or medium sized tree than a large one. A well grown two year old as grown in the north, or a good yearling from the south is a good size. Such a tree will be from 3 to 5 feet high. A very excellent tree, and one I would adopt as a model is made by cutting back the yearling to the ground before spring growth begins. Allow but a single stem to grow from this cleft. In the fall we have a straight stem supplied with leaves and buds its entire length frequently with spurs, and about the height above given. This tree if grown in the north should be taken up carefully in the fall after the wood is entirely ripe, and either properly buried or wintered in cellar. The latter is better if done correctly. Such a tree goes to the orchard in the spring following with every part exactly as it was when lifted the previous fall. Its vitality is unimpaired, and such trees will usually make about the same growth, and ripen their wood the same as if they had not been transplanted.

This tree might have been allowed to stand in the nursery row all winter without necessarily being diseased in the spring, but it could be no better nor stronger for its battle with the elements during a severe winter. Experiment has proved that such trees are much heavier in spring than those wintered in nursery row. Before the latter

can start in the spring they must through their shortened and lacerated roots gather up this waste caused by evaporation, thus delaying the early growth which is so necessary to early maturity. If a tree has to be removed in spring, in a high northern latitude I would delay the work till this waste had been repaired by its own full system of roots, or till there was evidence of activity in the swelling buds.

The proper form of a tree is of the first importance. A model tree is one having a stem from bottom to top with side branches, always smaller than the main stem, taken out from it at proper distances, and one which will allow the orchardist to convert into a very high or a very low headed tree as he sees fit without the cutting of large, or two year limbs.

This form is my type of a tree ready for planting in the orchard; but after years this will be lost in a spreading top. The roots of the tree will also assume about the same form.

A low headed tree is of great importance, unless the orchardist has determined to protect the trunk of his trees until the top of this or of the next tree on the south will protect it from the rays of the sun and thus protect it from "sun scald," one of the most destructive of all the enemies of orcharding. This will be treated in the chapter on "Enemies of the Orchard."

Trees of this form cannot always be obtained in the market, indeed very seldom. The nurseryman

is, like many other people, so vain as to think he must live and support his family as other folks do; and should he stock up with such a tree it would be called "brush" by his customers, and would, very likely, be left on his hands for the "brush pile." Warder says, "By all means give the people what they want whether in form or variety, whether best or not." This may be a good rule where customers are persistent, but try to educate customers to buy a low headed tree and a young one.

The form that pleases the majority is one that is a model of a bearing tree. It must have a clean trunk of 3 to 4 feet and then merge into a "head." Such trees, unless planted leaning very heavily to the south, and even then protected from the sun in some way will be apt to lean heavily to the north and east in a few years and finally lose the bark on the south side from sun scald.

SOIL AND LOCATION.

There are some soils in which it might be almost impossible to make a good apple orchard. If the top or drift soil is underlaid at a depth of 1 to 3 feet with a hard pan, such as will not let water through it either downwards or upwards, we should hesitate before trying to make an orchard there. In such locations the cottonwoods and other trees are short lived.

If our land admitted of the choice, and we were making a small home orchard we would select a

moderately elevated piece, where the soil was of good natural fertility; not too abrupt, but sufficiently rolling to insure good drainage. The exposure might be in almost any direction, though a sharp southern exposure is usually condemned. I have, however, seen the Ben Davis in Madison county, Neb., which is considered only hardy enough for about thirty-eight to thirty-nine, at the age of twenty-two years, sound and bearing enormous crops, and on a steep south slope with a grove of cottonwoods on the north and in close proximity on the south.

When we reflect that there are excellent orchards of many acres, hundreds and over, in all parts of the country, it is obvious that the different parts must present almost every exposure or slope, hence if we adopt any particular exposure as requisite to success we should have our large orchards considerably broken up in patches.

It is easier to make an orchard in clayey loam than in sand, still in several of the northwestern states I have seen and made excellent orchards in drifting sands. In these cases it is necessary to plant deeply, 3 or 4 inches deeper than in clay. The Russets and the Duchess, Haas, and Iowa Blush, generally succeed in these light soils, and the cherries are especially at home in them.

It is generally taught that the ground should be plowed very deeply. My experience in making orchards in the soils of western Iowa, northern Nebraska and South Dakota, has taught me that

this is entirely unnecessary, indeed some of our best orchards were made by planting in the virgin prairie sod, and which was not broken afterwards. In these cases the ground was subdued by heavy mulching.

In poor or thin soil it is a great advantage to dig the holes considerably deeper than necessary for setting the tree, and then filling up in part with top soil. The holes need not be dug wider than is required to properly adjust all the roots without crowding. If the root grows at all it is equally strong and piercing when one day old as it will be in ten years, and if it can ever force itself through the hard ground it can do it the first year.

For reasons given in our chapter on the nursery it will be well to plant the tree some deeper than it stood in the nursery. Say 3 inches in upland clay soil, and 5 to 6 in sand.

If trees are procured the fall before planting and buried, before this is done the bruised ends of all roots should be cut off with a sharp knife, always cutting from the under side so that the cut surface shall be generally at a right angle to the stem of the tree. If this is done in the fall and the roots buried moderately deep, say 1½ to 2 feet it will be found that the tree has not been idle during the winter, but that there has been a nice callusing of all these cut surfaces which is the first stage of root making. In fact if preserved without too much injury, this at once takes the place of, and performs the office of the roots,

absorbing the water and food from the soil in contact, and sending it up toward the buds. If this has been omitted in the fall, cut as directed before planting. It is also well to head the top back to some extent, especially if the roots appear to be short or poor; the poorer the roots the more the top should be cut back. It is never advisable to cut back so far as to remove two year old wood at planting. Should there be a limb of such wood that ought to come off, let it be till the next year. The tree will then have more vitality to withstand the surgical operation. This subject will also be further treated under the head of pruning.

If trees are procured in the fall they should not be planted till spring except below 40° latitude. They should be carefully unpacked, the bundles cut apart and the trees buried in a slanting position that will cover the roots about 18 inches, while the tops are barely covered. If the tree is good and the work done right there will be no material loss.

It matters not just what form is used in covering these trees, if we arrive at the same result, but there is a practice where a large number are to be buried that will save much work, and will be described.

Let us suppose we have 100 or more trees, we will lay off a strip of ground about 4 feet wide, and as long as is necessary. We will suppose that the strip lays east and west (but it does not matter) and we stand spade in hand at the east end, facing

the east. We will throw the earth from us—to the east—as we work gradually deeper, and to the west. When we have worked back about 3 or 4 feet we shall have quite a mound in front, and be down at the west end about one foot. From the top of the mound to the bottom of the trench will be 6 or 7 feet, about the length of a tree. Now place in as many trees as will lay side by side with their roots down in the trench to the west, and the tops reaching about to the top of the mound. We continue digging just as we did at first, taking the earth away from the roots and throwing it upon them, working back say a foot or more, when we are ready to place in another layer, which is done, when we proceed as before till they are all in. At this time the trunks and roots will be nearly covered, and to complete the work we will go along the sides and throw earth upon the whole till the trees are all out of sight, root and branch. This will cover the roots deep enough and the tops but little. It is well to work the earth among the roots some, but no great pains need be taken, as the earth will generally in a short time settle around them. If the earth is not naturally moist it should be made so.

In the spring take them out as they went in, that is the last in will be first out. Dig quite deeply at the end of the trench, so as to be sure that we are below all the roots, and take them out by lifting the tree bodily through the earth. Be quite sure to get the top layer, and that all the roots are free

or trees may, as they are frequently, split in two.

To keep a record of varieties, lathes or other strips of board may be laid between them and a record of them kept in a book. This is necessary if we wish to preserve the record, as the labels will be faded out by spring.

It is advisable to cut the roots, as has been directed, in the fall before covering, as many varieties will between this and spring nicely callus and some progress be made toward the next year's growth.

By handling as above described any tree except evergreens can be wintered successfully, and there are many advantages in it. The trees are on the place and can be taken out and planted a few at a time as opportunity offers, and the work done carefully and well, while if they are received in spring it may be in a very busy or very dry time, and the work not done so well on this account.

Evergreens should never be ordered for fall delivery.

The same is true of strawberries, and August planting gives no advantage beyond waiting till the next spring.

Raspberries, blackberries, grapes, roses and many of the other flowering shrubs if received in the fall, may as well be planted out as covered in the trenches and handled again in the spring. The work should be well and carefully done, and then the plants liberally mulched before freezing weather. These

plants will do as well covered as the trees, but it adds to the labor of handling and is of no benefit.

The same would be true of trees if we could give them the same protection that we do the smaller vines, etc. Fall planting is practiced in many places where the climate is more moist and equable. In the trying locations where many are making orchards, trees thus planted would not live till spring, and the practice should not be encouraged, as far north as southern Iowa and Nebraska.

If trees could be taken up very carefully as early as October 1, and immediately planted, with all the care recommended for spring planting, and the ground should be naturally moist, they would make a considerable root growth before winter, and such trees have been known to winter as well as though not removed, but the practice is not recommended. In such cases it is understood that all the leaves are stripped off before the tree is taken up.

In planting the tree or adjusting the roots in the ground, it is only necessary to use good common sense. The roots must be thoroughly encased in the earth, which will generally require the use of the hand without a glove. With this any spaces not filled will be detected. If the soil is very dry, it will be well to put a pail of water in each hole and let it soak away before planting. If the top soil to be used in filling is also dry, moisten to make it as near natural as you can.

In my opinion there are few worse practices than "puddling" trees in. Trees do not require to

be soaked in order to grow, natural moisture is enough.

The objection to this process of "puddling" is that in most soils the ground that is wet becomes a ball, or like a sun dried brick, it contracts when drying and cleaves away from the surrounding earth, thus breaking the connection, and the capillary attraction. Some soils will not do this, but it is unnecessary in any case, and objectionable in most cases.

In this connection let me say that the plan of "watering the trees" after planting is of no avail whatever as commonly practiced, and not advisable in any case where good cultivation, or in its absence good thorough mulching, can be given. To pour a pail of water on the ground at the foot of a tree to water it is much like going upon the roof and pouring water there to water the houseplants inside. Even if a sag or trough is made to prevent the water from running away, a single pailful will do no good. It will soak in but a few inches and then when dry the ground is left hard and will crack and become a perfect chimney through which the moisture from below will be drawn up and thrown off.

In case trees are to be planted where mulch or cultivating is undesirable, as in a lawn, watering will be generally necessary. Bore two holes down with a post auger about 18 inches from, and each side of the tree, as deep as the tree sets; fill these with coarse manure, hay or straw and fill occasionally with water during the summer. Notice closely,

and when there is a drooping or yellowish appearance of the leaves fill the holes again with water.

LAYING OUT THE ORCHARD.

If we plant all apples we would not plant nearer than 20 feet each way or which is better, and gives about the same number of trees to the acre, 14 by 28, the short way north and south.

The land having been plowed and planked or rolled smooth, if it is desired to have the trees exactly in line every way, and it ought to be, take a part of a check wire or other line that can be spaced off into the desired distances, mark them in some way so they will remain immovable, and throw the line straight across one end or side. A stake is driven firmly at each end, then other smaller stakes or pins about the size of the little finger and 1 to 2 feet long are stuck at each of these marks upon the wire or line. The line will then be swung around to make a right angle to the first line, when it will be thrown straight and staked as before, remembering to bring the same mark or "button" to the same corner stake. It is better now not to move the line to space off the third side, but to do it with a tape line or any measure, and put a guide pin at the distances, without regard to their general direction in the line, when the line is swept across the field it will correct this line. The line will then be moved to the next row as indicated by the pins, this row and the others will be treated the same, until all are finished.

The land being staked off it is now necessary by some appliance to put a tree at the exact spot indicated by each stake or pin. This is done with what is called a "replace," and is very simple. Take a piece of board about 6 feet long by 4 to 6 inches wide, cut a V shaped notch about 1 inch at the top, and about 1 inch deep in the center of the board on one edge, and two notches about the same size near the ends on the opposite edge, and the replace is made. Throw this down east and west with the center notch to the north, and the same side up every time; let the center notch receive the pin where the tree is to set, now stick a stake in each of the two end notches, pull the center or tree pin, dig the hole, put the replace back over the two stakes just as it was, plant the tree leaning into the center notch and it must occupy the same place that the pin occupied.

It is well to give the tree considerable inclination to the south and slightly west, but this is not so important if the planter, as soon as he is through with planting will protect the trunk of the trees with something that will defend them from hot winds and sun. There is nothing better than cornstalks for this protection, and no work that the tree planter can do from the time he starts till the orchard is bearing is of so much value as this small piece of labor; indeed it is one of the essential requisites of success.

The work is not yet done, even if it is well done, so far as we have gone. These trees must

be cultivated thoroughly and often the first year. It is not enough to go in with a corn cultivator as near to the row as we can and leave the trees uncultivated. This is of very little good, but it is all very many young orchards get. Even if followed by the hoe it is still poorly done in most instances. If the weeds are cut off at the ground surface and the ground not thoroughly worked and kept mellow it will bake and dry up. There is a very large extent of country where not one year in ten is there sufficient rainfall to mature a crop of corn without resorting to artificial means to supply or retain moisture in the ground. Supposing that we carefully cut or pull every weed in our cornfields but never introduce a cultivator? Cultivating answers a double purpose; it not only destroys the weeds which are great absorbers of moisture, but by breaking and disarranging the conformation of the soil it acts as a mulch and prevents for a time, the evaporation through an infinite number of infinitesimally small tubes. The more finely pulverized the soil the better the mulch, or, as it has been called "dust blanket." I have never yet seen it so dry in summer that I could not in a well kept field find earth moist enough to pack in my hand a few inches down.

One of the best tools to handle an orchard with is a disc harrow, but if a small tree has been used it can generally be handled with the corn cultivator by straddling it. This is one of the many advantages of a small tree. The second year such

careful cultivating is not as necessary, but at all times the tree must be kept in a good thrifty growing condition, and not be allowed to be robbed of its food and water by weeds and grass.

WIND BREAKS.

Among the early settlers of the west there was as much a stereotyped plan of laying out the grounds for the buildings and orchard as there was a little later when ornamentals began to be thought about, and culminated in the two rows of evergreens running from the front door directly to the gate. This was not done probably for the purpose of insuring a snow blockade during the winter, but that visitors who should find the gate might be directed to the door; it does not seem to serve any other purpose.

The wind break was generally in the shape of an L sometimes a perfect square. When in an L, it was on the north and west of the buildings, but an area of from a fraction of an acre to one or two acres was left between the buildings and this grove for the orchard. It is not strange that so many of them were unsuccessful in such a location as it could not well be worse. Had the fruit trees been planted as soon as the forest trees (cottonwoods), they would have stood a better chance, but they must wait, as others did, till the wind break was up before risking the trees. By this time the roots of the shelter trees had taken undisputed possession of the ground to be occupied by the orchard and

were thriving well on the substance that the fruit trees later would stand so much in need of.

An artificial wind break of this kind is an excellent thing for the buildings, and it should embrace several acres, but for a protection to the orchard it is worse than useless. In a quiet warm day in late winter these groves reflect the sun's rays and if continued for some days will either start too early a growth which is soon to freeze up again, or the freezing and thawing of the bark kills it in patches and we have the next summer the evidence in the sloughing off of the bark on the sunny side, followed by decayed wood and a consequent swarm of borers which take possession and death soon follows.

It is generally conceded now by practical orchardists that these wind breaks are detrimental for the fruit trees, but we are frequently asked what we are to do to prevent the fruit from blowing off.

We answer by asking what prevents this in an orchard of several hundred acres in extent? Adams says that the best wind break is "another row of trees." If it is determined to have this wind break why not make it of the Haas apple? It is a strong, very upright grower, is fully as limby as the cottonwood, and will make timber for fuel and many other purposes *in value* as fast as the cottonwoods. A cord of this wood for fuel would be worth perhaps more than twice as much as the cottonwoods, and there would be the additional value of the fruit, for if well fed these trees will bear growing very thickly.

I have been surprised for some years to notice that apples growing on a high northwest slope, without a particle of protection, held their fruit better in a storm than others of similar varieties growing in the hollows, and in the shelter of buildings. It does not surprise me now as it seems natural that it should be so.

It is an axiom of the phytologist that the necessity for a certain condition will produce it. I believe this to be measurably true. Subject the stem of the young apple to the daily changing blasts from its infancy, and the stem will take a firmer hold of its twig, become larger and stronger. It seems to develop a sort of "vegetable instinct" which says "cling on or die." It is hard to imagine a wind break so secure that at no time can a blast reach it from some direction. When this time comes it finds the stem only prepared for fair weather and gentle breezes, and it yields to the ruder blast.

NUMBER OF TREES OR PLANTS TO AN ACRE.

To acertain how many trees or plants will grow on an acre of land at a given distance apart, first find how many square feet each tree will occupy, and the number of times that this will go in 43,560 will give the number to the acre.

To find the number of feet that each will occupy, multiply the distance from one tree to another by the same to another tree at right angles to it. For instance, they are to set 14x28, multiply these

together—it is 392 feet—the space that each tree will occupy. This will go in 43,560 (the number of square feet in an acre), 111 times, which is the required number. Should the trees be set in equal squares, square the distance, as at 20 feet apart each tree will occupy 400 square feet, or 108 to the acre.

If trees are planted in nursery rows 6 inches apart, and the rows 4 feet, each tree will cover 2 feet, or 21,780 to the acre.

CHAPTER IV.

Orchard Management.

IT is supposed that up to this time we have only got the orchard thoroughly established, the trees are sound and making a growth of from one to two feet per year, in apple trees. The roots are well and deeply established and with a reasonable amount of cultivation or even mowing the weeds and allowing them to lie upon the ground, so far as the soil is concerned the trees will generally take care of themselves for a few years.

If there are cherries and plums among them they will begin to bear at this time, say at about four to six years old; the apples will not commence for a few years more. Some varieties such as the Duchess, Wagner, Ben Davis, Iowa Blush and Yellow Transparent, will show the first fruit.

The question is now most frequently asked "What shall we plant in the orchard ?"

If the ground is strong, and the trees continue to make a rapid growth, the land is near market, and valuable for other crops, we may safely utilize it for any crops that will not bar you from cultivating or otherwise keeping the orchard in good growing condition. Never plant small grain in any orchard.

The same of most grasses; red clover is an exception. There is the objection to this, however, that it is quite apt to invite the pocket gophers which are a great pest in an orchard.

As a rule it is best not to try to raise anything in the orchard but the trees and fruit, unless we take advantage of the orchard to grow such plants as cannot be well grown elsewhere. This is applicable to the raspberry. This fruit is quite apt to be tender in more open and exposed positions. If the trees are 20 feet apart, two rows of them can be grown between each row while the trees are from six to eight years old, and as they get older, grow only one. This is done with great success in localities where the raspberry cannot be practically grown in any other way without winter covering.

Level cultivation is at all times better for the orchard. I cannot conceive of a necessity in a properly cared for orchard of ever introducing the stirring plow, except for ridging up in low flat land.

There are many enemies to the orchard such as insects, etc., which must be watched. These enemies will be treated in a separate chapter on enemies of the orchard.

FEEDING.

Intimately connected with the space that is to be given to each tree or the number of trees to the acre, is the subject of feeding the trees. We can not expect to "get something for nothing." We will again compare a tree to animals, this time horses

on the picket ropes. They are picketed at equal distances from each other; they commence to eat at the stake, and as the food is exhausted the rope unwinds giving additional food as required; but there will come a time when lengthening the ropes will not supply more food as they will come to the territory once fed over by the adjoining horses. This means starvation or a very meager supply of food and a very poor existence. There are two ways to remedy or prevent this: (1) by picketing them so far apart that before they reach each others territory a plentiful supply will have again grown where once fed over, or (2) leave them as they are and carry feed to them. The latter is the best and most economical way.

A tree just as surely feeds the ground over as a horse does and as closely; not one little particle is allowed to escape; but nature is very recuperative and will do her best by dissolving for the use of the tree as fast as she can, such elements in the soil as were not palatable the first time, and in course of time the ground will supply it a second crop of food, but at best it is only "the second table."

As soon as the trees come into heavy bearing the ground should have a top dressing of stable manure, ashes, or any of the phosphates if the ashes or stable manure cannot be had in sufficient quantities. Ashes and all alkalies are valuable to soils as solvents. They reduce the indigestible particles to a condition in which they may be utilized by the tree. Thus these alkalies applied to the soil for

any great length of time without other food elements would have less effect.

I am of opinion that the habit of "off years" or bearing only alternate years can in a great measure be broken up by a careful system of feeding or fertilizing.

THINNING OUT SURPLUS FRUIT.

Do not allow the trees to overbear. It is extremely injudicious. After the fruit is large enough to satisfy you what is firmly established, or when the size of a hickory nut, look at the burden and try to imagine that each is a full sized specimen. If the fruit would not in this size be more than an ordinary crop all right, but if it would be a heavy crop such as would require the propping up of the tree pick off a part of them. Do not be afraid that you are wasting your fruit; in very many cases if half the fruit, even, is picked, that which remains will measure as many bushels, but of much better and handsomer fruit.

In this way the tree has been relieved of nearly half its burden; for the great strain upon the vitality of the tree is not in maturing the pulp of the fruit, but in maturing the *seeds*.

It is a matter of record that the greatest injury has generally been done to apple trees the winter following the production of their heaviest crops.

It is obvious that the better condition a tree is in, in the fall, the more vitality it has stored up, the better it will resist the rough usage of the winter.

In regard to off years, it has been asserted that this habit could in a measure be broken up by proper feeding. The probable reason that trees do not as a rule bear every year is that they cannot, on account of exhausted vitality from the last year's production. This granted it is evident that whatever will assist in maintaining this vitality will assist the tree to produce fruit buds—which are formed in mid-summer—and to develop them into fruit the coming spring. The two things which will do most to so aid the tree are, proper feeding, and thinning out fruit before the seeds have developed.

Judgment must be used in applying stable manure or it may do more harm than good. It should be applied only to the surface and no attempt made to plow it under. Neither should it be so thick as to burn or to "fire fang," and should not be placed against the trees, nor in contact with the roots. If piled against the trees, roots are apt to be induced to grow directly under it and in almost every instance will be warty and covered with fungus growth.

Gathering fruit for market. The price will in all cases be determined by the excellence of the fruit, and the appearance it presents to the eye of the purchaser. It is poor economy to try to send out more baskets and to do so be compelled to use a poorer quality. Fruit should be carefully handled to prevent bruising, and then put up in the neatest cases.

Summer and fall apples should be gathered before quite ripe as they bruise less, and keep better. Winter apples, whether for the market or home consumption, in order to get their best results as keepers should be gathered early. The practice among those who only grow for home use is to allow the fruit to remain on the trees about as long as it can without freezing. Such fruit will not keep, even when otherwise long keepers.

Grapes of many kinds can be kept several months after ripening by placing them on shallow shelves in a cool cellar, so arranging them that the bunches do not touch each other. Some pack them in shallow boxes filled with perfectly dry, coarse sawdust. When taken out for use the sawdust that adheres is removed by dipping them in water.

Canned fruits. Whether or not we can grow sufficient quantities of winter apples for the season, we can always have small fruits by the easy and cheap method of canning. This art is understood by all the housewives.

Cherries are improved if about one-fifth of the amount of fruit is put up without removing the pits.

Currants are improved by adding nearly one-half mulberries.

All fruits will keep as well if cooked in a kettle and dipped from this into the cans, the only objection to this being that the fruit is more broken and does not look as well.

There will be no danger of breaking the cans if a towel is wrung from cold water and pressed

tightly around the can, being sure that all parts of the can, especially the bottom, are in contact with the wet towel.

It is immaterial whether sugar is or is not used at the time of canning. It keeps as well in either case, and the flavor is not changed.

PRESERVING FRUITS FOR EXHIBITION.

Prof. Hilgard discusses the requisites of the ideal material for preserving fruits for fairs and other exhibitions. He says such preservatives should prevent fermentation, must be liquid, must not extract color, and must not change the size of the fruits, causing them either to swell or shrivel

In order to retain the size, the best means of increasing the density of the fluid, and as a guide to the proper quantity to add, the percentages of of soluble matter (glycerine) to total weight are given: Apples and pears, 12 per cent; plums, prunes, apricots, peaches, about 10 per cent; cherries, 12 per cent; most berries, 8 per cent; currants, 10 per cent; that is to any preservative fluid having about the density of water, add 12 per cent of glycerine for apples, etc.

Several preservative fluids are discussed but only two appear to meet with the requirements: (1) a solution of one ounce of salicylic acid to five gallons of water, to which as much glycerine has been added as per above schedule. This constitutes a preservative fluid that has been used with success on all fruits. There has been some difficulty experienced

in dissolving this acid in water, and various alkalies have been added but these are not necessary, as it dissolves readily in boiling water. When first dissolved the water turns bright pink, but when cool it returns to a nearly colorless liquid. Fruit should not be introduced while liquid is hot.

Corosive sublimate in the proportion of ½ ounce to 1 gallon of water is used in Italy successfully, but as it is a deadly poison while the salicylic acid is not, and is equally as good the Italian method need not be used.

CHAPTER V.

Pruning in General.

IT is within my recollection that the subject of bleeding in the human family was discussed something as pruning is now. It never occurred to them that habitual bleeding was unnecessary; it was only a question of proper times and methods. Every season and every variety of torture in this line had its advocates; and, as it is now all clearly attributed to want of knowledge, such a condition (ignorance) has in all ages made its possessors very firm in their beliefs. There was the lancet, the phlegm, the cups, and even the filthy worm called the leech was invited to the feast, and, in contact with the bare arm filled up with the blood of the poor dupe of ignorance. This practice was so common that the physician was commonly called a "leech". It is now almost entirely discontinued. The physician of to-day rarely takes the blood away from his patient; but rather studies to add to it. Nevertheless, there may be, and doubtless are times when bleeding is advisable, even necessary. It is no longer, however, trusted to the barber (who formerly performed it in many cases) but to the skillful physician, who can give a good reason for doing it.

The same is nearly true with the art of pruning. To insist that every tree must at certain times be subjected to a surgical operation is to doubt the wisdom of the Great Creator.

In California there are trees more than 30 feet in diameter, and hundreds of feet high. In all parts of the world, where conditions have been favorable, great trees and woods grew long before the advent of man. Indeed, man in his earlier, and even more recent, conduct has acquired the name of the great tree spoiler. How did these immense woods and trees succeed so well without the assistance of man to do the pruning? How does the natural wild grape, the wild cherry, plum, etc., succeed in growing such loads of fruit without care or assistance from the great intelligence of man?

The forests will show us straight trunks without limbs or blemish for 40 feet or more, yet there was a time when these giants were but a few feet in height, with limbs to the bottom, such as you have seen upon the lawn. Where have these branches gone? They have been shaded to death. Nature is extravagant in the use of seeds. She sows hundreds where one can make a full sized specimen, yet those that make a beginning are often of great benefit in assisting others to attain that size. The young plants come up thickly under the parent tree, whose shade and protection they receive, as well as that afforded by each other. Light is a great stimulant of vegetable growth, and without it the lower limbs die, and finally drop off, while

the tree is still reaching upward for light. The weaker ones fail in the race for light, and the fittest only survive. The annual layers of wood soon cover the wounds, or knots, and we have the first conditions for "clear lumber."

There is a communication through the bark of the tree with the atmosphere, as there is through the skin of an animal, measurably, and in order to maintain this mechanism in a healthy condition it seems that nature requires it to be kept in the shade, wholly or partially, and she will provide for herself just right if left to her own will.

There is not an exact similarity between the growth of the natural forest and the growth of the orchard, or isolated trees; yet the principle is the same underlying the production of each; and it is this that we are trying to study. We raise the orchard from the start artificially; and when we leave nature and pursue art in this manner we shall be compelled to follow art in a measure; but we should keep as close to nature as possible and practicable.

Trees in the forest grow closely; they not only protect each other, but each specimen is supplied with a means of protecting itself, should it become isolated. The stronger outgrow the weaker, which thus being robbed of light are "shaded to death." The same process continues as long as there are any weak ones, and only "the fittest" survive.

This same shading process is nature's manner of pruning. As the trees attain size, and each is reaching up for the light, the upper branches be-

come close, and so in a measure exclude the light. This is fatal to the lowest limbs; those which but a few years before were so green and healthy begin to shed their foliage, and finally, slowly, after the principal growth has been diverted from these branches they die, dry up, and in a few years drop off, and yearly deposits of wood cover the place beyond recognition. This process continues so long as the trees are growing in height.

The means referred to by which an isolated tree may measurably provide for its skin the needed protection, is the natural low growing of the first branches. Even before branches are produced nature is sure to provide this protection, and she does it with a screen of leaves during the first summer, and provides at the base of each leaf stem a bud or embryo branch to be developed for the next year's protection of the same parts. *These are there for a purpose or they would not be there;* then why should we, as soon as these buds are partly developed the next spring, go and strip them off? This is commonly done, and the tree denuded of these most important buds for about 2 to 3 feet in height. The purpose is to form the "trunk" and have it smooth, showing no knife marks, or as the "agent" will tell us "all glove pruned."

As these trees stand in the nursery row, and as all of these rows run north and south (or should do so) the damage is not as serious as it would be to an isolated tree; still, I hold the practice as pernicious and avoidable.

Dr. Warder says, "The growth during the first year is generally a single shoot, sometimes two, but if there be a second it should be subordinated by pinching off its extremity, never by cutting it off, indeed, laterals should always be encouraged, and this will be more and more the case since the demand for low headed trees is increasing, as the laws of physiology are better understood. A young tree better furnished with laterals, is always more stocky, and every way better though not so tall as that which has been drawn up to a single stem. To encourage this, some advise pinching off the terminal bud in the midst of the growing season, which will cause the swelling and consequently breaking of the lower buds, so as to furnish plenty of lateral. If done later in the season, especially in the strong growing varieties, a branching head may be formed higher up, during the first season, making very pretty trees. This plan of making stocky trees cannot be too highly recommended, and the opposite plan of trimming off all the side branches, and even of stripping the leaves from the lower parts of the shoots during the first summer cannot be too severely condemned."

I have not seen the stripping of leaves during the first summer referred to practiced in the west, however, it is very common to do this the second season, as soon as these lower buds burst, which is not less harmful.

Is it not time for a concert of action among the nurserymen to educate the planters who gener-

ally depend upon them for such trees as they should plant, and are governed by their recommendations? Does he choose a large high headed tree for himself and for his own orchards? Rarely. He will, if he can, use a low headed stocky tree, not over two years old, such a tree as Warder, Thomas, Downing, Lyon, Budd, and other of our specialists have uniformly recommended. Such a tree is good enough for any one to plant. There is every reason why such trees should be used and no good reason why not.

If these trees are grown as far south as central Kansas a good yearling will be about 3 to 4 or even 5 feet high. If in latitude 41 or higher, only about 2 feet with an average of about 18 inches. It would probably not be advisable to cut one of the former to the ground the spring of the second season, and would not be necessary, as such a tree when fully appreciated would be found to give the best satisfaction. In the north, however, there is no reason why the tree should not be allowed to remain in the nursery one more year. It will be then but little larger than a good Kansas yearling. In this case the yearling must either be laid down and covered during the first winter or protected in some other way from becoming discolored or "black hearted;" or we may let it stand, and depend upon eliminating this trouble by cutting it off at the ground surface, as has been described in chapter three.

Notwithstanding the fact that all the authorities

recommend the small tree; still the "trade" demands a tree three years old or older and about 5 to 7 feet high. This, without generally trying to influence the demand, is the tree that the nurseryman has by long habit become rooted to. If the nurseryman will try to educate the trade to accept these large one year, or the two-year olds as described, he will find no inconvenience in packing and handling such trees, and by instructing the planter that these low growing branches or the dormant buds nearly to the ground are his very best friends, and should be protected and preserved, he will have overcome one of the greatest obstacles to successful apple culture.

In opening the book to this chapter, if the reader has expected to be told in the old stereotyped way just "how and when to prune," he will be disappointed. It shall rather be my aim to instruct him how not to prune.

While it is true, as has already been observed, that pruning is sometimes necessary (and this will be considered later), it is, in my opinion, an unquestionable fact that pruning, or over-pruning, is one of the principle causes of failure where it occurs. If we plant out an orchard of properly grown trees we shall generally make more mistakes in pruning than we shall to avoid it altogether, which is not advisable.

Improper pruning is one of the causes of what is called "black heart." This is especially the case if it is done in the winter when trees are frozen. This should never be done.

If we look at a natural tree the first year of its growth, we shall notice that the buds, or embryo branches, are quite close together, sometimes but little over an inch apart. We are now told that it is necessary to remove these branches in part, when they develop, as, when they have become large, there will not be room for them all. This is true, there would not be space in a single inch for a 4 or 5 inch limb; but let us not jump at the conclusion that they will ever become such size. Nature will not crowd two substances into the same space at the same time. One of these will be strangled by nature's own pruning process, dry up and die.

It is sometimes the case that two or more limbs will grow too close together, and so even in size and growth that it becomes apppreent that one should be removed. Do this at any time when not frozen. Observe carefully and you will see a small ring or "collar" near the base of the limb to be removed; cut the limb or shoot off just above this but not so close as to injure it. The cut will be, if this is followed, nearly at right angles to the limb removed.

It is well, and cannot be too strongly recommended, to follow this and all pruning with the paint brush. Paint over the wound to exclude the air. By this means black heart or discoloration, which means the first stage of decay, is prevented. This may not be at all times necessary, but it is a small matter and should never be neglected. The paint should be moderately thick, thicker than

would be used by the painter, to prevent its running down upon the trunk of the tree. Grafting wax, varnish, or anything that will seal the wound from the air will do as well. Gum shellac cut in alcohol is an excellent preparation for this.

When at planting there has been a heavy cutting back of the tree, which is advisable, we have introduced a manner of pruning from almost necessity which, like all other pruning, is liable to lead to trouble later on. At the ends or stubs, where the limbs have been removed, there is likely to be an unnaturally close growth, several branches starting from this point; here judgment must be used, and, if too many, thin them out as soon as they start. If a branch is to be cut off, the earlier it is done the better, while it is small.

Some varieties will need much closer attention in this matter than others. The Duchess of Oldenburg, Wealthy, Walbridge, Tallman St., Limber Twig and others make an open top, while the Ben Davis, Iowa Blush, Jonathan, Northern Spy, etc., are more apt to make a close top. The Willow Twig is at times, unless closely watched, apt to make poor forks, such as do not "weld together" at their union with the trunk or other branches. These will not sustain any great strain, either from weight of fruit or the wrenching of storms. Cut out the one that is the weaker, as soon as it first develops this weakness.

A perfectly natural tree will not lean, as a rule, to the northeast; while one with the lower limbs

cut away or the lower buds stripped off, will invariably do so, unless artificial means are taken to prevent it. This leaning away from the sun is a very serious matter in making the orchard, and such trees are the first to "sun scald" on the sunny side. Being inclined they offer their trunks at almost a right angle to the sun's rays, and it has, of course, a greater power than if they struck the tree at an acute angle. This mischief again intensifies itself, as the condition here is unfavorable to the best growth, the growth being driven to the other sides of the trunk, this side becomes partially flattened, and thus offers a still better target to the fiery archer. If we cut one of these high-trimmed trees across, midway between the ground and first branches, we shall see exactly what has been described above. The bark will be thicker on the south, showing that nature has made an effort to shield this spot, and also that the heart of the trees is not in the center, but much nearer the south side, or, which is the same, that the growth has been much larger on the side furthest from the sun. The same Great Power that made the sun made the tree too, and the tree is entirely dependent upon the sun for its existence. It seems entirely unreasonable to suppose that the friendly sun becomes the great enemy of the tree, and that it is necessary, or natural, that it should be the cause of the destruction of them by the thousands. There is no such inharmony in the great labyrinths of nature. The trouble is: God made

the sun and man made—or tried to—the tree; and the man's tree does not fit the sun; and as there is little hope of reforming the latter, it is best to follow nature and make a tree that *will* fit the sun.

Compare the bottom and top diameter in a naturally grown tree with the same in an artificial one, where the stem is drawn up to 4 or 5 feet. Two such trees of the same age just measured give the following: The former, bottom diameter, 7 inches; top (3 feet above), 3 inches. The latter, bottom, 5 inches, and top, same height, 4¼ inches.

It will be readily seen that the cause of this malformation is in part the action of the sun upon the trunk, and partly the loss of the greater amount of sap or plant food descending from the leaves of the lower branches, which builds up the trunk in proportion to the leaf surface supplied above them.

In a conversation with the venerable T. T. Lyon, of Michigan, he said, "I would not plant a tree with over a foot of trunk. I never yet saw a borer in a tree where the trunk was shaded." This is from a man of fifty years' experience as a practical horticulturist, and in a state where we are apt to think there is no trouble to contend with as there is in the dry, bleak northwest.

To conclude, let us "sum up:" (1) Let us not fall into the habit of thinking that pruning is in all cases necessary. (2) Study to avoid rather than to find an excuse for it. (3) When the best judgment advises it, cut as above described to the ring or collar, cut when small, and follow with the paint

brush. (4) Never prune while the tree is frozen. (5) All pruning is a shock to the tree and reduces its vitality. (6) Thinning out the tops of trees "to let the sun in" is injudicious, unnatural, and consequently unnecessary.

CHAPTER VI.

Cross-Pollenizing the Flowers.

IF it had not been for the wise provision of an All Wise Creator, the almost countless varieties of plants and trees would not have existed but would have remained each one producing after its kind as they were created. The only apple we would have would be the wild one or crab of ancient Briton, Europe or Asia; in size more like a berry than an apple of the present day. In plums we should be confined to the wild Sloe of Europe, unfit for the food of man or beast, etc.

It is said "Nature abhors self-fertilization." It is a theory and probably correct, that if we could suppose the existence of a tree having had no cross-fertilization in its ancestry, could be so isolated that it could never come in contact with any pollen but its own, if it produced fruit at all its seeds would—if it had seeds—reproduce perpetually exactly after the parent. If there were no provision for fertilizing in any other way, there could be no change, and consequently no improvement in varieties. This crossing is, like budding or grafting, confined within certain limits, generally to the same species. As these are generally in blossom nearly

at the same time the pollen is by the wind or insects carried to the flowers of other trees. The result is the production of fruit with seeds related to both parents, and so mixed and commingled that each will have different characteristics, some producing trees which are better, but generally those that are inferior to either parent. It is in the selection of these children that we have gained the excellent varieties of our fruits and vegetables.

The above supposes that nature has alone been the agent of this cross-fertilization. Art has taken the hint from her, and pursues a course suggested by the known laws of vegetable life.

In a work of this kind it is only necessary to treat upon this from a practical standpoint. The lesson to be drawn from it will be obvious. Mr. Wait, of the U. S. Pomological department says: "The factors affecting the production of flowers, are variety, age of tree, and vegetable condition, which is influenced by the soil, culture, climate and pruning. The factors affecting the setting of fruits are frost, insect injuries, and sterility of pollen. Thus, Bartlett and some other varieties of pears do not set fruit when protected from the pollen of other trees. Experiments were tried by fertilizing Bartlett with Bartlett, but in no case did any fruit set. When fertilized with Anjou and Clapp's favorite, good results were obtained. Some pears will fertilize themselves, but two thirds are self-sterile. Fruits produced by self-pollenation are quite different from those produced by cross-fertilization. The crosses

of Duchess (pear) are much rougher and larger at the blossom end. Even a greater difference is found on internal examination. Self-fertilized fruit had none or very few seeds, while others crossed, had a large number of them.

"The result with apples was not so great as with pears, for no variety was found that would self-fertilize to any extent. Cross-fertilizing with more than one-half the varieties of pears and apples is essential to successful fruiting.

"The chief agencies of fertilizing are insects, and the honey-bee is best of them all."

It will be seen that it is not best to plant large areas of fruit of one kind; they should be mixed. Where such orchards exist already other varieties can be introduced by top grafting. In selecting a variety to use for this fertilizing, use one that ripens at about the same time and produces its blossoms at the same time. Supposing the trees are all Ben Davis, and we should top work with Rawls Janet, there would be no gain as the blossoms of the former would be all gone before the advent of the latter. Use the Winesap and you will accomplish the end desired.

Some of our readers may wish to experiment in this cross-fertilization. It is one of the most interesting of all experiments, and easily accomplished. The object to be obtained is the producing of new and valuable varieties. The pathology of the experiments is generally based upon the use of two parents having in themselves excellent qualities, but

which have other qualities that condemn them. For instance the Grimes Golden is in quality unsurpassed, but it has a tendency to drop its fruit before ripe and is not hardy in all localities. Suppose we cross this with the Wealthy or Duchess. It will be with the hope of either adding to the keeping qualities of the latter—and possibly to their quality—as well as to add to the hardiness of the Grimes Golden, retaining its keeping qualities and quality of fruit.

Botanists are assuming it to be true that the female parent will be more apt to govern in the tree and the male parent in the fruit. This remains to be proven.

Let us first describe a perfect flower; one having all the organs complete within itself. These are called Hemophroditic. First the outer case called the calix bursts and reveals the next which is usually of beautiful colors and is called the corrolla. It is composed of leaves called petals. Inside of this we have another set of organs called stamens, they may be known by their generally greater length than the pistils, and terminating at the top in a small pod called the anther. This pod contains the fine dust that we call pollen. This pollen carries the male element of the flower, or the sperm cell.

Arising from the center of the flower there is another important organ, sometimes many in a single flower, called pistils. Whether one or more it consists of three parts. The upper part is the stig-

ma; the middle, the style, and the bottom the ovary. This ovary also is a pod and is partly hollow and contains rudimentary seeds or ovules. In these are the embryo sac, which contain the female element of the flower.

There can be no fruitification unless the pollen containing the sperm cell is brought in contact with the germ cell at the bottom of the flower. These two cells are called protoplasmic, or the beginning of life.

FIG. 1. SHOWING PISTILATE STRAWBERRY FLOWER ON LEFT AND STAMINATE ON THE RIGHT.

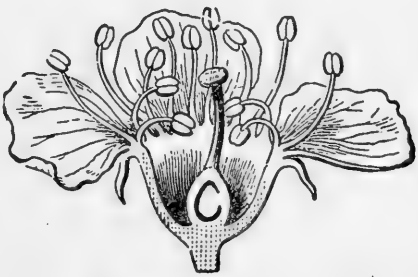


FIG. 2. BISECTED CHERRY FLOWER, SHOWING ALL THE ORGANS OF A PERFECT FLOWER.

Fig. 1 shows two flowers of strawberry, one staminate, the other pistilate.

Suppose we take the flower of the cherry which is a good study (see Fig. 2) as all the organs are very distinct. In this case there is no trouble in producing this union. A gentle wind stirring the branches, or the ingress of an insect and the bursting anthers discharge their loads of golden dust upon the pistils or stigma. The actual contact between the two cells does not take place by the

outward contact, but through a filamentary tube which grows from the stigma to the ovule.

There are many plants which have male and female flowers growing on different parts of the plant, as the squash, while others have their separate flowers on different trees, as the mulberry, buckthorn, hemp, etc. Such are called dioecius.

It will be plain that if a flower has no stamens nor anthers, we have only to protect such from the ingress of possible pollen from some other flower, and then at the right time introduce such pollen as we may desire for the father of our artificial progeny. This protection is by carefully encircling the flower with a piece of oiled silk. The pollen is easily gathered and introduced. It may be shaken onto a piece of white paper, and then with a camels hair brush dusted off into the subject flower.

Exactly the same process is necessary in perfect flowers, except that with a delicate pair of scissors we must clip off and remove the anthers from all the stamens before they are mature, and then apply the oiled silk as before.

Carefully mark the subjects so that you can tell when the fruit is mature what the parents are; plant the seeds and watch. Those that look desirable can be tested by topgrafting into bearing trees, and those having the appearance of a seedling, throw away.

It may be useful to mention here to our farmer friends some of the benefits of the bumble bee. Darwin said that they were necessary to a good

crop of red clover seed. The Australians could not raise this seed till after they imported these bees, and after that succeeded in proportion to their success with these bees. The common honey bee cannot reach the nectar, so will not work on it, while the bumbles find it their best field.

Red clover is a biennial plant and unless seeded from the crop on the ground, will not last but the two years.

Don't kill the bumble bees.

CHAPTER VII.

Enemies of the Orchard and Fruit Garden.

THEY are many, but all orchards and all trees need not necessarily be troubled with them. The object in describing and giving the remedies, so far as is practicable in a book of this size, is to teach the planter how to avoid or arrest them if they do get a foothold in his enclosure. We premise, thinking that perhaps some might after reading this deem it better to give it up before commencing. Notwithstanding the many enemies we have to meet and overcome, there are still very large and profitable orchards, and made by exercising only that amount of care that would be necessary to succeed at any other undertaking.

If we could, before we had existence here, have been allowed to read a list of the "diseases that flesh is heir to," some might have thought best not to make the effort; still a fair proportion of those who do make the start are successful and satisfied, and some would be willing to begin again if they could under as favorable circumstances.

Aside from the free, natural elements, without which there could be no life, we find it true that "that which costs nothing is worth nothing." There is some "poetry" in this expression, and it must be taken in a poetical sense, as it is not literally true; but it does seem that in the great economy of nature that which is of the most value and of the finest order is the most difficult to obtain, and comes only through hard and intelligently applied labor.

This chapter will be devoted to insects, etc., as follows: (1) Leaf eating, (2) juice sucking, (3) fruit eating or destroying, (4) burrowing in the tree or vine, (5) bark eating, (6) fungoids, (7) burrowing animals, (8) sun scald, and (9) fire blight. The pruning knife could well be described here as one of the orchard's worst enemies, but a chapter has already been devoted to this.

In considering insect ravages it is well to suggest that they are not regularly and annually destructive. In bestowing them upon us nature has been so kind as to send with them other insects or other agencies that keep them in check. These consist of a host of parasites that infest them, deposit their eggs upon or within them, where their young are hatched and matured, living upon their bodies and destroying them. There are also others which, as adults, devour them and their eggs. Birds and fowls also feed upon them. Thus the war goes on, and as it is more or less successful, so the friends or enemies are more or less numerous.

Dr. Lintner says: "Insects have established a kind of universal empire over the earth and its inhabitants. Minute as they are, they have desolated countries and brought ruin in their train. If unrestrained power were given them, and they were left free to attack us in person, food, clothing, houses and domestic animals, the consequent disease, poverty and want would in the end remove the human race from the earth." Prof. Reily estimates that in the United States they annually cause a loss of from $300,000,000 to $400,000,000.

There is at present 350,000 named and classified *species*, and it is estimated that not one-third are yet named.

The number that is injurious to vegetation is much smaller, and many of them are their parasites, and consequently our friends.

Prof. Reily says, further: "Insects play a most important part in the economy of nature. The average townsman, whose only knowledge of them is confined to certain household pests, has no feeling for them but one of repugnance; yet as scavengers, pollenizers of our fruit and as food for other animals, they not only vitally concern man, but, philosophically considered, are seen to be necessary to his very existence upon the earth."

Many large volumes have been devoted to the description of insects, but as we have promised to take a practical view of all the subjects treated upon it is not believed that the generic description of one will be necessary here. Space can be

devoted to other matters of greater practical importance.

Hexipod insects are transformed through four separate stages—(1) the ova, or eggs; (2) the larva, or active eating stage, in which they are improperly called worms; (3) the pupa, or chrysalis, in which it is inactive and from which it emerges as the perfect insect or imago, in the fourth transition.

Leaf Eaters.—These are in most cases the larva as above, but there are some bugs or beetles that also eat leaves; but the perfect insect or imago is usually harmless. Whatever the insect, bug or worm may be that eats the leaves of any tree or plant, the remedy is the same and very simple; that is, the spraying with some of the arsenites, and those most in use are London purple and Paris green. These are applied as will be directed below with a force or spraying pump in a stream broken up by a mechanical appliance into fine spray. Every fruit grower, as well as every farmer, should have one of these. They may be large, powerful and expensive, or simple and cheap, according to the work that is expected of them. Trees should be watched very closely during the summer to see whether leaves are being eaten. If they are and the trees are small, the eaters will be easily found and picked off and destroyed; but if large, use the sprayer and the eating will stop.

There is one insect that requires special mention, the *leaf crumpler.* In winter we often see small tufts of withered leaves adhering to the twigs, gen-

erally of small trees. These are the homes of a small brown worm ½ inch long, the egg having been deposited there the previous spring, and which will at some time during the early part of the next summer emerge a perfect winged insect, being a grayish moth having about ¾ inch spread of wings. They are not as injurious as some, as they do not under ordinary circumstances become very plenty; but they are hard to reach with the poison, but can be picked and destroyed in winter. As these, as well as all other insects in the pupa or larva stage, are apt to be infested with parasitic friends, it is well to put the cocoons in a box over which there is fastened window wire screen, which will allow the latter to escape, while it holds the former.

Sap Suckers.—These are a class of very small insects, known as plant lice, of the *Aphidæ*. They suck the sap of plants by means of a tubular proboscis which they insert into the tender shoots. They are more destructive to house plants than others, but some of the tribe are often destructive when they get a lodgement in the roots of apple and other trees, and from which they are very hard to dislodge, but will generally in a few years be overcome by their natural enemies, for small as they are, they, too, are infested with parasites and also greedily devoured by the larva of the lady bug and lace-winged fly. When their natural enemies are insufficient to hold them in check, they are easily overcome where they can be reached by ker-

osene emulsion. They cannot be reached by the arsenites, as they have no jaws and take no solid food.

Fruit Eating or Destroying. — These consist mainly of the codling moth, curculio and gouger.

The former is by far the most destructive. When we get a "wormy apple" we get the larva of the codling moth. This insect is dark brown and has a spread of wings of about 5/8 to 3/4 of an inch. She deposits her egg in the calix or blossom end of the apple as soon as it is set, and it soon hatches and commences to eat its way to and into the fruit. It is at this stage that the remedy is applied; that is, spraying with an arsenite while the apex of the fruit is still turned upward. It has been found by experiment that trees so sprayed yield 70 per cent more perfect fruit than where it is neglected. The spraying must not be done while the trees are in blossom, but as soon as the petals are shed. Some repeat after four or five days, which is advisable.

The gougers and curculio are much alike and deposit their eggs in the young fruit, or up to the time it is nearly half grown, by either puncturing the skin, as with the gougers, or by cutting a crescent-shaped opening through the skin, as with the curculio. The larva hatches and eats its way to the stone, for they work mostly on stone fruits. Here they live upon the kernel, and when the fruit drops they escape into the ground, where they are transformed. It is ascertained that these insects, at the time of their egg laying, eat some of the

fruit, and at times even the leaves. Spraying has been found beneficial on this account, but jarring the trees at this season of the year early in the morning is also resorted to. The insects drop down on to sheets and are gathered and destroyed.

Borers.—There are two of these insects that attack the apple trees and some others. The round-headed one works near the base of the trunk. This is known as *saperda vivitata*, or *candida*. The perfect insect is a brown beetle with two white stripes running the entire length of the body. It deposits its eggs one in a place in the night, generally near the ground; the larva works its way through the bark and then works either upward or downward in a circle in the sapwood, frequently girdling the tree before it burrows deeper toward the heart of the tree. The time required to make the life cycle again to the adult is stated by Dr. Fitch to be two years, but Reily says three. This is immaterial; the remedies are the same, as well as for the flat-head, which works higher and occasionally in the larger branches. This is the *chrysobothris femorata*, and is the one that attacks the box elders and soft maple. The first indication of the former will be in the latter part of June, when a small hole will be observed, and the bark around it will be darker and, later, somewhat sunken, and the chips or dust will be seen protruding. The latter will show the effect a month or more later. If noticed early the remedy is to press hard with the thumb, and if it is effective the grub will be crushed and easily

detected by the feeling. If not successful with this the knife must be used, which will at any time during the first summer soon dislodge him. If the second summer, prod him to death with a strong, flexible wire.

Washes of strong soap and water, to which has been added ⅓ its bulk of turpentine, will also kill them if not too deep. It will also prevent their getting a lodgement in the tree.

It is believed that the beetle will never deposit the eggs on trees that are whitewashed with the preparation hereafter described. It is also my opinion that they never attack a perfectly sound and healthy tree. When from any cause the sap becomes disorganized and stagnant the insect is attracted by the odor to the tree. Trees with low heads or those shaded by artificial means will not be troubled by borers in the west.

The tree or white crickets are at times troublesome by boring into the canes of the raspberries, and frequently kill them. The remedy is to cut the canes and burn them.

Bark Eating.—Aside from domestic animals there are but two of these that are liable to give us trouble, namely rabbits and mice. Sometimes sheep or old hogs will girdle the trees. These, if allowed in the orchard, and they are sometimes used there to advantage in devouring wormy windfalls, should be watched.

Mice will not frequent a clean orchard, unless there is a lot of weeds and grass very near it,

in which case they might run in for a few yards. The preventive is simple and effective. Bank up the trees only a few inches in height with clean earth, and smooth it down in the shape of an inverted funnel. The mouse will never climb it.

Rabbits have been a great pest, and some have been deterred from planting an orchard on account of them. Blood applied to the trees is in nearly all cases a sure preventive from the "Cotton tails," or timber rabbits, but not against Jacks. They are not a nice feeder, and will eat trees so prepared, and even when soaped seem to relish it just the same. The only sure remedy is to encase the trees in something that they will not meddle with. We have found the corn stalks to be the best and cheapest. They should be left on the trees summer and winter. Wire screening is used by some, but is more expensive and no better. They should be shot and trapped, and every effort made to get rid of them.

Fungoids.—These are the lowest forms of vegetable growth, and so minute in their organisms as to require the most powerful microscope to discover them. It lives in the form of mildew, scab of the apple, and is particularly abundant on the leaves of yearling apple seedlings, and the leaves of the cherry in the latter part of the season, where it appears as a whitish mould, which causes the leaves to curl and frequently drop. The remedy for this is the Bordeaux mixture, described below. It is

claimed that "fire blight" is the effect of one of these spores.

Burrowing animals.—Pocket gophers and ground moles are at times, especially the former, very destructive. Moles are only injurious in small fruit or other gardens, and the injury is only from the displacement of the earth; they never eat any vegetable substance, but live on worms, bugs and grubs, and may be as beneficial as harmful. However, they are easily trapped if desired with a mole trap which can be procured at the hardware stores, with full directions for use.

Pocket gophers frequently cut through the trees a few inches under ground, which are 4 to 5 inches in diameter. The first indication may be the withering of the leaves, when it will be found to be entirely severed. They are easily trapped or poisoned. In trapping, dig to the runway and set a common steel trap, then cover with a board to prevent the earth from falling back, and cover this with earth to keep out all the light. Use the end gate rod to a wagon for prodding the earth to find their runways which will save digging. Small potatoes with a small amount of strychnine pricked in, and these deposited in their runways will be the easiest and most effective way to get rid of them.

Prof. Hilgard, of the state university of California, has orginated a means of destroying all burrowing animals, and which is vouched for by several of our best agricultural papers. It is thought to be of sufficient value to give it here in full.

KILLING GOPHERS.

One of the simplest means and probably the most effective and cheapest method yet devised for destroying gophers and other burrowing animals is by the use of bisulphide of carbon. This compound when pure forms a colorless, mobile liquid having a peculiar odor, and when taken inwardly is a violent poison. As usually obtained it contains impurities in the form of other compounds of sulphur which give it a strong and extremely offensive odor, and when inhaled it soon causes death. For the purpose of destroying gophers or ground squirrels the crude bisulphide is better and much cheaper than the pure article. Care should be taken in using the liquid, as it is both inflammable and explosive. Its efficacy depends on the fact that its vapor is heavier than air and when introduced into burrows flows like water into all the recesses.

The method of use for burrowing mammals is as follows: A small quantity, about 3 tablespoonfuls for prairie dogs, and 2 tablespoonfuls for gophers, should be poured upon a bunch of rags or waste, which should be immediately placed within the mouth of the burrow, and the hole closed.

In a bulletin "On the destruction of Ground Squirrels by the use of Bisulphide of Carbon," published in 1878, Prof Hilgard gives the results of experiments made on the California ground squirrel as follows:

"It is curious that in no case have I known a

squirrel to run out of the holes before the gas; when it meets it face to face in a run, death seems to be almost instantaneous. But in most cases the animals seem to retire to their nests to die there in a stupor. The mode of proceeding is simply this: Select one or two of the freshest holes in a burrow, introduce into it, as deep down as you can reach, a wide-mouthed ounce vial full of the liquid, upset the vial, and withdraw it. The holes may all be closed at once, with earth, which need not be rammed; the only object being to keep the gas in, and to see if any of the inmates dig out afterwards. The dead animal is thus buried and out of sight in his own burrow, creates no stench and poisons nothing; its flesh would not be injurious even if dug up. No other wild or domestic animal runs any risk, unless it be the gopher. The holes retain an offensive odor for some time, and remain closed and untenanted. As for the expense of this method, I have freed the most thickly-peopled portions of the University campus (level ground) from every vestige of squirrels with about a pound of the liquid per acre; about half an hour being spent by two men in closing the holes with shovels.''

The same will kill wolves with equal certainty only using a little more than double the quantity used for gophers.

Sun Scald.—This is an injury to the bark on the south or south west side of the trunk of trees which causes it to peel off, leaving the wood exposed.

It is more frequently, and indeed nearly always, confined to trees with a long exposed trunk that have an inclination to the northeast.

This is not always fatal to a tree, as sometimes the injury will be partially mended by the natural deposits of wood and bark from both sides till the wound is wholly or partially healed over. Even where this occurs it is still very injurious to the the tree as it leaves beneath a large portion of dead wood which is apt to decay and will in any case be almost sure to attract the insect that produces the borer. She will deposit her eggs there and the borer follows. I believe that this will seldom or never occur in a perfectly sound tree.

This sun scald has been generally considered one of the worst obstacles to overcome in the making of a good orchard. It is now not considered at all serious, with proper management. The reader is referred to the chapter on pruning where this malady and its causes are treated. If the tree has the proper natural form it will not occur.

Young trees seldom scald; it is the tree from 5 to 8 inches in diameter in early bearing that is the first to show this trouble; so do not suppose that when the trees are this size that the danger is over, it has only just begun, and lose no time in making for them an artificial screen of some kind.

Wire screening, such as is used for windows, encircling them will be an excellent protection, and like all the others will not only protect from the sun's rays but the depredations of field mice, rabbits,

hail, and incidentally from borers. Where this is used allow at least two inches space between the wire and the tree.

Corn stalks stripped of their leaves and set around, using just enough to reach around, only, and then fastened there with a small wire will be cheaper and answer the purpose as well. They may be tied with string but the crickets are apt to eat the strings off. Hay ropes twisted about them will do as well.

It will be understood that this protection is placed there and kept there till the limbs of the tree above, or of one adjoining on the south have made further shading unnecessary.

The reason younger trees are less apt to sun scald than older ones, is not so clear, but is probably because the circle is so much smaller and sharper, that there is not the same proportion of its surface exposed at the same angle, or a greater surface proportionately of the larger tree exposed at a lesser angle. Another cause may be the continued exposure for years, which may have been a constant source of slight injury, culminating later in the full effect.

This induces the belief that a whitewash of some kind applied to the trunks of trees at the age when most likely to be affected would prevent this mischief measurably, perhaps entirely, though it has not yet been tested by me. Such a wash might be of material benefit in other directions. It is believed by some and with some show of reason,

that lime preparations applied to trees will prevent fire blight.

Such a wash may be made as follows: Slack a few pounds of lime in a bucket, and when nearly full add about one pound of copperas (sulphate of iron) previously dissolved in hot water. This will thicken it. Stir thoroughly, and thin as is needed for use. Apply at any time when the tree is not frozen, and several times during the year. Some add to this a half pound of glue, thinking that it will be less liable to wash or scale off, but it is not necessary, and adds to the expense. If more is made than is wanted it can be set away in the cellar for future use.

This treatment can do no hurt to the trees, and is believed to be of considerable benefit in destroying insects; and lessening the danger from sun scalding, as a white substance will not absorb the rays of the sun to the extent that the brown bark of the tree will.

Do not depend upon this to take the place of the corn stalks or other protection in young trees.

It will not do to use white paint, or any substance containing oils, either vegetable or animal. The bark performs an important office and the pores must not be clogged.

Dark colored screens of any kind should not be used, especially tarred paper. The author tried this at one time on a five acre orchard, in which the trees were just coming to bearing, and the second winter every tree so processed was killed in the

bark just as high as the paper extended. A few from which the paper had become dislodged were not harmed.

The light colored paper called parchment would probably be as good as anything, but I do not know of its being tried.

The descriptions, etc., of insects in this chapter have been necessarily so meager that we wish to say that any one who wishes to know more will always find a quick response to any question by writing to the "Professor of Entomology," at the capital of his state, or at the Department at Washington. Bulletins are issued from time to time giving the most minute and careful descriptions, together with the remedies, and they will always be forwarded when requested.

Fire Blight.—It will be frequently noticed about midsummer that some trees will present the appearance of having been scorched by fire. The first appearance is at the ends of the growing shoots, but at times, though rarely, it attacks the trunks, near the intersections of the large limbs. This is said to be the work of one of the *fungoids*, so minute that several hundred could hold high carnival on the head of a pin. They are much smaller than the name given them, which is *Micrococcus amylovorus*. They are said to exist in unlimited quantities, and to be blown about at random by the winds, and when one comes in contact with incomplete wood, the exposed cells are so open that they enter, when the trouble begins. They

may also get a lodgement in a tree at any place where there is an abrasion of the bark.

The immediate cause of the death of the parts of the tree thus effected, is the fermentation caused by these spores. Their action is the same in the vegetable world as is that of the germs of cholera or diphtheria in the human family. Just why they exist is very hard to determine, but that they do, is all that concerns us in our battle against them.

There is no known remedy that we can apply in one case more than in the other. The only way that they are combatted at present, in the vegetable world is by prevention so far as possible, and by the pruning knife if the former is unsuccessful. Trees that are in the very best condition of health, *and located most favorably* will be less liable to attacks than others under converse conditions.

That this disease is contagious as well as endemic there is no doubt, and if a tree becomes affected and no attention is given it, others in the vicinity will soon be attacked. For this reason the greatest care should be used to select those varieties not subject to this trouble. The crab apples are most subject to this and the Russian varieties as a class are also bad blighters, but there are some of these, however, that are as free from it as are the American or European varieties. In the list of Russian apples given this has been carefully considered.

The trees should be watched during the early

summer, and the first indication of the disease should be met with the knife. Cut and burn, or carry to considerable distance from the orchard, say 100 feet or more. The latter has been my practice, and I have never had blight in large orchards and nursery to do any material harm. This is due to prompt action.

From the above it will be seen that in cutting out the wood it must not be taken nearer to other trees than is necessary, or we shall communicate it to them.

There are many things which we meet in investigating this that would cause us to doubt the position taken by our scientists and microscopists but which would not justify controversy here. The treatment is the same, whatever the cause may be.

In cutting it will not be enough to cut out the parts that show the dead and withered wood, the cut should be made a foot or more below the aparent injury, if the shoot or branch will admit of it, and where a small tree is badly affected, it should be cut away entirely.

This disease is much worse in the southern part of Iowa and Nebraska, and in that latitude than it is further north. It is also more common on the Mississippi than the Missouri slopes, but it has no limits, in the United States.

To recapitulate, select high ground for the orchard, if practicable, and avoid the hottest places, especially where there is not a good air drainage, which is of the utmost importance for this, as well

as for all other purposes connected with the establishing of a good orchard.

Avoid planting largely of the crabs, especially the transcendent, which is the worst blighter of all. When it is first discovered cut it out, even if takes whole trees.

Insecticides.—Some form of arsenic is the best for the destruction of all leaf-eating insects. Paris green or London purple have their basis in this poison, and are cheap. The London purple is the best. As it is a deadly poison to all animals it must be handled prudently. Cattle or other stock should not be allowed to feed under the trees where this has been used as a spray.

It is also essential that the solution shall be strong enough to accomplish the object, without being so strong as to kill the delicate tissues of the plant. Such a strength has been found to be 1 pound of London purple or Paris green to 200 gallons of water. Keep well stirred while applying, as it quickly settles to the bottom of the water, which would make the last of the cask so strong as to burn the foliage. Neither of these arsenites should be used upon the peach trees, as their leaf tissues are so delicate as to be destroyed by the weakest solution. There is less danger to the foliage of any plants if White Hellebore is used. It may be used as a spray at the rate of one ounce to three gallons of water. When applied as a dust or a powder it is mixed with its own weight of flour to add to its adhesiveness.

The three substances above described are poisonous to animals as well as insects, while those which follow are poisonous to insects alone:

Kerosene Emulsion.—This is made by dissolving ¼ pound of good hard soap or 1 quart of soft soap in 2 quarts of hot water; add 1 pint of kerosene and mix thoroughly. This is sometimes done by churning. A better way is to make it with a force pump, pumping it through and returning it to the vessel several times. When thoroughly mixed it may be set away for any length of time, and when needed dilute the mixture with three times its measure of water.

Pyrethrum (*Buhach*) is used successfully for plant lice or red spiders. It may be applied direct in a powder, or dissolved in alcohol. Use 4 ounces of alcohol to 1 of pyrethrum in a bottle kept tightly corked. Shake occasionally, and at the end of a week filter through fine muslin and apply with an atomizer.

Quassia Chips, boiled to a strong solution, will kill plant lice but does not injure the spiders. Use 2 ounces of chips to 2 quarts of water. A few hours after the application of any of these preparations upon house plants, they should be thoroughly washed in clean water.

Neither of the three last-named are poisonous to animals and kill the insect only by contact, so it will be necessary to know that the work is done thoroughly.

BLACK HEART.

Lack of correct information upon this subject has led to great imposition upon planters by either ignorant or dishonest vendors. It is this that has enabled them to so adroitly work the budded apple tree swindle described elsewhere.

This they teach to be a disease of the tree caused by improper methods of propagation. It is no more a disease than a burn or frost-bite. It is a condition, simply, and will not spread by contagion from tree to tree; nor will it spread from one part of an affected tree to another part. It may increase, but it will require the same cause to increase it that it did to produce it at first.

Just what this condition is, and the cause or causes, is now as well known as is any other physiological fact. It is simply a rupture of the wood cells, of which all plants are composed. In this condition the sap will not flow from one cell to another, becomes stagnant and discolored and this is "black heart."

The sap or plant food is enabled to flow through these minute vesicles freely to all parts of the tree when in a normal condition, but this delicate organization is liable to injury by any adverse or unnatural conditions. These may be the unadaptabilty of a tree to the climate, or the improper handling of one that would be under ordinary circumstances adaptable. If we plant an orange tree here, the first severe frost would not only rupture the cells of the inner wood, but would rupture

them all and cause its death. Should we take the peach instead of the orange, the effect would be measurably the same uuder a severer strain; but this tree might preserve enough of its cells under the bark, which is the throne of life of all trees, to not only preserve its life but enable it to overcome, in a measure, the injury and become a valuable, productive tree, while the inner wood remains badly discolored. Again, take the apple instead of the peach; and we may have the same result, for there is as great a difference in hardiness between different varieties of the apple as there is between the tenderest apples and the hardiest peaches.

It is also known that freezing, under some conditions will cause the rupture when under others, much severer cold is harmless. It matters not how the tree is propagated, the effect will be the same and there is no treatment known that will entirely prevent it.

There is a practical view of it, however, and if we follow the best course that can be marked out, there will be little loss arising from it. The first precaution is to select such trees as are known to be hardy in the locality, and after this to give them such care as will enable them to mature their growth, and fortify themselves in every way against the attacks of the coming winter. To teach the planter how best to do this is the province of this book.

There are other causes, however, besides freezing, which are to be avoided, one is pruning

improperly, and this injury is more severe, for that caused by freezing may not be of great damage to the tree, while the former results in death in a short time.

No one will claim that this condition of a tree is of no consequence, and no one would wish to plant such a tree; but there are, in my opinion, throughout the United States, far more trees that are discolored than perfectly sound ones. In Vermont, the Baldwin is one of their most valuable trees, yet, Mr. Hoskins tells us, that he does not know of one tree of this variety which is not discolored. The same is true of the Talman Sweet in the west, and measurably so with the Fameuse, yet both are valuable, long-lived trees.

The "Superknowledgist" should also be mentioned in this connection as one of the enemies. As the word is coined for the occasion it will be well to define it.

He is the man whom A. Ward must have had in his mind when he said: "It is better not to know so much than to know so many things that ain't so." He is a walking encyclopedia of positive knowledge. When he goes with us to the orchard *school begins* and unless we are carefully on guard he will open his knife and give us practical lessons in pruning by mutilating our trees. He is the man who plants his vegetables in the moon, and who "never knew it to fail." He will tell us how to make dried trees grow by putting a feed of oats under them, or sticking a potato on the ends of all

the roots; that as many days old as the moon is when trees are planted so many years it will be before the trees bear; that weeping trees are made by inserting the buds or grafts upside down; that he has seen his uncle (who was a "gardner in the old country" perhaps) graft apples in the elms, but admits that the fruit was inferior; that evergreens should be planted in June (the very month in all the year when they should not be moved) that trees late in coming into bearing "need iron" and he drives them full of rusty nails; in short if aught is amiss with anybody or anything, "Baith their disease and what'll mend it, at once he tells it." He is a well meaning person, his advice is always voluntary, positive, and positively gratuitous but in the ordinary, practical walks of life, and especially in this line we should kindly decline his services, and struggle along as best we may without him.

CHAPTER VIII.

Propagation.

IF fruits reproduced themselves true to name like vegetables, this matter of propagation would be very simple, but as they do not, we are compelled, in order to continue any one desirable sort, to absolutely prolong its life. Thus the Rawls Janet of to-day is a part of the original tree that originated in Virginia 100 years ago.

A piece of a tree which it is desirable to perpetuate, is placed in such a position that it will unite with another tree of the same species. This becomes a tree and may at some future time be required to surrender a like portion of itself to still further continue or perpetuate the variety.

Whether we propagate these desirable varieties by grafting, budding, cuttings or layering, the principle upon which the work is performed is the same; the introduction of a root system to a cion or young shoot having none. When by grafting of budding the cion or bud must strike its roots or cells into the stock upon which it is to live, and thus through the medium of this stock acquire its connection with the root system.

Many suppose that any two trees can be grafted

together, but there is a limit to this work, and the grafter will not be successful unless the stock and cion are closely allied. Varieties of the same species unite most readily, then species of the same genus, then genera of the same natural order, beyond which there can be no uniting of the parts. Thus apples work easily upon apples, crabs or thorns, less easily upon pears and not at all upon peaches.

The initial point of growth in any case will be exactly the same as though we were growing it from a cutting, which is a cion planted in the earth; that is, the formation of wood cells of which the entire tree is made. In this case they form until they unite with like wood cells which are induced in the stock, when there is a connection with the whole system of the other tree.

When by cuttings or layerings, this cion is supposed to be of such a sort that it will, under proper circumstances, continue this cell formation until it takes the form of, and performs all the offices of the original roots, when we have a new tree or vine as the case may be, "upon its own roots."

Propagation by Seeds.—This is the simplest form of all. The seeds of currants, gooseberries, or any other of the small fruits may be washed by rubbing the ripe fruit smartly in water, and pouring it off. The seeds settle to the bottom. These seeds may all be planted in the fall, or generally at the time of ripening, and in this way some valuable new

sorts may be obtained, but the chances of this are so remote that only the scientific cross-fertilizer will care to take the chances of throwing away a life for the ideal fruit that will probably never come, if at all, in any other manner.

The apple and all stone fruits will also succeed better if planted in the fall in moist ground, and covered as the judgment will direct, and the soil firmly pressed down upon them. Sometimes stones of the peach, plum, etc., will remain in the ground till the second year before germinating.

By Cuttings.—This consists of planting a shoot of the last season's growth which under favorable circumstances will emit roots and grow. The currant, gooseberry and grape are readily grown in this way, though for the amateur it will be found more successful to propagate all but the first named by layering, or "patting down," which is described below.

The best manner to treat the currant is to cut the young shoots as soon in the fall as the leaves fall, and cut them into lengths of 7 or 8 inches, plant them immediately in deeply plowed rich land, putting them in the whole depth, and firming the soil about them. In this manner they will make roots before freezing weather of from 2 to 4 inches long, and will make fine plants the next season. They may also be grown by planting in the same way in the spring, but not so well. If "trees" are desired cut out all the buds but 2 or 3 at the top before planting. Many other trees and shrubs can

be grown in this way such as the cottonwood, willow, syringa, honeysuckle, of all varieties, etc.

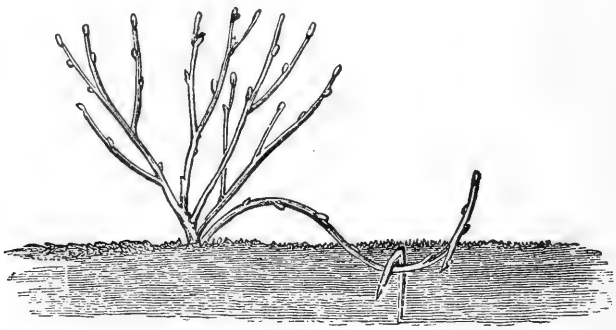


FIG. 3. SHOWING A TONGUED LAYERING

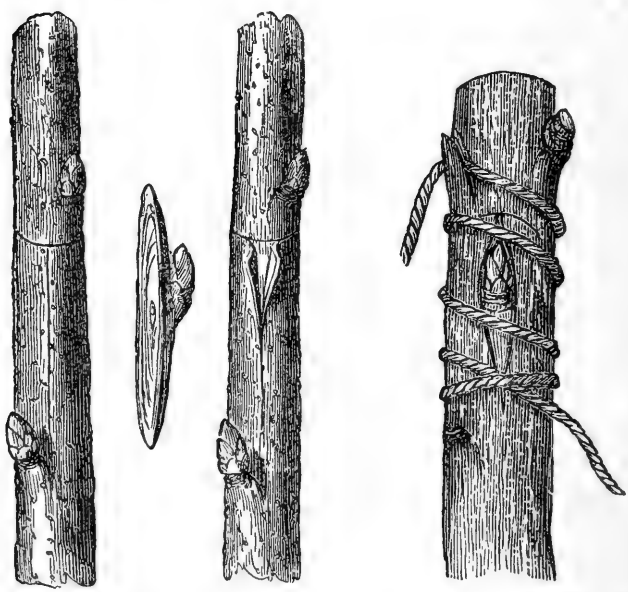


FIG 4. SHOWING (1) THE STOCK WITH 2 INCISIONS; (2) THE BUD CUT READY FOR INSERTING; (3) THE STOCK WITH CORNERS RAISED READY FOR THE INSERTION; AND (4) THE BUD INSERTED AND TIED.

By Layering.—This is done by simply chosing a low growing shoot generally of the past year's

FIG. 5. STICK OF BUDS WITH LINES SHOWING THE PROPER CUTS.

growth, bending it down to a shallow trench in the ground previously prepared for it and fastening it there by setting a forked stake over it, and covering with earth. In some cases the emission of roots is hastened if there is a slit or tongue raised by partially severing the shoot at its lowest point (see Fig. 3). The grape is very easily propagated in this way. It will also apply to any tree susceptible of being placed in this position, though some may require two or more years to establish a root system.

By Budding.—This consists of inserting a bud of the desired variety under the bark of the stock at the right time which becomes a part of the tree as in grafting. There are two principal methods; spring and summer budding. The latter is most in use and is done at any time in the summer when buds are sufficiently matured, and the bark will "run" or peel easily in the stock, generally from July 20, to the first of September, varying with the latitude. Cherries,

plums, and peaches will mature first, and the apple and pear later. No definite time can be given, as different seasons will also vary the time. It is better that the buds are from a cion that has hardly matured its terminal bud. If at this time the bark of the stock runs readily, and the work is performed rightly there will be little danger of failure.

If the stock is a thrifty one of one or two years growth it is better, and is not generally successful on larger stocks. In Fig. 4 is shown the stock with the incision; the bud ready for inserting; and the bud in position with the ligature properly fastened. If the stock is in proper condition it will only be necessary to raise the corners slightly as shown, when the bud can be easily forced home. If the bud should be of some of the very slender, weak ones, like some of the chicasa plums, it may be necessary to open the bark the full distance, in which case the edges are carefully raised without disturbing the *cambium*, or gelatinous matter under the bark. Fig 5 shows a stick of buds ready for the operator, the curved lines showing the proper cut to be made. These buds must not be allowed to become dry. Coarse woolen yarn is used much for tying, but of late raffia is used altogether by nurserymen. For the amateur it is not better than the yarn. In about ten days this should be removed to prevent its growing into the tree.

This bud remains dormant till the next spring when the stock is cut off with a sloping cut just

above the bud, when it develops into the branch or future tree. In rapid growing varieties, and in strong stocks it will be necessary to give these some support or they will break off by a very moderate wind. Staking with the stock that is cut from above the graft, and tying to it is practiced by many.

Spring Budding.—The advantages of this are that work that failed the past summer can be renewed without loss of time, and the buds are developed soon after being set.

The buds should be cut in fall or winter and kept absolutely dormant till they are to be set. This is done by packing them in the sawdust of the ice-house, as soon in the spring as there is danger of growth taking place. Keep them nearly dry, or as near as possible in their natural condition, and only take them out as fast as they are used. They are not set till the tree is in leaf, say about the first of June, when the young shoots have made an inch or two of growth. If in small stocks they should receive some injury to check the too rapid flow of sap at the time the bud is set. Some cut a notch about ⅓ of the diameter directly above the bud, while others seize the stock with both hands and give it a twisting, or green stick fracture. In about ten days the stock is cut off and the buds treated as described above.

Plums, cherries, peaches, pears, and many flowering shrubs are propagated almost entirely by budding, while grafting is used for the apple,

crabs and some other trees and shrubs. It is not necessary to use wax in any of the forms of budding.

Grafting is of two general kinds. Aerial and Terrestrial. The former is above ground, and will always demand that the splice shall be so waxed as to entirely exclude both air and water. The latter is either performed under ground, or will be established below ground, depending upon this to so far exclude the air as to admit of the union. This is applied to grafting the grape (not used) and to root grafts, by which nearly all apples and crabs are propagated.

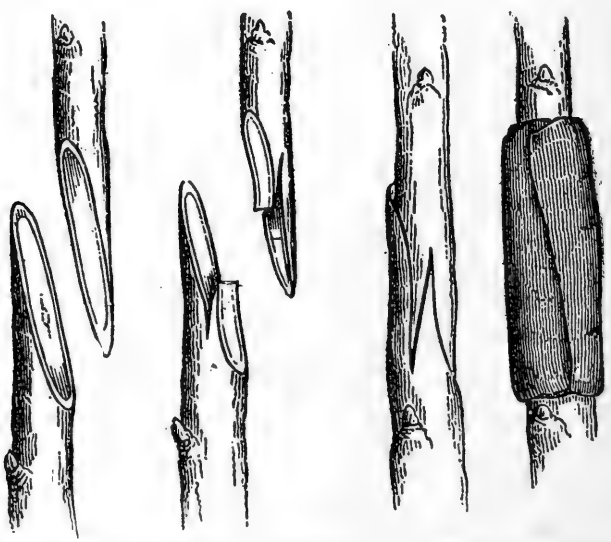


FIG. 7. WHIP GRAFTING SHOWING (1) THE SLOPING CUTS, (2) THE PARTS TONGUED, (3) SET TOGETHER, AND (4) THE WORK WAXED AND COMPLETED.

Fig. 7 shows the manner of whip grafting, which is very simple and effective. In this the cion and

stock should be as near as may be of the same size. The sloping cuts being made the cut surfaces are simply split as shown, and they are then pressed firmly together. Should one be larger than the other, make them match on one side, while the other laps. Waxing is best done where there is much to do, by keeping the wax warm in a kettle by the use of a small lamp. It is then applied with brush or a flat stick, and, while warm, a strip of cloth is wound around it which holds the pieces in place, and insures a perfect sealing.

Cleft Grafting.—Is that usually practiced in the top of large trees, but let us drop a word of caution

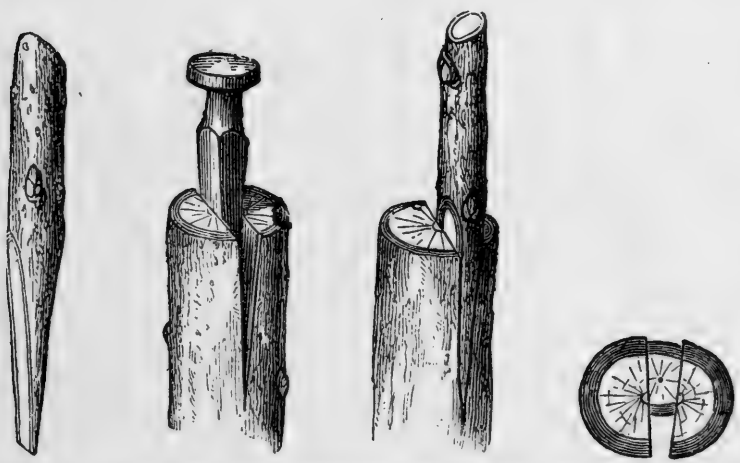


FIG. 8 SHOWING THE PROCESS OF CLEFT GRAFTING. THE FIGURE ON THE RIGHT SHOWING DIFFERENCE IN THICKNESS OF BARK.

here. Trees in the west will not admit of the cutting of large limbs for grafting, any more than in pruning, nor a great many of them at a time. In

top working a tree eight years old make three operations, going through as many years. If it should be found that the tree is discolored it will be better to abandon the grafting, and leave it for what it is worth, as blight is almost sure to follow. Fig. 8 shows the manner of cutting, splitting, and cutting and inserting the cions. The wedge may be made of wood, and is only inserted to hold the cleft apart while the cion is being placed, when it is withdrawn. It will be noticed that the bark on the smaller cion is thinner than on the larger stock, and care must be taken that the *inner bark* be made to match, disregarding the outside. Success will depend upon this and upon thorough waxing, and the use of a very sharp, thin knife.

FIG. 9 CLEFT GRAFT READY FOR WAXING.

Fig. 9 shows the cions as placed in the cleft, the wedge withdrawn, all ready for waxing.

Root Grafting.—Is done indoors in winter, the roots called stocks and the cions having been previously stored in frost proof cellars. The stocks are cleaned of most of the side branches and cut as shown in Fig. 10 very much as in whip grafting. The sloping cut is first made at or about the crown of the stock, the split or

FIG. 10. ROOT GRAFT SET TOGETHER.

"tongue" is then made and the stock cut off about 4 inches below, when the same is repeated till the stock is used. The cions are cut in the same way, about 6 to 7 inches long. They are then pressed firmly together and tied with waxed thread. The wax is not for the purpose of sealing the cuts, but for convenience in tying. It is not necessary to have it waxed. The thread is fastened at the bottom of the splice by overlapping as shown in budding, then three or four wraps are made and the other end fastened by drawing it into the cleft at the top, or simply breaking it and rolling in the fingers. The former is best. These are now packed away in boxes in damp sawdust or sand in cellar to callus. They soon unite and when everything is favorable will give very nearly a full stand. Dibbles are used for planting, and the graft set below the ground except the top bud, and the soil is pressed very firmly, especially at the bottom of the graft, taking care at the time not to break the joint, or the graft will die.

FIG. 11.
A SIDE GRAFT

Side Grafting.—Fig. 11 shows a very useful mode of grafting, and a novice will succeed with this oftener than with any other aerial work. The stock is grasped firmly in the hand and bent slightly to facilitate the incision, the cion is cut as for

cleft work and inserted as shown, when the stock is cut off above it in a line parallel with the cion and half an inch above it, wax is applied and the work is done.

Grafting Wax.—For out door work 32 ounces resin; 14 ounces beeswax; and 7 ounces linseed oil. Melt together and bring to a heat, some above the boiling point for water, cool and use. Stone fruits are sometimes root grafted like the apple, and in that case they are waxed with a brush. This wax will be a little softer. For this add 1 more ounce of beeswax and another of oil.

DOUBLE WORKING.

Where it is desired to have a high headed tree, some of the objections to that form may be overcome by a process called double working. This consists of grafting the desired variety upon the straight stock of a tree one or two years old, previously root grafted with the long cion and short root. In such cases the cion is set from 2 to 4 feet above the ground, according to the fancy of the operator.

The variety used for a stock is of the greatest importance, as it is found by long experimentation that there are few suitable. Either the stock or the cion overgrow, and in some cases the tree becomes barren. There is no way of determining what stocks and cions are affinities except by experiment, and even those who have continued this system the longest and most

persistently do not agree with each other, but in many cases flatly contradict each other.

The object to be obtained is the putting such a stock or trunk under the tree as will be less liable to sun scald borers; etc., than the variety that is desired for fruit.

Such trees are on trial at this station, but so far they have given no results either way, as they have been out but a few years.

The only experience the author has ever had was in grafting the slow growing Tetofski upon the Transcendent Crab. In three years the cions had overgrown the stocks to such an extent that they toppled over with their own weight. The growth habit of these two varieties was reversed when worked together, the rapid growing Transcendent nearly stood still while the dwarfish Tetofski made the most phenomenal growth.

Being very desirous to make no mistake in this matter that is attracting so much attention at present, letters were sent out to many of the leading western horticulturists, asking for information on this and "top grafting," and from the answers received, as well as from my own experience, I am of opinion that the whole matter of double working is unimportant, and that the results so far have not justified the claims or the expectations of its advocates.

Those stocks that have proved the most congenial in the greatest number of cases are the Whitney No. 20, Hughes Virginia, and Yellow Siberian Crab.

The best way to accomplish all that is hoped for from this system is to avoid the high trunk, and make a more nearly natural, low headed tree, and the next best is, if the high head must be had, some protection to the trunk as has been before described.

TOP GRAFTING.

This is understood to apply to the practice of putting new heads of desirable variety upon established trees, hardy, but of an undesirable variety. Tender or half hardy varieties can be successfully grown in this way when they cannot in any other. This will be understood in a local sense entirely, for what is hardy in one place may be tender in another, and when we apply this to practice it is equivalent to saying that where a desirable variety cannot be grown in any other way it may be in this manner.

If I were trying to grow an orchard north of latitude 45, and perhaps some lower than that, I would pursue this course, and with every assurance of success where such were possible.

This consists of planting the hardy trees, root grafted on the short root and long cion method, and allowing them to stand till they have become thoroughly established, say three years or more, and then grafting or budding the branches to such varieties as the climate would justify, and this would be ascertained by investigating the orchards or trees in this vicinity. If it should be so far north that no trees were growing to guide I would

take the "Iron Clad" list from some of the northern horticultural societies, say Duchess of Oldenburg, Wealthy, Iowa Blush, and perhaps some of the Russians. Of course our success will depend upon the hardiness of our stocks, for where Whitney No. 20, and the Siberian Crabs, and Duchess cannot be grown we should not make the effort.

The philosophy of this is, that as all trees are more tender when young than when matured and established, we pass over this period of youth practically by giving our tree age from the start. There is another very important consideration. All the very hardy or Iron Clad varieties have very strong and deep growing roots. The top or cion from which the tree is to be made entirely controls the form of the seedling roots. Not only the form but in a few years not at first it also determines their hardiness. As to form or habit of growth, if we graft in any manner, any number of Winesaps, Jonathans or Willowtwigs upon yearling apple stocks, we can in two years in most soils pull them up by hand, while the same number of Siberian Crabs or Tetofskis will at the same age be found to have made a root system that would defy the united efforts of several men to dislodge them. The question suggests itself here, does the hardy tree make this strong hardy system of roots, or do the roots, having penetrated deeply into the earth where there can never be any lack of moisture, give the tree its ability to withstand all the strain that is ever put upon it? Undoubtedly they work

equally upon each other and in perfect harmony. Possibly if we could—which we cannot—put a mature Siberian top on Winesap roots, the tree would not be hardier than the Winesap. Nature has not made trees with low, spreading tops, and a shallow system of roots for very high latitudes, especially if, as in the northwest there is frequently too little rainfall. Now as it seems to be clear that a good, deep system of roots is essential to the maintaining of a tree in these trying conditions in its best health, and that nature is so perverse or persistent that she will not make such a system of roots under certain desirable varieties, we may take advantage of a little strategy to compel her to accept and wear the particular root system which she had made for quite another tree.

After the stocks upon which we are to make this artificial tree have stood for three or four years, they will have extended their roots downward possibly twice as deep as the height of the tree, and we have accomplished all in this direction that any reasonable tree could ask or expect to grow upon, or any "whole rootist" or "unmutilated rootist" could demand.

Any one who should, with the above only to guide, undertake this top working system, might easily make a failure. Nature is very persistent and apparently at times unreasonably obstinate. There is no theory or system of reasoning that will determine what stocks are suited to certain varieties but actual experiment.

There is another advantage to be gained by this system; many varieties first show signs of bark failure in the intersections of the limbs with the trunks. By this system the forks are formed largely of the hardy stock which should be chosen with special care as to its behavior in this particular. This is perhaps the most important gain of all.

It may be well to drop a word of caution here; this system is not commended for general practice, nor for extended planting, as, where conditions are so adverse to apple growing that they cannot be grown any other way, it will never be a source of profit to grow them in this way. It is only recommended for small home orchards in the far north, and it is believed that there will be a moderate success as grown in this way, when they would fail in the ordinary way of growing. The mere act of top grafting a tree does not add to its hardiness or longevity, but lessens it, as severe pruning would do, it is done for the sole purpose of passing the young tree over its infancy, where it is so liable to injury, placing it upon a deep system of roots already formed, and avoiding in a measure the danger of bark scalding at the larger forks, and the *conversion of undesirable sorts into desirable ones.*

The trees mostly used in the north for a stock upon which to top graft are Hughes Virginia Crab, Whitney No. 20, Duchess, Minnesota Crab, and Haas.

The following is the best list of cions to work upon these, so far as can be ascertained:

Hughes Virginia.—Grimes Golden, Jonathan, Winesap, Golden Sweet, Baily Sweet.

Whitney No. 20.—Grimes Golden, Wolf River, Northwestern Greening.

Duchess.—Wealthy, N. W. Greening, Grimes Golden, Ben Davis, Red Astrachan, Fall Orange, Wolf River.

Minnesota Crab. — Jonathan, Baltimore or Bethlehemite, Early Harvest.

Haas.—Wealthy, Winesap, Wolf River, Red Astrachan, Baily Sweet and in favorable location the R. I. Greening.

The Western Wild Crab (*Pirus Prunifolia*) makes a perfect stock for the Bethlehemite (Baltimore Red) and where that indigenous tree is growing wild it can with little labor be converted into a most valuable apple tree.

The Wealthy is also used as a stock, but it is believed that where that tree succeeds well there is little use of top working it, as in those high latitudes it is a winter apple, but the Grimes Golden, Baily Sweet and Golden Sweet have been successfully grown on it.

One of the best known of the Illinois horticulturists reports success with the hardy Russians as stocks, but after thirteen years' experimentation on all stocks does not feel competent to send out a list having no doubts attaching to it. (J. V. Cotta.)

The Hibernal.—This is used as a stock for the

Northwestern Greening and Seek-no-further, and is one of the best and hardiest of all the Russians. It is also known in different places as Leiby, Ostrokof, Glass, Romna, Pendant Ear, Silken Leaf, Juicy Burr, etc. There may be slight variations in these but they are practically the same.

CHAPTER IX.

Landscape Gardening.

WE can do little better than to touch upon the most common and practical points in this work. Elliot and Downing have covered the ground with extended works, and the reader is referred to them, especially the latter, for such instruction as cannot be given here.

The principle objects that will the most please the eye in a landscape are green grass, trees, flowers and water. Hills and mountains are grand and impressive, but cannot be considered except as they are sometimes introduced in miniature, together with grottos of rocks and earth, rustically arranged.

To prepare the ground for the lawn, it is not best to try to save the natural sward by the introduction of proper grasses. The ground should be plowed carefully, and if not naturally fertile, it should be made so. Drag and plank and finish with the hand rake, at the same time working in blue grass seed liberally, and a smaller proportion of white clover. It will be two, and sometimes three years before a good sward is obtained, but during the time, such trees and shrubs as are wished can be established.

The one great fault of amateurs is in over crowding with these, which will destroy the pleasing effect, and hide such objects as it is desired to bring into prominence.

There are two principle views of the lawn to be considered at every step. First the view from the residence, and second the view from the street or highway. The former is of the most importance. This is for our pleasure, the latter for the pleasure of the public, but both are important.

If very large trees such as elms or hackberry are used, they should not be planted where they will obstruct the view, either in or out. For this purpose it is better to place them a good distance from the house with a view of trimming them up ultimately, so as to see under them.

If the street is south or west, this might be necessarily varied for comfort in shading. The east is the best front where it can be so arranged. Large trees, both evergreen and deciduous are necessary for a background, where they may be massed into something like the natural forest. It is another serious fault to put these large trees in quantity in the front, as *the background should be in the rear.*

Another common error is interspersing varieties in straight rows. I have seen long rows of trees along the highway or streets in town, made of two different sorts, such as catalpa and box elder, alternated. This would suggest a regiment of soldiers with each alternate one wearing a different

uniform. It will always displease the eye, though the observer may not be able to tell why it is so. A straight line is art, and to be pleasing it should be as straight and uniform as art can make it. Straight lines of trees are frequently necessary, especially in towns on division lines, where the grounds are not extensive enough to admit of curves, which are much more pleasing. The old fashioned stereotyped plan of planting a straight row of trees on either side of the walk, from the gate to the front door is inexcusable. It resembles nothing in nature, and has no significance in art, or if it has any it might be the suggestion that the proprietor might be in such condition as to enable him to find his front gate, but entirely unable then to find his door without the friendly assistance of these landmarks.

Curved hedge rows, or curved walks are pleasing, but must be introduced with great care. They should not give the observer the impression that they are there for effect, but that they could not be avoided. Thus a tree can be placed in such a manner as to curve the path to avoid it, and another further on, changing the curve into an opposite direction. Curves are not pleasing if too abrupt. The most graceful and pleasing are those barely curved enough to catch the eye and destroy the impression that it was intended for a straight line, and a failure made of it. If shrubs or bushes of any kind are used for borders of walks, they should be low growing and uniform in height and

expression, and such as are beautiful at all times, whether in blossom or not, or they may be of such bulbs or tubers as bring early flowers and disappear for the balance of the season, to be replaced with verbenas, pansies, phlox, or other bedding plants. For the former tulips are excellent.

Where shrubs or small trees with large leaves are grouped with others with smaller ones, put the coarse ones back of the others. For instance if we were to use a snow ball or lilac or both to group with Fl. Almonds or spireas, we would place the former side by side nearly at right angle to the point of view, and the finer ones near them, but closer to the observer. If the view were from two principle directions, then place more of the same style beyond them.

Grouping, if correctly done, gives a pleasing effect. In this, uniformity of figures should be avoided. Give the appearance of a chance production.

Evergreens are of the greatest importance for specimen trees. Unless the grounds are very large we should avoid the large coarse growing ones, like the Scotch pine. For large trees choose the Colorado silver spruce, called blue spruce, too, *Picea pungens*). It is the most beautiful of all, and very hardy. The Black Hills spruce, too, *P. alba*, is beautiful, and the next to the pungens, the Norway spruce east of the great divide between the great rivers is indispensable, but not so desirable on the Missouri slope. Douglass and Concolor

spruce are very desirable for larger specimen trees.

For smaller low growing specimens, the different arborvitæs, such as American, Globosa and Siberian are best. The Pyramidallis is, as its name implies, an upright grower, like the Lombardy poplar. It is very hardy, holds its color good through the winter, and is very desirable for a striking object.

In small lawns it is hardly necessary to say that the lawn mower should be kept in frequent use. In large grounds, trees and other obstructions should be arranged with a view of using the mowing machine. Not necessarily in straight lines, but at such distances apart that the machine can be operated.

Do not obstruct the view to the street, or to any object of beauty, such as fountains, statuary, or to fine distant landscapes. Unsightly but necessary objects, such as outhouses, barns, cribs, etc., should be hidden by a judicious use of trees, or vines.

In using the lawn mower, if some patches are left in various figures, such as circles, diamonds, stars, anchors, etc., they are very beautiful when the clover is in blossom. These are used to surround vases or statuary, or even trees that are trimmed so as to show the whole figure designed.

Among the deciduous trees and bushes Catalpa if in sheltered locations, Balm of Gilead, Magnolia Acuminata (not very far north) and Bass wood sometimes called Linn, are among the best of the coarser

leaved sorts, while for the finer ones Cut leaved birch stands first, but the European white is also very good. The cherry and plum, and sometimes the Whitney Hislop and other crabs are introduced in large grounds with nut trees, butternut, walnut, hickory, etc., for variety. For a large stately tree nothing equals the elm.

There are a great variety of the spireas, but the Prunifolia and Van Houtii are the only ones very desirable. The lilac, snow ball and flowering almond, Tartarian honeysuckle, and Mock orange, commonly called syringa, all have their places. The finest flowering tree of all the low growing ones is the prunus Trilobata, bearing dense masses of light red double flowers the size of a quarter.

Among the climbers are the Red and Yellow honeysuckle, woodbine, wisteria, and clematis. Of the last named among the best are the Jackmanii, with flowers from 4 to 6 inches across and deep blue, and the J. Alba, much the same but the flowers are pure white. Both are perfectly hardy.

Among the herbacious plants that are desirable are the peonias, bleeding heart or diacentra and the phloxes. These last have all the shades and bright colors of the Drummondi, but are perpetual and very free bloomers.

Bulbs and tubers such as tulips, crocuses, hyacinths and jonquills and many of the lilies, such as Tiger, both double and single, and the Japans, Gold banded and Lancifolium rubrum and the little lily of the valley (which is not a lily at all) are all

hardy and remain out over winter with slight or no protection. Then the gladiolas, dahlias, and cannas of the tender ones are easily grown and can be used to give the most pleasing effect. Do not forget the bed of pansies and verbenas along on the north side of the house.

Among the best and most showy annuals are the Drummond phlox and poppies. Dark blue flowers do not attract attention and are not as pleasing on the lawn or flower garden as white, red, crimson, scarlet and yellow.

There are hundreds of other good flowers and shrubs, trees, etc., more than those mentioned here, but with these alone together with the evergreens described in their chapter, no one need want for material to make a good lawn and flower garden. A few trees, vines, shrubs and flowers well kept will attract attention and admiration more than a whole park of them in a badly arranged and dowdyish condition.

CHAPTER X.

Plums.

WITH the exception of the grape there is no wild fruit so common to the Great Northwest as the plum. Like the grape it submits readily to domestication and cultivation.

Plums are classed botanically into three different species: *Prunus, domestica, P. Americana* (*or Canadensis*) and *P. Chicasa.*

The first is the small plum and tree of the Old World, from which we have the class known as the Gage family, and will merit but little notice here, as they are almost if not quite unfit for the changed location from the more equable and moist climate of Europe, to the more rigorous and dry climates to which this work is restricted. These fruits are grown largely in California, and on the Pacific coast in many places. They are also grown, but to a less extent, on the Atlantic coast, not so much on account of unsuitable climatic conditions, as to diseases which attack them there, principally the black knot or black wart. They consist of such varieties as *Lombard, Yellow Egg, Coe, Green* and *Purple Gage, Bradshaw, German Prune, Ponds Seedling, Jefferson, Washington* and many others.

This class is distinguished readily from either of the other species by their larger and ranker growth, heavier shoots generally with a purplish cast. In leaf they are larger and thinner, inclined to be ruffly. The fruit is larger, and at times very large, approaching a moderate-sized peach, very handsome and deeply creased or sutured. It is also another characteristic that in quality, especially for eating from the hand, it is inferior to many of our best select natives; and generally inferior for culinary purposes. Their size, great beauty and fair quality will, however, always make them deservedly popular where they can be successfully grown.

Of the above, those varieties which are still kept upon many of the northwestern lists, and will succeed better than the others, are Lombard, German Prune and Bradshaw. The causes of failure are generally that the tree is too tender to withstand our trying winters, and the wood becomes blackened and brittle, so that a tree of considerable size will break off easily when the shoots are growing vigorously. Even when this does not occur the fruit is easily spoiled by the curculio or gouger, and falls soon after the visits of those insects. It is also much subject to rot, which attacks the fruit just before ripening in small specks distributed over its surface, which expand till they include the whole surface.

We have been particular in describing this class of plums, for the reason that so many who purchase

trees are disappointed in the size and beauty of the fruit which their visions had pictured, and these visions, too generally aided by the overdrawn plates exhibited at the time the sale was effected. The question was frequently asked, "Why don't you raise and sell the large blue or purple plums such as we used to have at home?" We are also told "Those plums we got of you are wild ones; I have much better growing along the creek."

The above not only explains why these Gage plums are not handled, but there is another consideration; in quality and productiveness we have at least quite a few natives that are superior to the best of the foreign sorts, not only for eating from the hand, but will compare favorably for canning.

When we go to look for the "better ones growing along the creek," we don't find them. It is not impossible that some one may have them, as all the domesticated ones of this class have at one time been wild, or the product of a plum stone. In most cases they are chance seedlings, found to have qualities superior to other seedlings, when they are named and propagated from, and are no more wild than the Rhode Island Greening or Swaar. The name is applied to them from their close resemblance to the wild ones.

The plum does not succeed so well upon high dry ground as in more moist places, hence we are more apt to find it along the creeks and in the cooler and rich moist grounds of the ravines; still

it can be successfully grown where corn or small grain will make a good crop. Avoid the tops of hills or abrupt knolls, unless they are known to have a good, deep moderately rich soil, which is not generally the case.

Plum trees are not much subject to diseases of any kind. It is generally only necessary to select good thrifty trees of good varieties, plant them well on good ground, cultivate them, keep off the worms that destroy the foliage, and nature will do the rest.

There are about fifty varieties of the natives that are grown, and described by the different propagators, and nearly all have merit; but as there are so many so nearly like the others, it will only be necessary to describe as many as will ever be needed for home use or market. There is really about as little use in having a large variety of plums of the same general character, as there would be in having one similar of potatoes. Those below given are of value for all purposes, and any three or four will be varieties enough for the family.

Desota.—Originated near the Mississippi river in Wisconsin; is good size; from 1 to 1¼ inches; light mottled red on yellow ground; very productive; a good grower and succeeds in more localities than any of the others.

Forest Garden.—Originated either near Council Bluffs or Cedar Rapids, Iowa; both are claimed. Fruit about same size as Desota, better in quality for dessert, but not so good a shipper, having too

thin a skin. Tree a strong upright grower and perfectly hardy; and immense bearer.

Hawkeye.—Origin, Crescent, Iowa. A trifle larger than either of the above; quality very good, if not best; color light mottled red on yellow ground; has a distinct suture, unlike any other purely American plum. Is very firm and a good market variety.

Wyant.—Of Minnesota origin; medium to large; mottled red; and of the best quality. Tree a moderate grower.

Weaver.—This is a perfect free-stone, which gives it its greatest value; but it is an excellent variety; very vigorous and productive. Originated near Cedar Rapids, Iowa; fruit uneven in size, the same tree bearing at the same time from very large to very small specimens, mottled dark red and shaped something like an almond; being thin and measurably pointed. Excellent quality for dessert.

Wolf.—Origin, Iowa. Is as large grown here as any of this class, a dark or purplish red, and of fair to good quality. Is a free stone when entirely ripe.

The above descriptions have been given from the behavior of the trees at this station, and it is believed that any of them can be grown successfully throughout the State of Minnesota, and the greater part of North Dakota, where there is sufficient rainfall. The following list of the same class is from other responsible horticulturists who are familiar with them and can be relied upon.

Cheney.—Of Wisconsin or Minnesota origin, light

red, large to very large, a good shipper and commands a good price in market. In quality this has made two records, being classed by some as best while by others probably grown under different conditions, as "fair to good."

Rolingstone. — Originated on the Rolingstone river in Minnesota. Tree a strong grower and good bearer. Fruit large to very large, bright cherry red, good quality and good shipper.

Van Buren.—This is another free stone, of most excellent quality, good size, and is a light yellow, sometimes slightly red when fully ripe. One of the best.

Quaker.—Fruit large to very large, and very firm, not good for dessert but fair cooker. Is the most "meaty" of any of the Americana varieties.

Harrison Peach.—This variety comes from the neighborhood of Minneapolis, Minn. Tree a rather spreading strong grower and good bearer. Fruit of medium size, oblong and good quality. Color, light red. Free stone. (Terry.)

Spear.—or "*Spear's Round.*" This is one of the most valuable of all the plums for culinary uses. We have seen and eaten the fruit at the home of the originator, and procured our first cions there. It is an annual and immense bearer of red fair sized round fruit, which shows no astringency whatever when canned.

The above are all of the American family and is the safest list for general planting, especially if in very high latitudes.

Prof. Baily, of New York has made three separate lists of the *Prunus chicasa*, placing the *Miner*, *Marianna* and *Wild Goose* as types of them.

We are of opinion that this classification is apt to mislead rather than to guide, and shall consider them as they have always been heretofore classed as above.

These plums are also indigenous to American soil so far as is absolutely known, though there are those who contend that they are of Spanish origin, and that they were brought here by the Spaniards in their invasion of Mexico, and from there have spread throughout the southern half of the United States, where they were first noticed, and where they are common now, growing wild as the Americana does in the north.

The distinctive characteristics of this family are the long narrow leaf, resembling that of the peach, generally ruffled, glossy above and smoother than the Americana beneath; shoots very small and pointed, generally supplied with very thorny, sharp spurs, and a tendency to hold their foliage long after all others have cast their leaves in the fall.

Some of these varieties are also remarkable for their long life and the great size that they attain. The fruit is generally either glossy red, or yellow, and not mottled with these colors like many of the northern natives. In quality, too, they are quite distinct, being more meaty and the pulp hanging tenaciously to the stone. As a class they are not as hardy as the P. Americana, but some of them

can be grown any where in Nebraska and Iowa, and in many of the southern counties of Minnesota and South Dakota.

There is also a belief among many excellent horticulturists that many of these varieties are self sterile, and cannot be grown successfully without the assistance of other strong pollenizers grown in the immediate vicinity. There is no doubt but this is the case at times, and in some seasons it is more marked than in others, but it is not so common as it is generally believed to be, neither does it require the close proximity to the pollenizing parent that is taught by many. Bees and other insects which are very numerous at the time of blossoming are active agents in distributing this very fine powder to trees near or at a considerable distance. I have known the Russian Mulberry where a single tree stood over a mile from any others to bear a full crop of fruit. This shows to what a distance this pollen may be borne in the air. We could not attribute this to the action of insects, as the female has no perceptible blossom, and bees do not work on it, and it could not have been self-fertilized as it is a purely dioecious plant. The Miner plum is a good illustration of this, but in another direction. It is well known that this is a fitful or spasmodic bearer. It never fails to load with bloom, but will bring a crop of fruit once in two or three and sometimes four years or more. It will be also remembered that when there is a good crop in one part of a given section, it is general

throughout. This would not be the case if its sterility could be corrected by massing with other varieties. Its fruitfulness would then depend upon this intermingling, and not upon the peculiarities of certain seasons.

But let this be as it may, there can be no harm in intermingling varieties in the row, but the massing in thicket form but a few feet apart for the purpose of cross-fertilizing to produce fruitfulness is little better than a fad.

The following is a list of the most commonly accepted valuable varieties of this class.

Miner.—This is also known as the Hinkly, and has also many other names that are purely local and of no value here. The plum is too well known to require an extended description. It is as has been said before a shy or spasmodic bearer, varying greatly in this respect in different localities. This is much more the case while young than when it attains considerable age. It is especially remarkable for the great age and great size to which it attains, especially if on its own roots. Prof. McAffee said: "It is the only plum tree that will make saw logs." I have seen these trees with a girth of trunk at the ground of 44 inches, and a spread of top of 30 feet. It is among the hardiest of this class and is a good and symmetrical grower. The fruit ripens among the very latest, sometimes being caught by early frosts. In quality so far as I have tested these plums, it stands first. Size of fruit about same as Desota or at times some larger,

and very uniform. Color a deep cherry red. It has a tendency to crack open at the time of ripening if the weather is very moist.

Wild Goose.—Believed to be the most popular of its class, but its value is in the more southern latitudes, being too tender for the north. Tree upright changing to spreading as it attains age, quite thorny, and an early and abundant bearer. Fruit light red, size of Miner as grown in the south, but in the north is quite small. Ripens very early which gives it its greatest value, and is of very good quality when fresh from the tree, but when overripe is watery and insipid.

Forest Rose.—Closely resembles the Wild goose but is more scarlet in color, later and of better quality, especially as a dessert fruit.

Robinson.—This according to Prof. Budd has been known as the Bassett and as this variety is frequently referred to as of merit, it is believed that this name is still used by many. The true Bassett plum is so poor, small and inferior in every way, as to be of no value, and the correction should be made for the reputation of this most excellent plum, the Robinson. Like the others, however, it it is not reliable very far north, but for this fault of tenderness, it would lead all the Chicasas. In habit it is almost a counterpart of the Pottawattamie, both in tree, leaf and fruit. The principal difference being in the color of the shoots, those of the latter being more brown, while the former are brighter, and have a pinkish cast. The fruit also ripens

some earlier and is much handsomer and of better quality than the Pottawattamie. The first fruit ripens in this latitude about the first of August, but the picking season will last nearly through the month. The habits of growth of the trees are some different, the Robinson being more spreading. Its fault is in making bad forks if not closely watched.

Maquoketa.—Originated near the river of that name in eastern Iowa, and is decidedly the best of all the Chicasas for canning. Fruit is much larger grown in central and southern Iowa than further north. Is supposed to be a seedling of the Miner, which it closely resembles.

Milton.—New and perhaps the earliest variety in cultivation. Tree an upright and fine grower, and bearing large crops of large fruit of finest quality. Its large size and fine quality and appearance, and early season make this a valuable variety. Seedling of Wild Goose. (Terry.)

Charles Downing.—Another of the same origin as the last. Fruit very large, light red and of excellent quality. Tree rather spreading and very productive.

Crescent City.—New. Tree very upright and handsome grower, and an immense bearer of medium sized fruit of fine quality. Color dark red, fine variety for market. Seedling of the Miner. (Terry.)

Hammer.—This is a new variety, the original tree of which has only fruited two years. Fruit is

large; color pale yellow or whitish on the shady side and bright red on the sunny side. It promises to be a very valuable variety. Tree is a fine, rather upright grower, and so far as tested, a good bearer. Fruit is of an excellent quality. A seedling of the Miner, though its broad and heavy foliage shows that it is crossed with some variety of the American family.

Moreman. — This variety originated on the Atlantic coast and is possessed of some value. Fruit medium in size, of the brightest red, and is so glossy as to have the appearance of being varnished. It is an immense bearer, and the fruit will keep for two weeks more after ripe. One of the latest varieties we have which adds to its value.

The descriptions of the last five varieties named are from H. A. Terry of Iowa, who is as good authority on this fruit as any in the west. They have not yet been fruited at this station.

JAPAN PLUMS.

Much discussion is had upon the origin and value of these very interesting plums. My experience so far with them is almost neutral. Trees have not had proper care, but have given strong evidence of great usefulness, though at present it is not advised to plant largely much north of central Iowa. The Burbank Ogon and Botan have been fruited, and while smaller than was anticipated are very handsome, and of good quality.

Dr. Dennis, of Cedar Rapids, Iowa, has made a

specialty of them, and is very warm in their praise; says they have fruited full after twenty-six below. It is believed that they will be of great value in the south, and as far north as stated, but there is another possibility, perhaps probability, that they will make excellent fathers for seedlings from our natives, by cross-fertilization, and this is being practiced very largely in some parts of the south, especially by P. J. Berkmans, of Augusta, Ga., and J. L. Normand of Marksville, La.

But few varieties will be noticed, and those only which have been grown in the north and recommended by reliable growers.

Abundance (Botan). — Trees strong, handsome upright grower, and early and abundant bearers. Fruit as grown here about 1¼ inches in diameter, oblong, bright red with a heavy bloom. Flesh yellow, very sweet, rich and juicy. For eating from the hand it is excellent, but for culinary purposes it lacks acidity and tone. Best for dessert. Season, August.

Burbank.—This is practically, both in fruit and tree like the foregoing, but the fruit is yellow and sweet, more globular, and much in quality like the first. Both these are hardy at Concord. Season late, July or early August.

Satsuma.—Tree a fair grower, but not as good as the others. Fruit is smaller but of good size, and a very small pit; purple to dark red in color, with a heavy bloom; flesh dark red with red juice, and very good quality. Season, late August.

Ogon.—Is not more than hardy enough for southern Nebraska, and is tender and worthless in the northern part of the state. Fruit larger than the Botan, nearly round, or slightly flattened, smooth, bright golden-yellow and of best quality. Season, early August.

There are many varieties listed that have not been tried sufficiently in the north to determine their value, such as Kelsey (tender), Simoni (worthless), Willard (very early twenty-six Botan) Normand, Chabot, Baily, Yellow Japan (said to be hardy at the north) Hattankin, Sweet Botan, Shira Shomo and others.

CHAPTER XI.

Peaches and Apricots.

IT is believed that peaches can be grown successfully and profitably as far north as the apple can, by giving winter protection.

They are so grown near Scotland, S. D., and quite successfully still further north without any protection whatever.

There are two ways of affording this protection. (1) by laying down and covering with earth and (2) by training on a low trellis made for the purpose, to be covered by litter and snow in winter; the latter is preferred.

To lay them down it is necessary that they should be planted with this in view. Plant one year-old buds and instead of spreading the roots out in all directions, flatten them, say north and south, making them all lie east and west. It will be better to choose some spot for the orchard where it can be irrigated, to soften the ground and facilitate the the work of laying down. The ground being wet the tree is partially undermined both on the north and south side and the tree is quite easily crowded over to a horizontal position, where it is fastened by stakes and covered, first with some coarse litter

and following with some earth and clods to keep it in its place.

When taken up early in May, the tree should not be raised to a perpendicular position, but only raised a few feet, as it will do as well and be much more easily put down the next fall.

There will be a difference in the time to take the cover off in different latitudes. The proper time is when there is the first indication of growth, which will be seen, as many of the twigs will be exposed. It is also well to place some litter under as well as over them to prevent the buds from resting on the ground where they are apt to rot if soil is very wet.

This process of covering can be repeated till the trees are five to eight years old and large enough to bear two or three bushels of fruit each. There is another method adopted by Peter M. Gideon by which he has been able to grow them successfully in Minnesota for many years. Prof. Budd also recommends this plan.

A tree of one year's growth from the bud is used, which will be from 3 to 4, and perhaps 5 feet high. In the fall this is trimmed up to a single stem; that is, all the side branches are cut off. The tree is now laid down as has been directed, by softening the ground with water and partially undermining it, when it is covered as directed. The next spring the covering is removed, and a forked stake is driven over the trunk about midway to prevent this part of the tree from rising, when the top is

raised in a curved position, and staked there where it is allowed to grow nearly naturally.

The advantage in this plan is that the laying down each fall does not necessitate the disturbance of the roots, and the long curve, by partly bending and partly twisting will readily yield to pressure, and take a horizontal position. This may be repeated several years, and when too large to handle practically, one of the lower branches may be substituted for the original tree, which will be cut away, and the same operation repeated with the new tree.

To train upon a trellis.—Suppose we have a single row of trees along the east or south side of a grove, or other obstruction that will catch snow, and if by a grove far enough from it so that the roots will not reach out and rob our trees.

Set a row of posts with the row and about 2 feet from it, and 16 feet apart. Set another row parallel with the first, and about 6 feet from it. These posts may all be common fence posts, but may be cut in two in the middle, if of good length, so that when set they will stand up about 18 inches. Nail some 2 by 4 strips along the tops of these, edge up, and it will be well to support them in the middle also, by nailing on a piece of board there, one end resting upon the ground.

This done we will staple a smooth fence wire to one corner and take it across and back, stapling at each side, till the whole frame is covered, and the wires being in the middle about a foot apart. This

is to hold the trees under, and in place of this wire any pieces of boards may be used, but the wire is cheaper and better. If the wire is used it will be necessary also to prevent spreading in the middle to get some long light poles, or "bats" from the lumber yard and staple them on midway between our stringers, and running parallel with them. The trellis is now done and the next and last operation is bending the trees down and thrusting them under it.

The peach is a rank grower, and if no further attention is given it, it will soon grow up through this trellis to such a height as to prevent covering it practically. It will be necessary frequently during the summer to look them over and bend back and under the wires such shoots and branches as have grown long enough to admit of it. A little labor applied at odd times during the summer will keep these perfectly under subjection so that few shoots will be above the trellis.

In this position covering is an easy matter. A good load of straw from the machine will cover twenty to thirty trees. If they should get in addition to this a good covering of snow, which in this position is quite likely, it will add to the probabilities of a crop, though there is little danger of failure without it, even less than there is in the peach countries, as there are always enemies to the peach there that we shall not meet here.

Should the trees set very full of fruit it is advisable to thin it out considerably, and we shall get

more fruit in weight, and of a much better quality than if they are all allowed to mature, and the strain will be less upon the trees.

The best ground for this orchard will be the highest practicable location that the place affords, and the ground should not be very rich. In time, if fruit is not up to size the ground can be fertilized by a liberal top dressing of well rotted stable manure.

The hardiest and most successful varieties for this system will be the Alexander, Wager, Hill's Chili, Tong-Pa, Kilbourn and Salway. The Poplar is a very hardy peach, but small and of only fair quality.

The trees may be planted in this manner 6 to 8 feet apart, and if in course of time they become too much crowded, each alternate one may be cut away, but they will bear several good crops at this distance.

It is believed that the peach will, in the near future, be grown successfully and profitably as far north as 42, and without protection of any kind, giving a crop once in two or three years. They have been grown here at times, and a few specimens of the Poplar were grown in 1890 after the intense cold of January in that year, in which the mercury sank to 34 below, and at several times in the same winter it was more than 20 below. It is a singular fact that the same cold wave that gave that very low temperature here gave the same at Wymore, Nebraska, which is nearly to the Kansas line. The

peach makes its wood and fruit buds the same year, and if the wood or main branch is not killed we can depend upon the buds every year, and when the season is favorable a crop of fruit will follow.

It is conceded that it is not necessarily the degree of cold that kills the buds. Under some circumstances they will go safely through more than 20 below, while at other times, as in the present winter, from 16 to 18 has destroyed them. Just what the conditions are that make such a difference in the ability of these buds to withstand this cold at one time and to be destroyed by a much lesser degree at another time, is not positively known, consequently we do not know what we should try to supply. I have noticed in examining these buds in different winters that when the buds in the fall are very solid and appear to be well stored with starchy or glutinous appearing matter they are in condition to go through the winter better than when they seem dry and husky. In such condition as this they kill at a not very low temperature. The same is true of the cherry and apricot. It is believed that a lack of moisture in the earth at the time the buds are maturing is the one great cause of their weakness, and if we could control this, which we frequently can, we shall have reduced the risk from this source to its lowest terms.

In this connection let us refer to "Adaptabilty of Varieties, etc.," in chapter 2.

Natural trees from pits planted where they are

.o grow, have proved, as a class, much hardier both in tree and fruit bud than the budded varieties. For this reason we recommend those who live much north of the peach belt, to plant pits from northern grown fruit. There is little loss, even if no fruit whatever is produced, while the chances are that the little ground occupied by the trees will at frequent periods give good returns for its use. If nothing better the trees will be worth their room for firewood, as the peach will make it nearly as rapidly as any of the trees that are planted with that express object.

Plant in the fall as soon as the fruit is borne, plant in rows, 6 to 8 feet apart, and the pits a foot or more in the rows. The first winters they should all be covered, after that let them try which has the best right to life, and the weak ones will be cut out from year to year and in this way those remaining will be thin enough, perhaps, to bear several crops with little attention.

To illustrate this: A Mr. Joseph Kauffman, who lives in Township 98, Range 55, in Turner Co., S. D., planted a number of peach pits from Nebraska grown fruit in about the year 1881, and in 1891 had a crop of from 8 to 10 bushels, and had fruit for his family in '92 and '93, and some at various times previous to this.

When we consider that these trees went through more than 30 degrees below in the winter of 1889-90 and bore this fine crop of fruit in 1891; it seems little less than marvelous.

There is one variety that reproduces itself true to variety from seed, and this is the tree, if any, that will in the indefinite future, as prophesied by one of our best horticulturists, be the one that will "Grow in the north, side by side with the apple." This may seem improbable, but we must, from the facts we already have, admit that it is easily possible.

The variety referred to is the Wager and the pits will in a year or more undoubtedly be upon the market.

RUSSIAN APRICOT.

In 1890 the Iowa Horticultural Society passed the following resolution unanimously: That the Tree Blackberry is a fraud, and the Apricot, Prunus Simoni, Salome apple and Keiffer pear are too tender for general planting in Iowa.

As a whole little exception can be taken to this, but the Apricot (Russian) deserves a little better fate than to be ranked with the balance of the list. Even in this the resolution was judicious at that time, as varieties had not, and have not yet even, established a positive character by which they could be fairly judged.

Our first experience with these trees dates back to 1885, when several seedlings were planted, and a list of named varieties were top worked on the Miner plum. These varieties were Alexander, Catharine, Alexis, Budd, Gibb and Nicholas. These have become large trees, but have only borne

an occasional specimen of fruit. From this it is believed that the plum is an uncongenial stock for the apricot. To add to this testimony, many of these varieties budded at the ground surface on the common wild plum stocks grow finely till an inch or more in diameter when they broke off under the strain of a moderate wind, as directly as though cut off with a saw. It is surmised that the apricot is condemned too soon, and more for the reason that it is worked on an uncongenial stock than from reason relating specially to the tree itself. From the first its hardiness of tree has been apparent. In this it is the equal of our ordinary apple list at least such as Winesap, Ben Davis, Jonathan, etc. The trouble seemed to be in tenderness of fruit buds which killed usually at from 18° to 20° below, about the same as the peach.

In the winter of 1891-2 there was a degree of cold most uncommon here of 34° below. At the time of the next thaw following this it was discovered, greatly to the surprise of all, that the fruit buds were very little injured, and some fine fruit was grown the following summer.

This effectually closed the argument of tender fruit buds.

There is upon the ground of this station one seedling apricot eight years from the seed, that bore about one bushel of fruit the past summer (1893), after a hard, dry winter in which 28° below was recorded. This tree is 15 feet high, has a spread of 12 feet and a circumference of 22 inches.

The fruit is greenish yellow, about 1¼ inches in diameter, free stone and very juicy and sweet. It is a fine dessert fruit. It is believed that there is no established variety of this tree that can be safely recommended at present for this latitude, but as there are many not tried here, this may be an erroneous conclusion.

We advise every one to plant the pits, or one or two year old seedlings, and, unless all indications so far given by this tree are delusive and deceptive, we shall soon have a fruit here that will solve the problem, "The Peach for the North," which is at the present time enlisting the best efforts of some of our best horticulturists and experimenters.

When we succeed in growing the Russian apricot as far north as the apple is grown, there will be little; or at least less need of the peach, for it will take its place for most purposes.

Too much importance cannot be attached to this matter. This fruit will in the next ten years make for itself a permanent place in the list of hardy northern fruits.

The pits can be bought at many of the larger seed stores, and can be planted either in fall or spring. If in the spring, they should be cracked carefully, and planted about 2 inches deep. If planted in the fall before drying, and the ground is moderately moist, they will burst the shell by the action of the frost.

The kernel of the nut or pit is equal to the almond in quality, only being smaller.

There is a variety originated with Budd, that it may be well to refer to, named by him Shense, but also called Acme.

The originator of this variety says it is "From seed sent me by N. W. Clima. It is the only hardy apricot I know of, that bears a large fruit of excellent quality. The tree is hardier than any of the Chicasa plums." There is little doubt of the accuracy of the above, but the fruit buds may prove tender. Again, it is not certain, nor even probable, that the trees propagated from this will be as hardy as the original seedling. The same is true of many other fruits, and especially apples.

There are many that are perfect "Iron Clads" when standing as natural seedlings, that are worthless propagated by any known method.

CHAPTER XII.

Cherries.

CHERRIES are divided into two general classes; sweet and sour. The former comprise the Mazzards, Hearts and Bigareaus, and, as they do not succeed in the west will not be considered, except to make the remark that in rare cases the Gov. Wood has produced some fruit. This belongs to the Bigareaus, is light greenish in color and faintly blushed. It is nearly sweet. I have not tested this variety in northeastern Nebraska, but have not heard of its succeeding anywhere in the state. In quality it is better for all purposes than the Dukes or Morellos, having acid enough to make it a good culinary fruit.

Prof. Budd says 26 Oriel is a sweet cherry from Central Asia and will thrive and fruit anywhere the Richmond will do well. It is on the grounds at this station but not yet sufficiently tested to give an opinion.

The sour cherries that are common in the west are among the surest of all the orchard fruits, and require the least attention. If there is such a thing as the lazy man's fruit it is the sour cherry. This tree will succeed where the apple will not thrive

well. In the shifting and drifting sands of the northwest "Sand Hills" it is almost as sure a crop with a fair share of attention as their native sand cherry.

What has been said under the heads of "Orchard Management" and "Making the Orchard" will apply to the cherry as well as to the apple, with this exception: they may be planted much closer, say for most varieties 8 feet north and south by 16 feet east and west. Should the trees after years interfere too much each alternate one may be removed, but this will rarely become necessary.

The cherries as well as all other stone fruit is propagated by budding. They are mostly worked on the Mahaleb stock. In planting a cherry there will be a necessity of observing where the point of union is between the stock and the bud, or tree that has grown from it, and set the tree a little below that point. The Mahaleb cherry, while very hardy in root or stock when below ground, is tender when exposed above. It is frequently the case that this wood is left several inches above the ground surface and in such cases in a severe winter it is apt to kill and leave the tree worthless, with a good root and perfect top, but a dead section of a few inches near the ground. In such cases the tree will leaf out and blossom weakly, but soon dries up, as its food is cut off both from above and below.

There is another point here to be remembered also. If the tree is planted so deeply that a con-

siderable portion of the variety is below the ground surface, it will strike roots from this wood and from these roots suckers will grow up around the tree and will in time spread to great distances and make a forest of brush that is good for nothing, and the parent tree is robbed of its support and is of little value either. These sprouts of course are the same as the variety from which the roots have spread, and if transplanted and the sprouts from these kept down, the trees will be of considerable value, but not as good bearers as when on Mahaleb roots, and on the whole they are very much of a nuisance, on account of their sprouting proclivities.

The cherry should be headed back very severely at planting. If the whole top, or a great portion of it is left, the tree will seldom succeed. It will start to grow almost as soon as it is given the light and warmth, and the owner is apt to think that it is a success when in about a week he will observe that his tree is dying, and will be at a loss to know the reason. Practically the reason is that he did not head it back as directed, but the explanation of the effect is that the buds burst into leaf before the roots had commenced to grow, and the evaporation above could not be supplied from below fast enough to maintain its water supply.

In "heading back" do not cut off two year old wood, but only that of the last year's growth, and cut from two-thirds to three-fourths of each of these shoots off.

It is necessary, in order to get the best results to

keep the trees cultivated and in good growing condition. Weeds and grass should not be allowed to mat under them. A good tool to work the ground in this or any other orchard is the disc harrow. It keeps weeds down; does not ridge up to the trees, and keeps the ground loose and friable.

On poor or moderately thin soils it will be well to feed occasionally. To do this spread the surface with fine stable manure, and leave it there. The roots will find it all. Do not undertake to plow it under.

If your trees are on a piece of very good ground they will not need this for many years if ever, and if over fed there is danger of injury to the trees. On the Missouri drift soils, and on the higher lands the cherry will be productive for about twenty years; but on the black soil on the Mississippi slopes, about half that time is their average life.

In making orchards of mixed fruits, where there has been in some cases a failure on account of the soil being clear sand, there has never been a failure of the cherries especially, and the plums generally. Both thrive well in the sandiest of lands.

Varieties—will be described first in their order of value for all purposes.

Early Richmond.—Tree a rapid spreading grower, forming a symmetrical, nearly round or slightly conical head, is a very early and prolific bearer; fruit a light red, usually borne in pairs, is very juicy and rich. The stem adheres so firmly to the pit or stone that with care the fruit may all be gath-

ered, leaving the stems and pits still adhering to the tree. This cherry succeeds under more unfavorable circumstances than any of the others.

English Morellos.—In habit of growth much like the Richmond, but slower, and ultimately makes heavier branches and a larger tree. This tree may be distinguished from the former while dormant by its shorter growth of shoots, and its larger and blunter fruit buds. It does not come into full bearing quite so quick as the Richmond, but becomes equally as good a bearer. Fruit is one-third larger than Richmond, and from three to five weeks later. Even when ripe it may safely be left upon the trees for two weeks more with improvement. In color it is a very dark red becoming nearly black when fully ripe, and very rich, meaty, flesh slightly astringent, and with a very small pit. One of the recommendations of this fruit is that the birds seldom molest it. It seems to be a little too sour for them. For culinary purposes this is the best of all the sour cherries.

Ostheim.—There are several varieties of the cherry called by this name. There is but one genuine, though the others have more or less merit. It is dwarfish in tree, and like the most of the Russians or North German cherries, is more like an overgrown bush than a tree. It is more in tree and fruit like the English Morello than the Richmond, although not so good a grower, and finer limbs and twigs, and more upright, but still a spreading habit. It blossoms the earliest of any of the cherries, and

will at times be caught by a late frost. (It is a strange fact, however, that in the spring of '91 we had a frost so severe as to form ice the thickness of window glass while these trees were in full bloom and they were not injured, but bore a full crop of fruit. This will seldom occur.) When in blossom the tree is like a snow bank, almost purely white. Fruit size of Early Richmond or a trifle smaller; ripens between the two first described, or but little later than the Richmond; is very dark purple and very much better and sweeter than either of the others described.

Late Richmond. (Kentish, or Late Kentish).—This is regarded as next in value. Tree better grower than either of the others, and more upright. Fruit very closely resembles the Ostheim, only lighter red. Quality about the same, or a little more acid. Its time of ripening is in this latitude July 10 to 25.

With the above varieties where they will succeed, it is not plain what will be needed of a much larger assortment, and consequently there will be no further practical need of describing them. The list that is still kept up by the western propagators and which are recommended by many would be taking them in their order of value: *Montmorency*, *Dyehouse*, *Olivet*, *Riene*, *Hortense*, and *Belle Magnifique.* It is not thought that these will be of value north of latitude 41 which is about the mouth of the River Platte. Below this line in some places the Montmorency is considered only second in

value to the Early Richmond. These are all grown in different parts of the northwest, but if they succeed generally, they are not better than those above described.

There is another list of cherries belonging to the same families as above claimed to be much more hardy, and to be capable of profitable production much farther north than the others. They are known as Russians, and are peculiar to that country and to northern Germany. Many of these are upon the grounds of this station but have not been sufficiently tested as yet to warrant a conclusive opinion. The list will be that recommended by reliable horticulturists of the different northwestern states, who have made a study of them and are best qualified to speak for them.

There are growing at this station, including the list given below, eighteen varieties, all of which have produced a few specimens, and all seem to be closely allied to the Richmond and Morello, and in time of ripening, color and quality fluctuate between these two sorts, but some of them are of slightly better quality. They are all hardy at Concord. What experience we have had confirms the reports of their value over a wide range of country, especially in the north.

Given in the order of their value for all purposes: *Brussalaer Braune*, *Oriel 23*, *Lutovka*, *Griotto du Norde*, *June Amarelle*, *Kings Amarelle*, *George Glass*, *Besarabian*, *Shadow Amarelle*, *Oriel 27*, *Spate Amarelle* and *Shubianka*.

Giving them in the order of their ripening we shall have: *Oriel 23*, *June A.*, *Kings A.*, *Brussalaer Braune*, *Lutovka*, *Griotte du Norde*, *Oriel 27*, *George Glass*, *Spate A.*, *Shadow A.*, and *Shubianka.*

A description of the last named is given from Prof. Budd of Iowa. "Still another class of late dwarf cherries will prove of value in the dry portions of northwest Nebraska. This is represented by our Shubianka and Oriel. They form bushes rather than trees, and bear finely when only 3 or 4 feet high. The leaves are small but firm; the twigs small—too small for grafting; and the habit is that of a large currant bush; but the fruit is as large as the Early Richmond, with very small pit, firm, dark colored flesh, colored juice, dark purple skin, and very mildly sub-acid when ripe. These bud very nicely on the Bird Cherry (*Prunus Pennsylvanica*) and I think will do as well on the Dwarf Mountain Cherry (*Prunus Pumilla*). On these stocks they would stand on the sandy lands of northwest Nebraska and southeast Wyoming."

Sand Cherry (*Prunus pumilla*).—This is found growing wild in great profusion in the northern and central parts of Nebraska, and generally over South Dakota. Its habitat appears to be the sands, and poorest lands, but does not take unkindly to good soil and cultivation. It grows from 1 to 2 or 3 feet high, branching out into a strong bush like the black currants; is perfectly hardy as far north as any one will care to grow fruit of any kind, and

very productive, though in the richer soils it is somewhat less so than in those more natural to it, the sands.

The fruit is borne on stems like the cultivated varieties, grows frequently to the size of the Early Richmond, and is nearly black. It is astringent uncooked, but loses this generally when so treated.

This is recommended for a stock upon which to work some of the Russian varieties, and it may be a success for this, as the buds take readily, but we think the principal value of this very odd freak will be recognized for its own fruit, which is susceptible of improvement to almost any degree. If it is not improved beyond what it is now–which is improbable—it will still command the attention of northwestern planters and nurserymen, as the fruit in many cases is really good and brings a good price in the market. It buds readily on our native plums making a hardy, graceful weeping tree that is very fruitful.

Choke Cherry.—Here is another fruit that should not be neglected much longer. Like the foregoing it is entirely hardy in the extreme north, but it is more dwarfish in these higher latitudes. It is also astringent, which is relieved by cooking.

The tree grows to about 8 or 10 feet in height, under favorable circumstances, but is more commonly found little more than half that.

The fruit is borne in racemes, like the black cherry, and can be grafted or budded upon it, but probably not upon the sand cherry. It is light

and sometimes dark crimson when fully ripe, and at times nearly black, and I have seen specimens that would measure ½ inch in diameter and almost free from astringency. Those who have the opportunity should choose the pits from these best varieties and plant, and by selecting and continuing we may get a fruit that will rival or surpass the Dukes and Morellos. The fruit when cooked has a peculiar nutty and aromatic flavor that is pleasing to all.

The tree is very ornamental, always standing erect with straight smooth stems, beautiful heavy blunt leaves, and when in blossom it is very ornamental, and very fragrant. Its weak point for the lawn is its tendency to spread by suckering. This is not the Choke cherry of botany which is *P. Virginiana*, this being *P. demisa.*

CHAPTER XIII.

Small Fruits.

STRAWBERRIES.

SOME one has said: "Doubtless God could have made a better fruit than the Strawberry, but doubtless God never did." Best of all, it can probably be grown through more latitude than any other fruit. Growing as it does so near the ground it is easily covered, and in this condition the severity of the winter has but little effect upon it. It can almost be said to thrive wherever wheat can be successfully grown.

The person who is to grow strawberries, or any of the fruits that will be described in this chapter, for market, on an extended scale will provide himself with some of the many works devoted specially to their culture; but as this is for the home and home maker, we can only give such directions as will be necessary for his guide to this end.

These plants are of two general classes; *Staminate* and *Pistilate*. The former are bisexual, having both stamins and pistils, and require no other than their own pollen to produce fruit; while the latter have only the pistils or female organs and

require a staminate variety near them for this purpose. (See Fig. 1, page 87.)

As "Nature abhors self-fertilization" it is found that the results are not so good where we rely upon the former alone as where both are mingled. These words are abbreviated by the use of "S" for the former and "P" for the latter, and are generally used in the proportion of two of the pistilates to one of the staminates. They may be mingled in the same row for home use, but for market the rows are alternated, in order to keep the fruit separate which adds to its appearance. It is also recommended that the same rule shall be followed for the home as well. Try to forget that there is to be a "strawberry bed" but plant in long rows. This is not so necessary in town, in small gardens as in the country where there is supposed to be more room for this purpose, and the object is to save hand labor by using the horse and cultivator. (This will apply equally as well to all such vegetables as are usually grown in "beds".)

Select a good piece of rich ground that is not foul with weed seed, and has not been manured recently with cow manure, as it is apt to be full of white grubs, which are very destructive to the plants. Plow it deeply and carefully to turn under all trash upon the top that may contain foul seed, and smooth with the "planker" or clod crusher, one of the cheapest and best of all the farm implements. The ground being smooth and in the best possible condition, stretch a line across and walk

back on it which will furnish sufficient guide for the planter, with no line in his way. Lay off all the ground in this way, and we are ready to plant.

If both sexes are to be used, plant the Staminates in the first row and follow with two rows of the Pistilates and repeat till all are planted. We have found the spade to be the best tool to do this with. A man goes before, walking backward, and pressing the spade into the ground draws it back till there is sufficient room between it and the wall of earth back of it to insert the plant. The roots must be spread out fan shaped, and the plant placed as near as may be in a natural position. This is done by an assistant, and as the spade is withdrawn, the man will with his foot press the ground from him and downward till it is firm about all the roots. This is sometimes done by the assistant with the hands. It matters not if it is done well and no cavities left about the roots. Set about 1 foot in the row.

The plants may be carried in a shallow vessel, sometimes water is kept in it but this is not necessary, and makes the roots harder to separate. Never wet the crown of the plant before setting. If they are dry when received, wet the roots only, and especially if the weather is very dry, clip off most of the large leaves with knife or scissors before planting. This may generally be done while they are in the bunch.

Strawberries should be cultivated often and the ground kept not only free from weeds but in a good

friable condition. Cultivate once a week and always after a rain as soon as the ground is in just the right condition.

The matted row is the best system for home culture. This consists in allowing the runners to root along the line till they have formed a close row of from 12 to 15 inches wide. Such a field is good for about three years, when there will be a decrease in the size and quantity of fruit.

To renew this, there are several ways. One of the best is to let the runners go free the third year, then in July after all the fruit has been gathered, mow the whole as if it were a meadow and when dry burn it off. This will not hurt the young plants, and is generally practiced yearly by some of our best growers. The next year the cultivator will be used to plow up the old rows, keeping the new for the succeeding crops.

During the summer mow some prairie grass before it has matured any seed and let it cure in the cock, for winter covering. Do not cover till the ground is frozen slightly. These plants will grow up to this time and if covered before growth has stopped they will smother out. It is generally enough to cover till all plants are out of sight, but more will do no hurt. This material will not blow off easy, but if there is danger of it a few corn stalks or other heavy matter may be scattered upon the covering.

There is a time when the first fruit commences to color that the plants require water to produce a

good crop. If there is no rain at about this time, and the beds can be irrigated from some well tank or otherwise it will assure the ripening of the crop. Sometimes a plantation may be located with this in view, placing it on ground near to and lower than the water tank.

After the first year the field is not cultivated till the fruit is picked, then it is kept in good condition by cultivating and pulling the weeds or mowing and burning as above, following with the cultivator. Should there not be sufficient rubbish upon the ground to burn rapidly it will be well to scatter on a thin coating of straw.

A fair yield of strawberries is about 2,000 quarts to the acre though there are records of 200 bushels or over 6,000 quarts, the Crescent and Warfield No. 2 having given the highest amounts. Both are pistilates, and fertilized with Capt. Jack, Piper or Jessie.

A few only of the best varieties will be described.

Beder Wood, S.—Where one does not wish to take the trouble of arranging a plantation with both sexes this is the best variety for the Missouri valley, and gives universal satisfaction. It is a good pollenizer, and can be used with any other variety blooming at the same time as a "help meet." It is especially good with the Warfield No 2. Light red, conical, early, large to very large, good quality, and fair shipper; makes runners very freely and is very productive.

Jessie, S.—Dark red, conical, medium to late, larger than above and of better quality, not so good a shipper and not so productive, though in the Mississippi valley it is considered one of the best.

Parker Earle, S.—Named in honor of Mr. Earle of Texas, who originated it. It is one of the most promising of the newer sorts, and has become standard with many of our best growers.

Like the Jessie it ripens uniformly and colors all over alike. It is *claimed* to have produced 12,000 quarts to the acre. In color and size much like the B. Wood, but ripens later, and is a better shipper.

Capt. Jack, S.—This is one of the older tried sorts, and is very good, and can be used with good effect as a fertilizer of most of the desirable varieties. Is dark crimson, medium size, very good quality, an excellent shipper, but not as prolific as the B. Wood or Earle. As it cannot be expected that the plant which furnishes its own pollen can have the ability to also compete with those females who have only the fruit to produce, we intersperse these as has been described, and the following lists is believed to be sufficient for all purposes.

Warfield, P.—The only berry that has been able to dislodge the Crescent in productiveness, and as it is of better quality it is for all purposes, where it has been tried, its superior. Deep red, colors all over, very conical, medium to large, and holds out in size well to the last picking. This and the B. Wood will make an excellent combination for all purposes.

Crescent, P.—Too well known to need description. It has a place in all the large growers plantations, and is a most excellent and very prolific variety. Quality is only good. Its principal merit is in its productiveness and shipping qualities. Is fertilized by Jessie and Capt. Jack.

Bubach No. 5, P.—This is the largest of the productive sorts, but as grown here is of poor quality, and will not ship to any great distance. Is coxcomb shaped, light red, and a very strong grower. Specimens grown here have measured 2½ inches in diameter. Is fertilized with Jessie or Beder Wood.

Haverland, P.—This variety has the reputation of standing drouth better than most of the others. It is a strong grower, and roots very deeply, and is free from rust which attacks many of the others in the eastern states, but which at present has given little trouble in the west. Early, productive, and large to very large, ripens evenly, and is a good shipper and market berry; blooms with the Beder Wood, which will make a good fertilizer for it.

RASPBERRIES.

These are of two families, the Antwerp and black cap. The former are generally red, and called Antwerps (*rubus strigosus*), while the latter are black, purple or yellow, and known as Black caps, or Thimble berries (*R. occidentallis*). In ordinary language these are known as the red and the black, though the color should be different. The

former propagate from sprouts thrown up from the roots of the parent and are called suckers, while the latter do not sucker, but propagate by the recurved tips taking root in the soil. These are called tips, or, more properly, stolons. They are among our most valuable hardy small bush fruits, but, like the blackberry, they do best in sheltered positions. Where the canes (bushes) are liable to winter killing, in latitude 42 or south, it is believed to be generally due to the drying and wrenching winds of winter more than to the intensity of the cold. This is also true of the grape.

Where there is this liability it is an easy matter to cover them and in this manner insure a crop almost without peradventure. If planted in an orchard of trees large enough to be of considerable shelter, they will not generally need further protection, or they will do in the place least favorable to the apple orchard, where well sheltered from the north and west winds.

Prepare the ground as for strawberries, and plant for a considerable field 4x8 feet; cultivate as for corn. For a small lot for home use they can be grown in a matted row system, or an approach to that method. Plant 2 feet in the row and the rows 8 feet apart.

The nurseryman hears more complaint from the planters of the failure of the raspberry than any other plant or tree. This is measurably so of the snowball, and for the same reason, namely, the great mass of fine roots which they bear. If these

are properly spread out and earth worked among them, they will grow if received in good condition; but if stuffed into a hole, with no earth in contact with any but the outside roots, those in the center will soon mould and heat and, of course, die. There is another great cause of failure to get the plants to grow. There is left on all plants of the black cap family a part of the old cane from which the tip grew merely for the purpose of a handle for bunching, etc. It is not necessary and is only left on for convenience in handling. This is, perhaps, 8 inches long. Many planters presume this is to make the future plant and set the stolon proper so deep that the new plant which is to grow from the crown down in among the fine roots will never get through to the ground surface. They must be planted deep enough so they will not dry out, and at the same time not so deep that the buds, which will always show at the crown, cannot readily force their way through.

The canes will usually make quite strong bushes the first year and give something like one-fourth to a half crop the succeeding season.

They are also apt the first year to run on the ground and not form the bush habit. No stolons should be allowed to take the first summer, as it weakens the plant too much. The first fall cut the canes back to about a foot all around from the crown, and the next summer, as the new canes grow up stocky and thrifty, pinch off the ends when at about 2½ to 3 feet high, and keep up this

practice, not allowing them to grow higher than this. By this treatment they will branch out and better mature their wood; besides they will interlace with each other and make a self-support.

The raspberry makes its wood one year, bears its fruit upon it the next, and dies soon after the fruit is gathered. This old wood, being of no further use, should be cut out and burned.

If they are not to be covered for winter, a heavy mulch applied to the ground between the rows has been found of great benefit in preventing winter killing. Much of this damage is due to drying, and the mulch holding the moisture in the ground, and by some process which we are not acquainted with this moisture is supplied by the roots to the tops, even in the freezing weather of winter.

The above instructions are given expressly for the care of the black caps, but is applicable to the red in every particular except to the difficulty of transplanting. If the suckers are allowed to grow freely from the red raspberries, there will be but little fruit. They must be kept down, and there will be a very heavy and desirable crop.

The raspberry will yield about one-half as much fruit to the acre as the strawberry. (See "Blackberry" for directions for covering.)

Turner.—This is the best and hardiest of all the reds. Fruit is light crimson, good size and of the first quality.

Cuthbert.—Very much like the Turner, but not

so hardy and not as good quality. Is a valuable sort where they are to be covered.

Shaffer's Collossal.—This is a cross between the reds and blacks, and is a dark purple, very large, nearly double the size of the Turner and of excellent quality. Is very difficult to propagate, as the tips will not take root unless pinned down, and then frequently do not. It is not as hardy as the Turner, generally killing every winter in the northern half of Nebraska. It should have winter protection.

Souhegan.—Is the hardiest of all the black caps and stands at the head of the list for the north. Canes are intensely thorny, more so than any of the others. Fruit of medium size and best quality. It will stand in many places without protection, but if it is found to injure can be covered thereafter, with the loss of but one crop.

Tyler.—Same as Souhegan.

Gregg.—In the Mississippi valley this is the most profitable berry grown. Is at home on the black soils of that locality. It is the largest of all the true black caps, and when fully ripe has a purplish tint. Quality best. Does not succeed so well in the northern Missouri valley where it is too tender.

Older.—These have been planted largely by us in the last year, but as yet it is too early to give a description on their merits, but copy the description given by a large grower, who is perfectly reliable:

"This originated in northeastern Iowa about 10

years ago. I have now grown it four years. Last season I kept an account of all my raspberries as I picked them, and the Older produced 50 per cent more fruit than any of them on the same amount of ground. The Older is jet black, no bloom, about as large as the Gregg, three days later than Tyler or Souhegan in time of ripening, and about six days earlier than Gregg. S. T. Ballard, of Wisconsin, says of the Older's good qualities in the Kansas *Review:*

"'First—Its hardiness to withstand all the winters as far north as the Wisconsin line, where I am growing it,and perhaps as far north as Lake Superior.

"'Second—It is perfectly drouth-proof, always ripening all its fruit into fine berries, when Gregg, Ohio, Tyler, Souhegan and Milbourn dry up and not half be fit to pick.

"'Third—It will produce more fruit to a yard of row than any other berry. It ripens six days in advance of the Gregg.

"'Fourth—The berries average larger than any other the season through. They are coal black, with the richest and thickest of juice, and the smallest seeds of any black cap, hence is best for table use and canning.'

"So far as my judgment goes after fruiting it for four years, I think Mr. Ballard's estimate is correct."

The Doolittle, Mammoth Cluster and Hopkins have merits, but with the above it is not thought that they will be necessary.

BLACKBERRIES.

With a little care this fruit may be grown successfully wherever Indian corn is a success, and, with laying down and covering in winter much further north, provided there is sufficient rainfall. An extended drouth at or near the time of ripening is fatal to the fruit, as it dries up badly. For this reason it will be well in selecting the location for the small fruit patch to locate it where it can be irrigated from the tank or well. In most parts of South Dakota where there is cheap artesian water this will become an easy task, and is one of the many advantages that this highly favored state enjoys, yet seems not to be fully appreciated. The presence of an artificial or other pond near the orchard or fruit garden is of great benefit, aside from its value for other purposes.

Where this fruit is raised along garden fences or the edges of timber belts, without cultivation, as it frequently is and very successfully, too, the danger of these drouth periods are greater than where grown in cultivated land checked off like corn.

Where there is plenty of rainfall the blackberry succeeds well grown in the cottonwood groves, provided that the trees are not too close and the ground is good. They will probably succeed as well in the orchard or in the ash groves, but they are a failure in the box elders.

In the above it is supposed that they are to be grown by what is known as the "slip shod" manner, that is, no particular work except planting and

picking the fruit. I have seen some fine plantations of this kind that produced large quantities of fruit. One patch is now in my mind, near Wisner, Nebraska, consisting of about three-fourths of an acre, that has not for years made a failure, except from drouth causes. They are grown in an old cottonwood grove; the trees are very large but not very close. The entire patch is a bramble, the old dead canes are not even cut out, but they make a growth yearly of 8 to 10 feet in height and are very productive. These are the Snyders; but there is in the same grove a smaller patch of Kittitinnies that only bears at rare intervals.

This mode of growing is only a makeshift, but is much better than nothing, and many are so situated that they will follow this plan and almost get something for nothing. The better way is to devote proper time and space to them, and make a success. If near a market they will always be in demand at good prices, and will be found to be a much more profitable crop than wheat or corn. If not near a market we have found that among the neighbors there has always been a good market for any surplus fruit.

Select a piece of good land, not the black muck of the river bottoms, but a rich clayey loam. Plow deeply, and put it in the best condition. The ground may be laid off with a corn marker and the plants set only in each alternate row. This will make them something like 4x8 feet apart. If practicable let the rows run north and south.

There are but two varieties of this fruit that nave been sufficiently tested in the northwest that can be recommended, the Snyder and Ancient Briton; plant half of each kind alternating the rows.

Good plants will always have at the bottom of the cane a cross section of root. Where the plants are carelessly taken up this cross root is pulled off and left in the ground, leaving only the stub for the purchaser. Such plants rarely grow, and it is essential that we get a stand the first planting. Keep the cultivator running; keep down all weeds and keep the ground in the best condition. If we get a good growth this year we may look for nearly half a crop of fruit the next season. If in a section where there is danger of winter killing by leaving them up, we will cover them in October or November. Three men will be required to do the work to the best advantage. The first with a heavy pair of buckskin gloves gathers the canes into a bunch, and as he presses them down one takes a spadeful of earth away from the roots in the direction that the plants are being laid, while the other puts his spade in deeply on the opposite side, cutting some of the roots, and the plant is easily bent close to the ground. It will be enough generally to pin them there or secure them by laying on some branches of trees. In this condition they will generally go through the winter all right, but if in a very cold and windy climate it is better to cover lightly, either with earth or some litter that will protect them better from the drying wind.

Three men will lay down and cover about one acre per day. The distance apart as above will give about 1,400 plants to the acre. The third year they will be in full bearing and will with good care yield about 3 to 4 quarts to the bush, and in some cases have produced more than double that. The Snyder is somewhat hardier than the Ancient Briton and will be the only plant proper for the "slip shod" system. It will not yield like the latter, nor hold out the size of fruit to the last picking like it. Both are excellent fruits, and good shippers.

In placing the canes back the next spring, do it early, and do not try to get them to stand upright. Those laying near the ground produce the best and most fruit. If the patch is thoroughly mulched so as to keep down weeds and suckers, it will add to the yield and save the labor of cultivating. This will also, in case they are not laid down be a great preventive of root or cane killing.

Cut the old wood out as soon as the fruit is off and the bushes begin to fail. A strong knife welded to the shank of a hoe, and used on the handle, the blade standing at a right angle to it will be found an excellent tool for this work.

CURRANTS.

This fruit, like the strawberry and gooseberry, is one that will thrive in the extreme northern limit of the wheat belt, is easily cared for, and no farm or town garden should be without a yearly supply. It requires the best of ground, and a partially

shaded situation. The north side of a board fence or row of wild plums, or, better, Russian Mulberries will furnish this. For field culture plant rows 6 to 8 feet by 2 to 3 in the row.

The ground must be of the best, and then they will be benefitted by a yearly application of stable manure. Keep them cultivated and the ground in a loose, mellow condition, in order to keep it moist.

A heavy mulching of sawdust or partly rotted straw, applied in the fall after the leaves have been shed, will insure a crop which in other cases might fail. It will be left on indefinitely, and save cultivation. This is especially desirable in sandy lands, and in places where they cannot have the shade referred to, as it prevents the ground from becoming too hot, and supplies some moisture to the foliage.

The currant starts to grow very early in the spring, and if young plants are received that show much starting of the buds the tops should be cut off to near the ground. The same treatment should be given if they appear to be dry when received. This is very important.

The White Grape is the best of the white varieties, and with us has been the most prolific of any. It is also for home use the best of any in quality, but is not so good as a market variety as the red ones, as the fancy of the consumer is for the reds.

The Victoria stands first of the latter class, is a very strong grower, and makes the largest bush of

any, sometimes standing 3 to 4 feet high; is prolific as any, and ripens ten days to two weeks later than the Red Dutch, though comes to bearing later.

Red Dutch.—One of the oldest of the well-known varieties, and can always be depended upon to do well, but especially so in the heavy black soils of the Mississippi valley.

Long Bunched Holland.—This should be tried to some extent by every planter. Where it does well it is one of the best, but in many places does not bear well. It is thought to do better on the heavy clay soils than on the bottoms or prairies. Slow grower while young. Ripens late.

Black Naples and *Lee's Prolific* have proved to be the best of all the black varieties, but have not with me been worth cultivating in Nebraska, while in eastern Iowa and western Illinois they are valuable.

La Versalles is a red variety that is in favor with some, but with the varieties above described will not be necessary.

GOOSEBERRIES.

As hardy as the currant, and too well known to need much description. It is easily grown treated as has been described for the currant. Its natural home is in the open forest, and rich compost soils of the partly shaded and protected ravines, and along streams. It will not give so good results if allowed to become matted in the rows with grass and weeds as is too frequently the case, and will repay well any extra care that may be given it.

The cultivated varieties are much superior, both in size, quality and productiveness, to the wild ones.

They may be planted in rows 5 feet apart and the plants set 4 feet in the rows. Larger and better fruit is obtained by judicious pruning in the fall after growth has ceased. Mulching is also of benefit, and is resorted to by many, on account of the difficulty of working closely among the canes, where the thorns are somewhat irritating.

The gooseberry plant starts the earliest in the spring of any of the small fruits, and if received in a much advanced condition, will not be apt to grow under any but the most favorable conditions. If the tops are cut off to near the ground as soon as planted they will grow readily, and no loss is occasioned by it, for it is generally the case that this, or any other plant treated in this way, even if received in the best condition is benefitted by it, and the plant will be as large in the fall as if it had not been cut back. This is of importance.

Of the European sorts the *Industry* has given the best results of any, and in some places has been highly praised. The fruit is very large, frequently as large as a large wild plum, and of excellent flavor, but it is better to try them very lightly, as, like all the other foreign varieties introduced here, it is subject to mildew. Where the varieties described below are easily grown its principal value is in its oddity. The bush grows upright and strong under favorable conditions; in leaf and expression it is like the Downing.

Downing.—The largest of any of the American sorts (and this has foreign blood in it), and stands at the head of the list for the west for all purposes, though with some the Houghton is classed as first

Bush quite upright when young, drooping somewhat when in fruiting, has large and strong spines, from which it is readily recognized from the Houghton. Fruit is very large, oblong, sometimes 1 inch the long way by 5/8 to 3/4 the other; greenish yellow when ripe and very handsome.

Houghton.—Purely American, and one of the largest and surest croppers. Little more than half the size of the last named, it will bear in bulk as much or more. Fruit more of a pinkish cast, and partly transparent, showing the seeds through the skin. The bush is of a trailing habit, and when in full bearing fruit is apt to lay on the ground.

Smith's Improved.—Is not so good a grower as the Downing, which it resembles, both in bush and fruit, though the fruit is not so large, and of light green color when fully ripe. Is of good quality. Shy bearer in Illinois.

DEWBERRIES.

A variety of the blackberry, and is a runner or creeper, sometimes called Running blackberry. In this vicinity they have done no good, while on the clayey bluffs near Sioux City they have been very successful. It is well to try them in a small way, for where they succeed they are very valuable, as

they are enormously productive, and are very easily covered for winter where this is necessary.

The vines should be cut to about 12 to 15 inches from the hill in the fall before covering. They do not sprout like the high bush blackberries with this treatment, but if the tops are cut away entirely they will throw up sprouts at some distance from the hills.

The Lucretia is the best variety thoroughly tried, but the Bartell is highly recommended.

DWARF MOUNTAIN JUNEBERRY.

A variety of the old serviceberry or shadberry of the New England states, but is much superior in all respects. It grows but about 4 to 6 feet high and is perfectly hardy. It is also a fine ornamental tree or shrub, bearing an immense load of pure white fragrant flowers very early in the spring. These are followed by a load of dark red or purple berries the size of large peas, and very much the same appearance as the huckleberry. It is frequently sold for them, and I am of opinion that some western nurserymen, not being acquainted with that fruit, have done it innocently. It is no more related to the huckleberry than it is to the hickory. The former is of the genus *Vaccinium*, while the juneberry is *Amelanchien.*

It propagates by suckering, but not to a very considerable degree. The young plants from the nurseries are generally destitute of any but the main root, and it is necessary before planting to

cut the tops to near the ground to insure their growth.

BARBERRY OR BERBERY.

Does well in the west, but not as productive as in the New England states, where in many parts it grows wild, and is very prolific and very handsome. The bush grows to the height of 6 to 8 feet, and is covered with spines, which are not troublesome, as they easily break off when pressed. It is little grown in the west, and has the reputation of producing the rust that starts in the wheat fields. It is generally thought that this is an error, but investigation has determined that this rust is identical with that of the wheat.

The fruit is the shape of a grain of rice, but hardly as pointed, deep crimson and borne in racemes, and is largely used for preserves, jellies, or other purposes, being much like the currant in acidity, and very pleasant. It has a large seed which lessens its value for many purposes. The purple-leaved variety is used much for ornament, having bright purple foliage. It also bears fruit, but not so profusely as the other.

BUFFALO BERRY.

This is confined to the northwest, indigenously, where it grows along the river bottoms, and is easily distinguished at a great distance from the silvery leaves. It is irregular in habit, and grows to the height of 10 feet or more. The tree is dioecious, purely, requiring the two sexes together

to produce fruit. The berries are somewhat smaller than the currant which they much resemble both in taste and appearance, being, however, slightly more astringent, and are borne upon short racemous sprigs. The fruit is used for the same purposes as the currant. It is, when removed from its natural habitat, apt to be a shy bearer, but when everything is favorable it is immensely productive.

CHAPTER XIV.

Grapes.

THERE is no better fruit for the home garden and none more easily grown in large quantities than the grape, and there is none more wholesome. Its habit is such that it can be trained to the trellis or upon the building, occupying but little space upon the ground; it recommends itself as strongly to the villager with his small cottage and few feet of land as to the one with more ample room.

Some of the principal requisites of success are a proper location, thoroughly prepared ground are deep and careful plowing and smoothing, good cultivation and judicious training.

Most of the good soils of this section are proper for this purpose, but a warm sunny location, with some protection from the north and west as groves or belts of timber, is a desirable one.

The rows should be run east and west, as this gives the greatest amount of sunlight to the ground between them. Put the rows 8 feet apart and the plants from 8 to 10 feet in the row.

A good one year old vine is preferred to start with. Before planting cut back all the top to one or two buds, and the roots to about 8 to 10 inches.

We have practiced cutting them much shorter than this and had the best results, and it saves time in planting.

These vines are grown from cuttings as will readily be seen, and this cutting should be entirely covered when planted. It has been in the ground for one or two years and has become practically a root instead of a cane as it was. The root of the grape is very sensitive to drying, and if the greater part of this cane-root is left exposed to the air there will be great loss. There is no one thing that causes so much loss to the planter as this. Slant the cutting to the north at an angle of about 45 degrees. Spread the roots out in a natural position but do not make the mistake of placing them in a downward direction. The root of a grape keeps near the surface, and should not be given much of a downward direction below the bottom of the cutting. They must not be allowed to dry, for they will perish in the sun or wind almost as quickly as those of an evergreen.

Cultivate thoroughly but not so deeply as to interfere with the roots which run very near the surface. It will not be necessary to put up trellises till the third year, though there will usually be some fruit the second. It is better to set the posts for the trellis about 16 feet apart, and they should be extra length, say 8 feet or 10 would be better, so that when firmly set in the ground the top wire can be 6 feet from the ground. These should be set about a foot or more

north of the line of grapes. Use three plain fence wires, the first 2 feet from the ground, one at the top, and one midway. The best fruit will be that which grows the highest.

The first and second year do not encourage the vines to climb, but rather keep them as close to the ground as possible. Do not let them spread toward each other, but by staking or weighting, make them all take the same direction. For instance we are on the south side of a row facing it; all vines in this row should grow to the right or left, it matters not which. By this system the vines can be much more easily laid down, and they have the same room as if trained fan shaped, which is usually recommended. There is another object which we accomplish by this; the main canes are for some distance parallel with the ground and close to it. However large they may grow, there will never be any trouble to cover them, as is the case where they are taken out in an upright position, in which case this wood gets so large in a few years, and so rigid as to preclude laying down. Where this is the case with old vineyards they can be renewed by allowing new canes to grow from nearer the ground and when large enough the old ones are removed.

Take only three canes from the plant, two is better than four. The lowest of these will of course be carried the furthest horizontally, the middle one next, and the top one but a few inches or a foot. Spread these out upon the wires, giving as near as

may be the same amount of space to each, so that when they commence growing they shall cover the trellis evenly.

The great fear of the planter is that he will not be able to prune properly. There are several methods employed, but the principle, or the object to be obtained is the same in all cases. Had we not departed from nature, by crowding too many vines upon the ground, it is my opinion that little or no pruning would be required. I have seen a Concord vine that had escaped from its straight jacket, and climbed a dead apple tree, produce more and better fruit than would ordinarily grow upon 4 or 5 vines as ordinarily pruned. Nevertheless, there are reasons why the close planting is the better. We shall get a full crop of fruit sooner from the same ground than if we plant only one fourth as many vines, which would contemplate waiting till the vines had become as large as the aggregate of the closer planted ones.

The amount of fruit where a close pruning system is pursued will be regulated by it. If we allow too much fruit to set it will be smaller, of inferior quality, and is apt not to ripen.

Each bud or "eye" is an embryo branch or lateral, which when developed will produce, about three bunches of fruit. In pruning keep this in view. Large strong vines will of course be allowed to bear more than smaller ones. The temptation is always to save too many of these buds, presuming that more buds will bring more fruit.

Better have fewer bunches of better quality. This will hold good in any fruit that has a tendency to overbear. By reducing the numbers we shall get the same, or perhaps more in weight that will command a better price, and the tree or vine is relieved of its greatest and most debilitating strain, that of maturing the seeds.

Pruning may be done either in the spring or fall. If in the fall, which is preferred, November or late October is a good time.

Let us suppose that the vine has been planted two or three years and has three canes 5 to 6 feet long. There are not at this time any branches to be considered, and we will shorten them to about 3 feet and they are ready for winter cover.

The next fall each bud will have made a lateral, and each bearing several buds. Besides this the main canes will have made an extension of several feet. We will again shorten these to about half their last year's growth, being governed by the growth it has made and the space it is to cover. The laterals will also be shortened to from one to three buds, according to the number of these laterals, and the strength of the vine. When the vine has reached the limits of space reaching to the next vine, it is thought that two buds to each lateral will give the best results.

The canes when treated in this way are ready not only for covering, but to go upon the trellis in the spring. It is not best to take them from the cover very early, as the grape starts late, and should be

allowed to remain till the buds show some indication of growth, but not till much swollen, as in this condition they are very easily broken off in handling. Tie them up as has been directed, leaving a good space between the wire and cane for expansion, and do not pass the cords around the canes as it will grow into them and cut them off.

There is a system of laying down without taking from the trellis. Each vine has a trellis of its own consisting of a frame 10 feet long, and as high as required, hinged to solid blocks at the bottom. It has also longitudinal wires. By removing the props it will fall readily to the ground. This is of little benefit as the vines must be taken from the trellis for pruning, and can be done as well from a permanent trellis.

The grape arbor is a beautiful addition to the home grounds. It may be costly or very primitive, and cheap in construction, it matters little as it is soon hidden by the mass of foliage and interlacing vines. As the fruit hangs down, it is nearly all in sight from the underside, and there can be no more beautiful sight than that given in one of these shady bowers, tasseled and festooned with purpling clusters of grapes, so sharply defined beneath their canopy of amber and emerald.

The best of all sorts for this purpose in a trying climate is the Janesville, which is described below. The object, of course, in laying down these vines is to prevent winter killing, but it comes through the better retention of the moisture in the canes.

There are times when vines left on the trellises will go through the most severe winters uninjured, while at other times a less severe winter is fatal to them. When the vines kill it is not usual that the roots are affected, but in this loss of canes we are set back at least one year.

It is believed that the different effect upon the vines in different winters as above, is caused by the condition of the ground in the fall as to moisture, and perhaps to the manner in which the canes ripened the previous summer, but in a less degree. It will kill or severely injure plants to freeze them dry, and when there is no moisture, or very little in the ground at the time of freezing, there is danger of a total loss of the plant. This is more especially the case if the plants are young and have not secured a strong hold upon the soil. This is the reason that so many complain that their vines made a fine growth the first year and died the first winter. If there could have been some way to have supplied this moisture, and the vines had been properly covered. this would not have occurred. Even in these dryest of falls, if the ground has been properly cultivated there will still be enough moisture retained to carry the plants through, and these losses are generally the fault of the planter. Very many people do not yet realize how important this stirring the ground is in a dry climate.

It is a mistake to suppose that grapes will ripen in the sunlight better than in a partially shaded position. Many have thought to hurry

the ripening process, fearing an early frost, and have picked or cut away the leaves to allow the sun a better chance at them. Instead of hastening it delays it, and if too severely done they will not ripen at all, but burn, sour and drop off. The leaves are the lungs of the plant and as such should be allowed to remain as nature intended.

Summer pruning consists of pinching off the growing shoots after the fruit has been all set. This practice is at best very questionable, and as very satistactory results are obtained without it, it should be done sparingly, and then only with a part to learn its effects. Some very rampant growers like the best of the Rogers hybrids might be improved by it if done judiciously.

Winter protection.—In parts of the country where there is plenty of rainfall, and the ground is in fairly moist condition in the fall, it is only necessary to lay the vines down and cover with earth, barely enough to say they are covered. This is the usual practice in the Mississippi valley, and the latitude of 40 and below, but further north, in northwestern Iowa, and southwestern Minnesota, and Dakota, it has not proved to be as reliable as the use of mulch of some kind, such as partly rotted straw, corn stalks, &c. Something that will prevent the canes from drying too severely, and will not easily blow off.

Many are recommending the putting down and covering the tops only, claiming that the large stems are not hurt by the severest winters. This

practice may have been successful at times, and may not subject the vine grower to loss, but the author lost large Concords in 1876 protected in this way, which is a warning that it is not always a safe practice.

In varieties the Concords still holds the lead, combining more good qualities than any other, though the Worden is a very close competitor. The former is too well known to need a description. It is not of first quality, nor indeed second, though in hardiness, freedom from disease and productiveness no other grape can show so many good points over so great an extent of territory. To be at its best it should be thoroughly ripened, and when kept carefully for three or four weeks after gathering, it is at least a very good grape.

The Worden very much resembles the Concord, both in fruit and vine, but is from ten days to sometimes two weeks earlier, and of much better quality. Its fault is in having a very thin skin which lessens its value as a market variety, and as a keeper.

A great number of varieties are not necessary, though there is generally a disposition on the part of grape lovers to plant every new variety that is presented with a good "pedigree." We will first give a sufficiently large list alphabetically and then name them in the order of their value as we have found them.

Agawam (Rogers No. 15).—This together with all the R. Hybrids were obtained from seed of the

native fox grape of New England, fertilized by the foreign Black Hamburg. It is light purple, and very large and showy. Quality, good to very good, and a good keeper.

Brighton.—Amber or brownish red; berries oblong; medium size or below; bunch very long, shouldered, but not compact. The vine is a vigorous grower, and fruit ripens at or before the Concord. Quality, best.

Coe.—This is an old variety that seems not to have taken so good a hold of the public as some others that are far inferior. It is a very early, black grape; bunch and berry small, but an immense bearer and almost as hardy as the Clinton. It is one of the grapes that will do in most locations for the arbor, or where it is not to be protected during winter. It is much better in quality of fruit than the Janesville, and nearly as good a grower.

Clinton.—This approaches nearer the type of the wild or "Frost Grape" than any other cultivated variety. It is very hardy; black, bunches small and compact; fruit, below medium size. It has the high vinous flavor of the wild grape, and is valuable for wine making. Its fault is in bearing a few berries of green fruit in each bunch, which gives it an unsightly appearance. Though the quality is such as to rule it from the list of table grapes, it is, when thoroughly ripe and has been kept for a few weeks, of very fair quality, and by some preferred to the Concord. The leaf is light and thin like the wildings.

Concord.—Black, large berry; strong grower; fair quality; hardy, and free from disease.

Croton.—A very good, white grape, but quite tender. Not a good grower.

Delaware.—This is one of the oldest of the popular pink grapes. It should be in every collection; though in some localities it does not succeed well. Bunch and berry very small, but a profuse bearer, and so beautiful as to be sought for in the best markets at the highest price. Quality, best. The vine is a fair grower, but its tendency is to overbear, which, if allowed, will frequently cause its death.

Duchess.—This is among the best of the white grapes for all purposes. It succeeds through a wide range; is a great bearer, and best quality. The skin is thick, which makes it a good keeper and good shipper. Bunch and berry medium, and fairly compact.

Early Victor.—An early grape of good quality. Black; bunch and berry small. Not a good grower, but does well on the rich soils along the river bottoms.

Elvira.—This grape is to the white ones what the Concord is to the black. It is a standard, and when all others fail can be depended upon to supply the table with a very good crop of fair fruit. Bunch and berry, medium to small. Ripens with the Concord or later.

Empire State.—A comparatively new grape from New York. It has been, like many others of these

new varieties, held at exhorbitant prices. It is, however, among the best of the white class. In quality of fruit it is best, and if we except the Brighton, perhaps the best. Bunch and berry very large; pulp, small, with a very delicious, rather thick and rich juice. It is not as good a grower as some of the others described, but is medium. It is a good keeper.

Goethe (R. H., No. 1).—Where this excellent grape will ripen it should be in every amateur list. Brown or wine color; very large berry and medium bunch. Quality, best. The best of the R. H. for the West.

Lady.—Also a white grape of good quality; closely resembles the Martha, but berry is more transparent and slightly better quality. Good grower and hardy when covered.

Martha.—Sometimes called "White Concord" of which it is a seedling. Good grower and hardy; not a good bearer, except in the best of soils.

Merrimac (R. H., No. 19).—In quality and time of ripening like Goethe. Black, very large berry; bunch not compact, and many berries fail to mature.

Moore's Early.—Has had too much praise for its value in this locality. Large berry and small bunch; ripens unevenly, and sometime before the Concord. Drops its fruit as soon as ripe, and sometimes sooner. Quality, fair.

Pocklington.—A very good, medium, yellowish, white grape; good grower, very healthy; holds its

fruit well. It has a very sprightly flavor for a white grape, but one tires of it sooner than of many of the others.

Wilder (R. H., No. 4).—Too nearly like Merrimac to require both in same collection.

Worden.—Closely resembles Concord, but ripens ten days earlier; better quality; not so good a grower, but very prolific. For a home grape it is one of the three best. Not so good a shipper as the Concord.

Among the promising newer varieties not described here are *Jefferson*, *Woodruff's Red*, *Niagara*, *Green Mountain or Winchell.* These are all undoubtedly valuable but have not been tested by me long enough to decide upon their merits.

The following list is given in the order of their value for all purposes: Concord, Worden, Brighton, Elvira, Coe, Duchess.

The following is given in their order for quality: Brighton, Empire State, Worden, Delaware, Lady, Goethe.

In time of ripening the following: Champion (not described as quality is too poor), Coe, Worden, Moore's Early, Lady, Pocklington, Concord.

CHAPTER XV.

Description of Apples and Pears.

IN describing the apples as given below, to avoid confusion in terms variously employed to denote hardiness, they will be numbered from one to ten, the hardiest being numbered one, and the tenderest ten, intermediate numbers denoting the different degrees between them as near as may be.

It is common in our western horticultural societies to place these different sorts in certain latitudes, but as we have shown in another place under the relationship of hardiness to latitudes, it has been thought better to make the above distinctions.

It is well to remark here, that there will no doubt, be exceptions to this classification in individual cases. Thus: the Ben Davis is marked 5, while there are cases where it is standing, and has stood for years side by side with the Duchess which is marked 1. The intention is to convey in the simplest manner what the reputation is in general, of certain varieties mostly grown in the northwest.

SUMMER VARIETIES.

Tetofski, also known as Russian Crab.—This is undoubtedly of Russian origin, but entirely unlike

any of the latter importations in the habit of tree. It is a very slow grower, and remarkably stocky. At three years old it is hardly taller than a large yearling, but heavy in trunk and limbs, which grow very upright, and makes a downward growth of roots, not exceeded by any other variety; hardiness, 1. Fruit medium or below, yellow and slightly blushed, aromatic, acid and hardly good. Ripens among the earliest.

Early Harvest.—Tree vigorous, and healthy, upright when young, but spreading when in orchard. Trunks and larger limbs light colored, but brown strong shoots, frequently produced in doubles. Makes perfect forks and never splits down. Hardiness 6. Fruit medium to large, flat, is oblate as grown in the Missouri valley, but nearly round on the Mississippi slope. Yellowish green when grown in the sun and occasionally a very faint blush, but grown in the shade is green. Quality best, both for cooking and dessert, very aromatic. Ripens latter part of August. Pleasant acid.

Summer Queen.—Tree vigorous and spreading, a shy bearer in the black soils, but grown in the bluffy lands of the west is very productive. Hardiness 4. Fruit is medium, conical, smooth; yellow striped and splashed red and scarlet; aromatic and spicy, mildly acid, and when taken fresh from the tree it is one of the most satisfying of the summer apples. Is grown largely in the northeast central districts of Nebraska.

Red June, or *Carolina Red June.*—Tree upright

with slender twigs and dark colored bark and shoots. Hardiness 3, when the trunks are protected from sun scalding, which is its weakness; fruit medium or below, conical, very red, and colors all over; flesh white, sub-acid, juicy and very pleasant. Best for dessert. It has the quality of maturing fruit while there are barely half grown specimens on the tree. Will continue to mature fruit good to the last for four or five weeks. In South Carolina where it originated it ripens in June, but in the north from July last to September 1.

Sweet June.—Tree upright and twiggy. Shoots slender, and pale green. Hardiness 4, except for the sun scalding as noted in Red June. Fruit medium or below, roundish, though at times conical, light yellow and very smooth; season, August and early September. Very sweet and rich, and one of the best of all the sweet apples. Sometimes called High top Sweet.

Red Astrachan. —Of Russian origin. Tree moderate grower when small but makes a very large tree in orchard. Upright diverging, close top with large and wavy leaves. Hardiness 2. Fruit medium to large, flat to roundish, yellow ground covered nearly with smooth red and a heavy bloom. Aromatic, and less acid than many of that race, but not mild enough for the dessert, good for the kitchen, always fair and seldom wormy. Season, August.

Duchess of Oldenburg.—Usually call "Duchess." The origin of this apple is in doubt. Its name

would imply a German origin, but the tree has the typical characteristics of the Russians. It is taken as a standard of hardiness, and when other varieties are classified by comparison with some well known sort this is usually used. Upright grower while young, but in trees 20 years old the habit is quite spreading where exposed; trunk and limbs are apt to be crooked without any apparent reason why they should be so. Unless grown in the nursery in very good ground the tree is not apt to be chosen by the customers, and frequently refused on the delivery grounds, when true to name, hence many other handsomer sorts are apt to go out under that name. It is not a good grower, and seldom makes a full stand when root grafted, frequently less than half. Hardiness 1. Fruit medium as grown in the Missouri valley, but on the dark soils of eastern Iowa it is very large approaching the Alexander. Round, sometimes slightly flattened; yellow and heavily splashed light and dark crimson; season, September. Quality only good for cooking, but can be used when half grown, is a pronounced acid. When fully ripe and just before decaying it is sometimes used for the dessert, but is not a favorite.

Coles Quince.—Moderate upright grower, somewhat straggling. Hardiness 3. Fruit large oblate and ribbed near apex. Yellow, mild sub-acid with a peculiarly pleasing quince flavor. Quality best both for kitchen and dessert. Like the Duchess can be used when not fully grown. Very productive.

Sops of Wine.—Tree very vigorous, spreading, straggling in habit, making very long swaying branches in nursery, but a very symmetrical tree in orchard. Hardiness 3. Fruit medium, round to slightly conical; light and dark red shaded, with dark red shading throughout from which it takes its name. Season, August and September in the north, but ripens in latter part of July in southern Illinois. Acid, but of best quality, both for cooking and dessert.

Cooper's early White.—(This is not the same as Cooper.) Medium, spreading in habit, early and abundant bearer. Hardiness 7. Fruit medium or below, reddish and pale waxen yellow. Mildly sub-acid but an excellent cooker, and fair for dessert. When fully ripe it is crisp and considered by some as approaching the best. Season, late summer.

Peach. (*Canada Peach* or Montreal Peach.)—Tree very thrifty, upright in nursery, shoots stout and olive color, moderately productive. Hardiness 2. Is grown in central southern Minnesota, where it is claimed to be as hardy as the Duchess. Fruit medium or above, nearly round, sometimes slightly conical, smooth and glossy. Color, when fully ripe, bright straw color. Fine grained, juicy, tender, with decided acidity like the Duchess, but better in quality. Sometimes it has a faint blush which gives it a peculiarly peach expression. Season same as Duchess.

Golden Sweet.—Tree robust, vigorous, spreading, round head, early productive. Shoots stout,

dark, foliage large dark. Hardiness 3 in deep sandy soils, for which it is peculiarly adapted. Fruit large, round, rich yellow, long slender stem, flesh yellow, melting and fine grained. Very sweet and juicy, with fine aromatic flavor, resembling sassafras. Use baking, market and dessert. Season, August and early September.

(I have not seen this tree except in northeastern Iowa, near Delhi, where it was in perfection in the almost clear sands of that locality. It is believed that for such soils, where other varieties so frequently fail, it will be valuable for a sweet apple.)

Hagloe. (*Russian Hagloe.*)—This tree was for some years sent cut by some nurserymen as the Duchess of Oldenburg, which it resembles in leaf and color of wood, aside from this it is entirely distinct. It is evidently of Russian origin. Tree strong, but irregular grower; limbs and shoots very strong and heavy, shoots blunt. In orchard it forms a spreading, flat-topped tree. Hardiness 3 or better. Fruit much like Duchess, but better, less acid. Use kitchen and market. For cooking it is good to very good. Season, August.

Keswick Codlin.—Origin England. Tree good, but rather irregular grower, brown shoots that diverge in a peculiar recurved manner. Hardiness 4, when established in orchard 3 or better. Fruit medium to large, ovate often ribbed, clear pale yellow. Quality very good, especially for cooking. Flesh fine grained and juicy. Is a good and productive market variety.

FALL VARIETIES.

Fameuse or *Snow.*—Straggling medium grower, poor nursery tree in the north, but it is among the most valuable when once established in the orchard, if sound; does not transplant as well as some. Productive and with good care is a constant bearer. Hardiness 4. Fruit medium, flat to roundish; specimens grown in the shade will be nearly green, finely flecked with pale red, like the Janet, but as grown in the sun is heavily striped or clear red, and very handsome; flesh almost pure white, from which it gets its name of "Snow." When fully ripe, especially if allowed to ripen on the ground under the tree in the leaves or grass is juicy, and of the finest quality. One of the best. It will, under favorable conditions, keep till midwinter, and I have seen it in prime condition in northeastern Iowa in March. To keep good it must be gathered early.

Haas or *Gross Pomier.*—Tree very rank and upright grower, which habit it maintains in the orchard, is very productive, but not an early bearer. Hardiness 2. Fruit medium to large, abruptly conical, being drawn down in a peculiar manner to the apex. Yellow, finely striped and blotched carmine and crimson. Quality fair for the kitchen, but somewhat astringent with an agreeable aroma, but not rich. Season, if allowed to ripen on the tree, September and October, but if gathered early will keep through the greater part of the winter. Very valuable for the north.

Wealthy.—Of Minnesota origin by Peter M. Gideon. Tree a moderate grower, somewhat resembling the Duchess, but stronger; will frequently show the slight angles in the middle of a shoot without apparent cause. Early and abundant bearer; Hardiness 2 or better. Fruit medium to large, round sometimes approaching oblate; stem and calyx deeply sunk meeting the eye, pale yellow, covered with clear red when fully colored in the sun. Quality very good, both for dessert and kitchen. The most valuable of all apples of recent introduction, seldom has discolored wood, and is at home in a great range of climate. Season, as grown in southern and central Minnesota, midwinter, but in Iowa and Nebraska late fall.

Utter or *Utters Red.*—Tree upright, moderate grower, and fair to good in the nursery, generally gives a good stand. Hardiness 4. Fruit large to very large, round, slightly ovate, early bearer and annually productive. Is a very profitable fall variety, as its large size and beauty will place it near the head in the market. Bright yellow, nearly covered with carmine stripes, sometimes broken into blotches. Quality good to very good, sub-acid, sprightly, juicy and aromatic. Season, October to January if rightly handled.

Plumbs Cider.—Origin Wisconsin. Tree strong upright grower, dark bark and heavy leaves. Hardiness 2 or 3. Makes a beautiful tree in the orchard, always preserving an evenly open top,

and never splits in the forks. Early bearer, and with age becomes very productive, one of the most useful of the fall varieties. Fruit medium or above, conical, and sometimes quite ovate. Yellow striped with red, which it nearly colors. Quality not rich, but very good, pleasant sub-acid. Season, October.

Fall Orange.—Tree a rather slow but very stout grower in the nursery and makes a very large and excellent orchard tree. Should be grown more than it is. Hardiness 4. Fruit large round irregular, greenish yellow, and pale yellow when ripe. Good quality especially for the kitchen, being too tart for good dessert fruit, though when very mellow is very good.

Season, September and early October. (Sometimes known as Holland pippin.) Is grown considerably in southeast Minnesota and about St. Paul.

Fall Winesap.—Tree a good, strong, upright grower, rather straggling, dark bark and dark shoots. Good tree in nursery and orchard. Hardiness 5. Fruit medium size, round regular, red stripes on greenish yellow ground, good quality, season September and early October. (This is not the same as Fall Wine, nor Sops of Wine.)

Colvert.—Strong spreading in habit, good in nursery and orchard. Hardiness 3. Fruit large oblate. Surface smooth green mixed with light red. Basin and cavity like the Wealthy. Quality good, season, October and November. Good bearer in the west.

Benoni.—Very upright grower, shoots light, brown color, fair grower, succeeds best on strong soils. Productive in the west, does well in eastern Iowa and western Illinois. Hardiness 5. Fruit, medium to small, round conical, yellow and striped and sometimes splashed red. Quality very good to best, season September.

Day.—Originated in Maine, where it is much grown. (Description by R. N. Day.) Strong, upright grower, and needs but little pruning. Hardiness 2. (?) Size medium to large; flat, slightly inclined to be conical; color when fully ripe, a greenish yellow. Better than Wealthy in quality, being mildly sub-acid, sprightly, tender in the highest degree, and very agreeable in flavor. Season, from September 10 to middle of October.

Dyer (*Pomme Royal*).—Tree spreading, moderately vigorous, not very productive in the west. Hardiness 7. Fruit, large round, frequently uneven and angular, surface rough like Swaar, and vein russeted, dull yellow, not attractive, but of best quality. Flesh yellowish, juicy and rich, very tender and fine grained. It is among the best dessert apples grown. It is well to try this in the north, top-worked on some of the hardy stocks.

Maiden Blush.—Tree vigorous spreading, early bearer and productive, is among the most profitable apples grown where it succeeds. Hardiness 10 in nursery and 6 in orchard. If introduced in the north it should be procured from the south, far enough to insure a sound tree, and the tree should be four

years old, and very carefully handled. With these precautions it is thought to be a profitable tree as far north as north central Nebraska. Fruit large, flat or oblate, rich, smooth yellow and fine blush on the sunny side. Season, September to October, quality very good for cooking, but not so good for dessert, having some astringency, and too much acidity. Valuable for market.

Prices Sweet.—Very strong upright grower, both in nursery and orchard. Is a perfect tree in nursery. Hardiness 4 in nursery and 2 in orchard. Its only weakness is like the most of our hardiest varieties: sun scalding where trunks are not protected.

In Minnesota is said to patch blight at the intersections of limbs, no such trouble noticed in Nebraska. Fruit medium, round oblique conic. Yellow, mostly covered with red stripes; very sweet; quality only good. Season, November.

Alexander.—A strong upright grower, good in nursery, and makes a very large handsome tree in orchard. Origin, Russia. Hardiness 3. Has been discarded to a great extent on account of its liability to blight. Fruit very large, oblate conical; red streaked on yellow ground. Both calyx and basin are large and deep; quality poor, flesh is coarse and use only the kitchen. Season, October. It is not a good bearer.

Autumn Strawberry.—Vigorous and healthy in nursery, and makes a fine round top tree in the orchard. Is a good bearer. Hardiness 4. Fruit

medium size, round, and streaked and splashed with light and dark red. Quality good to very good; flesh yellowish, crisp, juicy, acid, with pleasant flavor. When ripe it is apt to bitter rot at the core and spread to the surrounding flesh.

Lowell.—Tree spreading, vigorous; light green foliage and yellowish shoots. Hardiness 4 or better. Fruit large and even size, round, yellowish green, with a greasy or tallowy excrescence, from which it is often called Greasy Pippin or Tallow Pippin. Quality very good. Flesh tender and fine grained and juicy, with yellowish cast, sub-acid, aromatic. Use, dessert and kitchen, and is a fine market variety. Season, August and September.

St. Lawrence.—Tree moderate regular grower with heavy solidly welded branches, attaining great size in the orchard. Of Canadian origin. Hardiness 3, and extremely productive with age. A very profitable autumn variety, and responds quickly to a good top dressing of some fertilizer. Fruit round, large, rarely conical; yellow, with most pronounced dark red stripes covering the whole surface which give it a unique appearance and once seen will never be forgotten. Quality very good, though too sour to suit all for dessert; fine for the kitchen. Season, October.

Jeffries. — Tree healthy, moderately vigorous, shoots slender, early and abundant bearer. Habit diverging to upright. (Its quality should place it in every amateur list.) Fruit medium to large, flat. Yellow ground splashed crimson. Flesh quite yel-

low; fine grained and breaking or melting, juicy, aromatic and delicious. Quality best; use, table and kitchen. Season, September and October.

Mr. Piper says of this variety: "For early fall we have the Jeffries, which is one of the heaviest of bearers. I have taken 4½ bushels off a tree less than 4 inches in diameter. The apples are equal in flavor to a good pear, and are first-class in every respect. Any one who has bought the Jeffries once will buy it again if he can get it."

We have not tried this apple top worked, but think it would be well to try it in some of the crabs and the hardiest of the apples, for the north. Mr. Piper in the same paper says the Wythe Salome and Pewaukee should be top worked, and as the Jeffries is not, we presume that in hardiness it will range about with these varieties, or better.

McMahon's White.—Tree a fair grower, somewhat irregular, shoots and bark light colored and dotted like the E. G. Russet; foliage, large, light green. Hardiness 2. Fruit, large round, sometimes drawn in at the apex, like the Haas, though not so abrupt; color light green and yellowish and sometimes faintly blushed on the sunny side. Quality good; flesh, white and juicy, and pleasant sub-acid flavor. Use, kitchen and market. Good bearer. Season, October to through November. This is generally placed on the winter lists, but keeps about with the Wealthy, or later.

Peerless.—A Minnesota seedling originated in

Rice county; seed planted spring of 1868, from Duchess apple, supposed to be fertilized by Talman Sweet. Original tree began to bear in 1875, and has produced more bushels of fruit than any other tree either of apple or crab in that part of the state. It bore 3 bushels in 1878 and kept increasing till in 1886 it bore 11 bushels. Mr. Harris, the special agent of the government, visited the tree in September, 1890, reported it as in fine condition. Of the quality of the fruit he said in January following, "It is really a better apple than the Wealthy." Season not given but supposed to be fall.

Catherine.—Another Minnesota seedling with a great local reputation. Seed from a seedling apple brought from Canada in 1854, to Houston Co.

This tree is growing ten miles west of the Mississippi, and six south of the Root river, on a high elevation. The spread of the top is about 30 feet; 1 foot from the ground, has a diameter of 16 inches, and has borne as high as 30 bushels at one time.

For fear of misleading let us refer to these wonderful seedlings again. They only show the possibilities of these trees as such, and do not give assurance that they can be propagated and be of value in the same latitude.

WINTER VARIETIES.

Ben Davis.—Tree fine grower, symmetrical, and will yield the largest proportion of marketable trees from a given number of root grafts of any variety.

Hardiness 5 in nursery and while young in the orchard, but when established in the orchard and sound, with age, it is as good as 3 or better. This rating refers to the Missouri valley. East of the great inter-river divide it is very tender in the north, especially after it has come into bearing.

Fruit, large, ovate conic, yellow ground striped with carmine, shaded to mottled greenish yellow on the shady side.

Quality barely good, by some rated poor. Flesh moderately fine grained, not very juicy, very mild sub-acid, and lacks tone in flavor. Season, December to late winter, and under favorable conditions till early summer.

This is the great market apple of the southwest. It is an early and abundant bearer, and if it were some hardier, and as good as Grimes' Golden it would be the perfection of tree and fruit. It should not be grown in the north on very strong soil, but rather poorer ones on the highest lands, and if care is taken to plant sound trees and get them to a bearing age so, they will be found to stand as well as the Walbrige, and nearly as well as the Wealthy. There are trees near Battle Creek, Nebraska, that have been in bearing over twenty years and are still very sound and look as if they might be good for many more years.

Notwithstanding its lack in quality and the prophecy that it would soon be of little value as a market apple ("when people found it out"), it still maintains the lead, though this may not be held

long in the future. Its great beauty, even and uniform size and coloring will make it a hard competitor to crowd off the market.

Winesap.—Tree spreading and moderately vigorous, very dark brown shoots and bark, somewhat irregular. Hardiness 6. Fruit medium to small. As grown in the north it is below medium. Round-ovate, and sometimes flat. Color red to deep red. Quality very good for table and baking, poor for pastry. Flesh firm, and breaking when mellow. Rich acid flavor. Is considered a valuable cider apple in the southwest where it is much grown, and is among the most valuable of the market apples.

Willow Twig.—Tree spreading, shoots slender with drooping habit; foliage and bark light yellow. Hardiness 5. Has the reputation of blighting and liability to injury from sun scald. Trunk should be protected if high, and where planted on high well-drained land there will be little trouble with blight.

Fruit large, round, yellow, faintly blushed and striped with light red. Quality poor. Will do for cooking late in spring, which is its use, except for market where its long keeping quality, and fine size and beauty will always find for it a good market. A fair but not heavy bearer.

Jonathan.—Tree not a very strong grower. Shoots slender, grayish, with rather sparce light foliage. Buds small. Hardiness 6. Fruit, as grown in the north, medium or below. In the

south it is large, round or ovate-conic. Color, waxen yellow, finely covered with blush or finely striped carmine over its whole surface. Quality, best. Flesh, yellowish white, very fine grain, juicy, sub-acid, aromatic with a very pleasant flavor. Season, early winter.

Rawles Janet.—Tree fair grower in nursery, with an upright spreading habit, shoots, slender and taper; grayish olive colored bark; hardiness, 5; fruit, medium size, round or obscurely conic; color slightly mottled green, and, on the sunny side, more or less distinctly striped and blotched light and dull red; quality, very good for dessert, poor for the kitchen; flesh, fine grained, brittle and juicy, very mildly acid; season, late winter and spring.

Minkler.—Named for S. G. Minkler of Illinois, who originated it. Tree very rank grower and very irregular; bark light color, shoots darker with heavy, thick dark green foliage; in orchard it makes a flat top, with heavy drooping branches; very productive; hardiness 3 to 4; fruit, medium to large, round, greenish yellow, covered with light and dull red stripes. Quality, only good; flesh, greenish yellow, fine grained and melting when fully ripe. Agreeable sub-acid flavor: use, market and kitchen.

Rome Beauty.—Tree, thrifty spreading and productive; shoots, slender with a high color; in orchard makes a symmetrical round headed tree. Blossoms late, nearly as late as the Janet. Fruit, large to very large, roundish ovate; surface, smooth, yellow

striped and mixed light and dull red. Quality, good. Use, market. Flesh yellow, coarse grained, sub-acid and lacks tone. Very popular market apple in the south west. Season late winter.

Northwestern Greening.—This apple is of Wisconsin origin, where it is being sought after on account of its fine appearance and reputed hardiness, although the latter is doubted by some who have grown it. However, it is worthy of trial. Size, large, 3 to 3½ inches, shape nearly round, very regular, surface very smooth, often green, but yellow when fully ripe, resembles Lowell. Dots scattering, mostly dark with some very light; basin wide, shallow a little folded or gathered; eye, rather large, open; cavity, medium, regular, a little russet in bottom; stem medium, rather slender; core, large, nearly closed; seeds, small plump, grayish brown; flesh, yellow, rather coarse, juicy; flavor sub acid; quality, good. Season, December to February in Wisconsin. (Report of U. S. Pomologists 1886.)

Scotts Winter.—We have here a variety that is a seedling brought to notice by Dr. T. H. Hoskins of Newport, Vt. It originated near that place and seems to be esteemed in that locality and in some of the northwestern states for the hardiness of the tree and its brilliantly colored fruit. Although it is a little too tart for dessert purposes, it is liked for cooking. It is called one of our native ironclads. My specimens were from Vermont; size, small, about 2½ inches; flat, conical, irregular, surface smooth, light yellow, almost hidden by bright red,

blotches and stripes; dots minute, almost undiscernible, light colored; basin deep, narrow, waved; eye small, closed; cavity, small, narrow russetted; stem, medium to short, slender; core, small nearly closed, seeds, small plump, light colored; flesh, white, with sometimes a tinge of pink, tender, fine grained, juicy; flavor, sub-acid, quite tart, but pleasant; quality good; season, December to spring in Vermont. (Report of U. S. Pomologists 1886.)

Iowa Blush.—Perfect symmetrical, upright grower, both in nursery and orchard; shoots and young trees recurved and olive green color. Under the bark of young thrifty trees will always be found warty excrescences not attached to the trees, but which can be removed, and are nearly as hard as ivory. The outer bark is raised above them, giving the tree a warty appearance. A few other trees, in rare cases, have this characteristic, but this is inseparable from the Iowa Blush. Hardiness, 2; fruit below medium, a perfect ovate in form; very light greenish yellow, shaded and spotted or mottled scarlet on the sunny side. In the middle of these scarlet spots are large white dots which give the apple a unique appearance, and make it one of the handsomest of all apples grown. Quality, for cooking very good to best; for the dessert, only good. Should be kept from the air until ready for use, as it wilts easily and loses its flavor. Season, early winter. This tree is very productive, and its value in the north is what the Rawles Janet is in the south.

Grimes Golden.—Fair to good grower in the nursery. Bark, shoots and foliage, light color. In orchard is a very symmetrical roundish upright tree with heavy foliage; hardiness, 6; fruit medium size, symmetrical, or parallel sides with base and apex flattened; irregular; surface smooth at base, russeted near apex, and when fully ripe a dark lemon yellow; quality best; flesh, yellowish green, fine grained, melting and juicy, with a sub-acid aromatic, spicy and refreshing flavor. Use, cooking and dessert, especially the latter.

Allens Choice.—Tree in nursery strong, upright grower, resembling the Haas; hardiness, in nursery, 5, said to be 3 or better in orchard; fruit, medium, roundish ovate, striped with light and dark red; coarse grained, but good sub-acid aromatic flavor. Season, late winter.

Wythe.—This is a seedling of the Rawles Janet, which it very closely resembles both in tree and fruit, being very often mistaken for that variety. It will be only necessary to say that it is hardier than the Janet, with larger fruit and a little better in quality, and without the tendency of that variety to over bear; season same as Janet. Said to crack and scab as the tree gets age.

Pattens Greening is thus described by the originator, C. G. Patten of Iowa. "A seedling of the Oldenburg planted by us in the fall of 1869, has borne ten years, and in 1888, after all the trying winters, bore fully 5 bushels; stands on trying ground, but made a fine growth; strongly shoul-

dered, and as hardy in orchard as Duchess. Fruit medium size to large, and uniform; color, light to dark green, sometimes shaded with red; flesh white, good eating and a superb cooking apple. Season, January."

Walbridge. — Upright, spreading, symmetrical grower, and equals, or nearly equals, the Ben Davis as a nursery tree. Is a stronger grower, with heavy, blunt, light olive-colored shoots, with frequently heavy pubescence at their ends, where they will be larger than at points lower down. Buds small and very close on the shoots. Hardiness, 3 or better; fruit medium size, ovate conic, light green, with narrow, broken stripes of light and dull red; quality fair to good; flesh greenish white, fine grained, not juicy, acid and lacks flavor; use, market; season, midwinter. A late bearer.

Sutton's Beauty. — Tree symmetrical, upright grower, with brownish, cinnamon-colored shoots; hardiness, 5; fruit, large, handsome, round, regular; surface, smooth, yellow, mottled and splashed carmine; quality, good to very good; flesh, white, tender and breaking, melting when fully ripe, and very juicy; flavor, sub-acid to acid, pleasant, aromatic; use, kitchen, market and table; season, late winter.

Salome.—Originated in Illinois, where it is very popular. This tree has been condemned by the Iowa Horticultural Society as too tender for general planting in the state. This is rather too sweeping a condemnation, as it may be and doubtless is

of considerable value west of the inter-river divide, where it is promising grown on high lands, both in the northern and southern districts of the state. The tree in nursery is a moderately good grower, symmetrical, upright, with a very close top; foliage, light green, large or rather thick leaves, inclined to be ruffly; hardiness, 5 to 6; fruit, below medium size, ovate conic; color, yellow, partly covered with light red, on which are narrow, faint stripes of darker red, very handsome; quality, good; flesh, yellowish white, fine grained, with pleasant sub-acid flavor; use, kitchen and table; season, late winter and spring. This apple corresponds in size, shape and quality to Iowa Blush, but is a better keeper and not so hardy, probably valuable, but should not be planted at present in high latitudes only in amateur lists till it has established a reputation.

It is recommended to be top worked on Whitney No. 20 in northern Illinois.

Iowa Keeper.—Tree, strong, spreading grower; throws out its branches at right angles to the tree; hardiness, 2; fruit, medium to large, round, with flattened ends; eye small, calix open; stem, medium, set in deep, narrow basin; color, yellow, one-half covered with bright crimson; dots, numerous, white; season, midwinter to early summer. (Day.)

White Pippin (*Canada Pippin*).—Its origin is obscure, but is supposed to be Canada. Tree, vigorous, upright, productive; shoots, dark, pubes-

cent; leaves, large, dark green above and downy beneath; hardiness, 4; fruit, large, variable in form, mostly round and fair; color, pale yellow; quality, very good; flesh, yellowish white, coarse grained, juicy; flavor, sub-acid to acid; use, cooking and market; season, early winter. This apple is much grown in central Illinois, where it is hardy, and it is believed that if introduced it would prove hardy in north Nebraska and southern South Dakota.

Cayuga Red Streak (*Twenty-Ounce—not Twenty-Ounce Pippin*).—Tree vigorous, early and prolific, annual bearer, twiggy, like Northern Spy; shoots, slender, highly colored, with large, healthy foliage; fruit, very large, nearly round, surface covered with light red on greenish ground; quality, good; only for kitchen and drying; season, early winter.

Talman Sweet. — Tree vigorous, spreading; in orchard it has the appearance of having been pruned out, as the limbs and twigs are few, though regular and symmetrical; early bearer and moderately productive; hardiness, 3; fruit, medium or above, round, green in fall, turning to fine yellow in spring; quality, very good; flesh, firm, white, very sweet; use, baking and cider. Not good for dessert where a sweet apple is desired, as the flesh is tough and never melting, even when over-ripe. Has the fault of dropping its fruit prematurely.

Pewaukee. — Origin Wisconsin. Tree strong, upright grower in nursery, and maintaining the

habit in orchard. Not an early bearer, and in some localities is not profitable on that account. Hardiness, 6; is on the list for northern Illinois, where it is said to do well, while in the Missouri valley it is not hardy in the north; should be top worked; fruit, large, round, greenish yellow, with dull red stripes and splashes; flesh, very coarse, but pleasant sub-acid flavor; not rich, but generally rated as good; season, early winter.

Roman Stem.—Tree moderately vigorous, productive and desirable for the north. Hardiness in orchard, 4; in nursery, very tender. Trees should be grown far enough south to insure their soundness before planting. Fruit, medium size, round, sometimes conical, yellowish green and somewhat russeted at apex; quality, very good to best; flesh, whitish yellow, fine grained, juicy; flavor, mild sub-acid, rich; use, dessert; season, December and January.

Wolf River.—Tree, very strong grower; hardiness, 6; fruit, large to very large, round or oblate, yellow and covered with stripes of mottled red and crimson; quality, good, with mild sub-acid flavor; season, early winter; sometimes on the fall lists.

Mann.—Has proved too tender so far for any place in the west.

Okabena.—Origin, Minnesota. Said to be a seedling of the Duchess fertilized by the Wealthy, in 1871. The parent tree is still standing and is healthy and productive; good tree in nursery being

an upright grower, resembling the Wealthy; hardiness 1 to 2. Fruit, medium, roundish oblate; early winter and will probably be late fall grown south of latitude 42° or 43°. Color, yellow, striped, splashed and blushed carmine, very handsome. Quality, good. Flesh, fine grained, tender and juicy. Not sufficiently tested to warrant extended planting but is promising.

There is a very great variety of very excellent and hardy seedlings that are being propagated under different names, but it is not thought worth while to describe, for however hardy these original trees may be they do not transmit it to their progeny by any known method of propagating. For this reason it should urge upon the planter and experimenter the advisability of planting these seeds largely, for the regions where apple growing is so difficult.

While it is true that the young trees will in nearly every case be very tender, they outgrow this if properly handled the first two years.

I would plant the seeds in drills, and the first fall in November bend them over and cover quite heavily with some mulch or litter. The next summer carefully examine them and mark those having heavy, good leaves and a freedom from thorns, and at about the same time again in the fall take them up carefully and cover root and branch about a foot deep, and plant in orchard the next spring.

Where good trees from the nursery are suc-

cessfully grown in the orchard we could not afford to start our orchard with seeds, but for the territory named and for the purpose of producing new varieties, this is advisable.

One of the best seedling orchards in the west is that of Mr. Thompson, of Grundy Center, Iowa. While in a bad location, the trees are, many of them, very large, and have astonished the critics many times with their fine, large and good keeping apples, which have taken many premiums.

Some of these have been named and are listed, but not yet established of value beyond older sorts as grown in the nurseries.

NEW RUSSIAN APPLES.

Not having many of these in fruiting we are dependent upon the descriptions and opinions of others. There is no other fruit that has attracted so much attention and elicited so much discussion, and where the conclusions are so varied, and the contestants so positive either one way or the other. After having given this a very careful consideration, my conclusions may not be less positive.

It is evident that many of the most conflicting reports may be harmonized. Some are basing their conclusions upon the behavior of certain varieties against the same with others when the names do not refer to the same apple. There is as yet but a moderate number of all the importations that are distinctly and certainly classified, as established the same throughout the United States. For instance,

some declare that the Hibernal is the same as Lieby, Ostrakof, Glass, Romna, Pendantear, Silken leaf, and Juicy burr, while others claim that they run in families so closely related that these are or may be many of them separate varieties.

That they have as a class been sorely disappointing is admitted by their friends, in this that (1) they are more subject to blight than our common varieties, and (2) they are not hardier (with exceptions), and (3) they have not proved to be keepers, but mostly summer and fall varieties, and (4) they are of poor quality.

If this were given as a deliberate opinion of the *entire lot* it would not be necessary to prolong this chapter, but happily there are exceptions to all, or nearly all, the above.

Another cause should be noticed that has led to their condemnation.

That tree man has seized upon this theme as one showing the finest field for extensive cultivation. He has opened his picture book and made his stake on the "Russians." None know better than the nurserymen how few of these sales have delivered genuine Russian varieties. Even if they have been so, if of the great majority of these varieties, they would be better to be almost anything else. President Morrison, of the Minnesota Horticultural Society, gives an instance of a conversation with one of these brush missionaries who, he said, was "making a specialty of the Russians." He was asked what was his best winter variety

and answered, "I am running the Yellow Transparent for my best winter apple."

As this is one of the earliest of the summer apples, if they were even delivered true to name the purchaser would not conceive an exalted opinion of the keeping qualities of these much discussed apples.

It is the habit of the American people to be very sweeping and radical in their conclusions, either in praise or condemnation, and in the sweeping condemnation that some have given these trees they are sweeping out very much chaff to be sure, but with it some grains of pure gold. This is a matter of little moment. If they have no need of them they lose nothing.

I think it is not claimed that where such varieties as the Ben Davis, Jonathan, Winesap, Roman stem, Grime's Golden, Iowa Blush, etc., are easily grown that there is any use for the new Russians, but they cannot be grown everywhere, and the true test of merit in this matter is: *Are there any of these varieties that can be grown over any considerable territory where any of our other varieties cannot be.* If a single one can be shown that will take such a place, then the time and money used in introducing the whole lot has been well spent. That there are some, and quite a few, of this character there is no doubt whatever.

The principal value of them will be in the extreme north, and especially in the black prairie lands of the Mississippi valley, where the growing

of apples of any kind has been a constant fight, all the way from the seed to the bearing tree, and quite too often a losing fight.

Through the kindness of Prof. Budd, of Iowa, a special list has been prepared for this work including all varieties which are good to best in quality; giving all the seasons of the year; hardy, and as free from blight as our common varieties.

Before introducing this list let us drop a word of caution: To get these varieties true to name it will be better to correspond direct with some reliable nursery, or procure them through the Agricultural College of your state. If the orders are given through dealers the chances are very remote that one, even, will be what is ordered.

Another caution will be, that where other desirable varieties can be grown there is no need of them, and a risk, always, of introducing blight.

In the spring of 1883 a bulletin was issued by the Iowa Agricultural College giving an outline of experiments with, and investigations of, some of the fruits of the steppe sections of east Europe and North Central Asia. Since that time have been made several importations of cions and rooted plants from the parts of east Europe where the summer heat is nearly or quite equal to ours, and they have been sent out by thousands for trial across the continent on our northern borders. The present notes are a summary of the reports received from trial stations and of observations on the College grounds up to date, of a part of the va-

rieties and species under the supervision of Prof. Budd.

Blushed Calville. (22 M.) * * * This at the west will prove more valuable than Yellow Transparent. The tree is much hardier, more nearly free from blight, and the fruit is about as early, as large in size, is handsomely blushed, and it is less perishable and better in quality.

Anisette. (No. 185.) * * * Of the Duchess family and hardier at the North. An annual and full bearer of fruit like Duchess, but finer in grain, less acid and earlier. Will prove valuable over a large part of the United States.

Lubsk Queen. (No. 444.) * * * As hardy as Duchess and noted for beauty and continuous bearing. Fruit, large, smooth, with varied shades of red and pink. Flesh, fine grained, sub-acid and very good for so large a fruit. This is placed with the summer apples because it colors up early and ships well at an early date, but it keeps well at fruit stands and can be easily kept through September.

Longfield. (No. 161 and 57 M.) * * Tree not hardier than Wealthy, but not so liable to sun scald. On dry ground will prove very profitable up to the north line of the state. An annual and full bearer of medium sized yellow fruit, handsomely blushed. Will be popular as it never fails to bear, is not excelled for cooking and jelly making, and pleases all for dessert use. After it has borne two or three heavy crops it should be

manured or the heavy crops of fruit will run too small. Season, autumn, but with very early picking, it will keep nearly as well as Jonathan.

Gipsy Girl. (56 Vor.) * * * A fine tree in nursery and orchard. Fruit, large, smooth and remarkably handsome. A famous train-boy apple in east Europe. Will be prized over a large part of the country. Season, late fall.

WINTER APPLES.

Aport Voronesh. * * * We introduce the Aport of Central Russia from several points. It has been sent out as Aport, 23 M., 4 Vor., and 12 Orel. We have kept these importations separate, but they all appear to be identical. Fruit, large, smooth, yellow, with much red in broken stripes and splashes. Flesh, yellowish white, slightly coarse, sub-acid, aromatic, quality very good for any use. Mid-winter here, and will keep through winter at the north.

Ostrakoff. (4 M.) * * * This is hardier than Duchess and less subject to blight. An early, heavy and continuous bearer, and needs manuring to keep up size of fruit after it has borne heavy crops. Fruit, medium to large, even in size, yellow. Flesh, firm, sub-acid and fine in quality. Mid-winter here, and will keep until May on its north limit of growth.

Aport. (No. 252.) * * This was sent us by Dr. Regel as the true Winter Aport. It is not identical with the Aport Voronesh above noted. It

is proving to be an early and continuous bearer, and promises to be very valuable. Fruit, medium to large, oblate, yellow, with splashes and stripes of red and crimson. Flesh, fine grained, sub-acid, nearly best in quality.

Regel. (No. 169.) * * * This was received by the College from Dr. Regel, of St. Petersburg, under the name of Green Sweet. But a mistake was evidently made as this is not sweet, has a fine color and is a late keeping winter apple. It much resembles Repka Malenka in shape and color, but it is larger in size and of better quality. In season and flavor it is much like Rawles Janet.

Zuzoff's Winter. (No. 585.) * * In the Bulletin of 1890 we did not credit this as a very hardy variety. Our recent reports show it to be as hardy as Wealthy and less subject to blight. It is an annual bearer on account of its very late period of blossoming in the spring. Fruit large to very large, beautifully colored, fine grained, tender, mildly acid and nearly equal to Northern Spy in quality. Season about that of Grimes Golden. In tree it is not hardier than Wealthy and it should be top-worked in trying positions in North Iowa.

Boiken. * * A variety imported from Transylvanis. It is now a favorite variety in Eastern France. The tree seems to be as hardy as Wealthy, and is an early and continuous bearer. Fruit medium to large, yellow, with handsome carmine stripes and splashes. Flesh snow white, fine grained, sub-acid and best in quality. Season, late

winter. Will be very valuable for top working at the north.

THE CRAB APPLES.

'In the past we have propagated and sent out for trial some of the most promising varieties and hybrids of the Siberian crabs. But at this time we have decided that their place is taken by such varieties of the Russian apples as the Longfield, Marble, Recumbent and other sorts.

"The Longfield, for instance is superior to any of the crabs for jelly, marmalade, pies, sauce, etc. It is also a better bearer and its fruit has a value for dessert use. The only crab we now pronounce valuable is the one known as Virginia crab, which is only valuable as a stock for top-working, but it is not as valuable for this use as the members of the Hibernal family."

GENERAL NOTES.

"It will be urged by friends who have had considerable experience in growing and fruiting the east European fruits that we have omitted some of the varieties they have found most valuable, and included a number with which they have not been wholly satisfied on account of blight or some other cause.

"But it must be kept in mind that this is a report on the varieties and species we will distribute at this time, and that varied soils, elevations and exposures bring us varying reports. The notes as now given are a summary of the behavior on

our own grounds and on the grounds of a large proportion of our reporters over an immense area of our country."

We cannot too strongly impress the importance of planting apple trees on the highest and dryest land available, and furnishing no protection on the north and west. If the elevation is not more than 10 feet above the general level of the adjacent lands, it is a great advantage in furnishing air drainage, equalizing the temperature in summer and lessening danger from frosts in the blossoming period.

Another benefit resulting from the selection of dry soil is that it permits deeper setting, which is a protection to the tender roots we are compelled to use in root-grafting.

If compelled to set the family orchard on low, black colored soil, get our selection of best varieties for such soil, set the trees shallow and ridge up for drainage and root protection.

We sent out low headed trees, and our advice is to keep them low. In setting, lean the trees at a strong angle toward the one o'clock sun. They will have an awkward appearance at first but they will soon become erect.

In the above lists, three stars (* * *) indicate the variety to be hardier on suitable soils than the Duchess; two stars (* *) indicate the variety to be hardier than Wealthy, except as noted in special cases. One star (*) indicate the variety to be hardy as Roman Stem, except as noted in special cases. (*Russian apple report by Prof. Budd*).

Excelsior.—This with the three following is a seedling originated by Peter M. Gideon, of Minnesota, the originator of the Wealthy. Tree from Wealthy seed, strong upright grower, said to be as hardy as Duchess. Fruit, medium to large. Color, light yellow; striped with bright red. Quality, best. Season, September.

October. — Strong grower, and profuse annual bearer of large red apples, clear acid, a first-class culinary apple. From crab seed.

Gideon.—A good rather upright grower; fruit, medium size to large, yellow with a vermillion blush on the sunny side. Quality, mild sub-acid and very good. November.

Peter.—This the originator calls "the best of all apples." The description following, like those before, is his, and some allowance will be made for the possible partiality which might exist on this account. "Origin, Wealthy seed, and in form, size and color the exact duplicate of that apple, but differing in flavor and season, keeping from 4 to 6 weeks longer. The fruit adheres well to the tree, and in tree it is a little hardier than Duchess, yet we would not recommend it as far north as some of our extra hardies, though it stood top grafted in 1884-5, where it made 4 feet of growth and bore apples the following season near the Wealthy and some of the Russians that failed to bear an apple. At the Iowa state fair in 1886 the Peter apple was pronounced by the judges to be superior to the Wealthy in every respect."

In a private letter Mr. G. says that this apple was not fully tested when the list was made and that the apple is a keeper; keeping in his cellar when picked early, till August. It will be remembered that the Wealthy as grown at his place is a fair keeping winter apple, while in this latitude it is a fall apple, therefore it will not be best to rely on this as a winter sort when grown in 42 and below. As to the hardiness of these apples there can be very little doubt, as the mercury there occasionally touches 45 below, and 35 very often.

PEARS.

It is better for the ordinary fruit grower for home consumption to plant pears very sparingly, as they are not, as a rule, successfully grown in any part of the northwest east of the mountains. There are plenty of these varieties that are hardy enough so far as ability to endure cold is concerned, but when about the bearing size, they are very apt to die with fire blight, or pear blight. This disease is claimed by the scientists to be different from the true apple blight, but that it will spread from one of these trees to the other, there is no doubt in my mind.

Flemish Beauty is the best of all the older varieties, and the freest from blight, is a moderately strong grower, branching to a spreading top, early bearer; productive, and of very good quality.

Bessimianca.—This is of Russian origin, and less liable to blight than the foregoing, but inferior in quality. Tree a slow though regular grower,

with very dark bark, and dark heavy foliage. Fruit medium size, green or faintly blushed or russeted; seedless.

Kieffers Hybrid.—Cross, Sand pear and Bartlett. Tree a very strong and very upright grower, yellowish bark and glossy good foliage. It is tender while young in northern Nebraska, but becomes hardier with age, and will probably be grown to some extent there. Fruit is large and handsome. Not of best quality, but will always demand a good price for market, and is, when fully ripe, fair for dessert. Not as subject to blight as Flemish Beauty.

Idaho.—This has come to us from its western home as a priceless gem, but it has proved here to be tender and subject to blight. It is valuable where it originated.

Kurskaya. (392.)—Said by Prof. Budd to be very hardy, and free from blight on all soils. Fruit Bergamot shaped, medium size and excellent quality. Russian.

Mongolian Snow Pear.—This is hardier in tree than Flemish Beauty, and its leaves are always clean, handsome and perfect. On dry soil it will prove valuable up to the 42d parallel. It is a regular bearer, even in such unfavorable seasons as that of 1892. Fruit above medium in size, and when ripened in the house it is much better in quality than Kieffer, Le Conte or any of the Chinese pears we have tasted grown in the south. It should be ripened in the house and can be kept until late in autumn. (*Budd.*)

Whitney No. 20. Apple. Called "Whitney Crab."—Tree, a moderate very upright grower; shoots, dark and stout; foliage heavy dark green; hardiness 2 in nursery, 1 in orchard; fruit, small to medium, conical, yellow nearly covered with red, faintly striped; quality very good; season, August and September.

Hislop Crab.—Tree, strong upright grower, making a round head in orchard. Hardiness, 1; fruit, nearly 2 inches in diameter, conical, dark red, almost black, quality good until too ripe, when it becomes mealy and tasteless; season, October to November.

There are probably 50 or more varieties of crab apples and hybrids which are crosses between the apple and crab that are of more or less value; some of them for high northern latitudes are very valuable, but as a class they are very much subject to blight, and their dissemination should on this account be discouraged. The Martha, Gen. Grant, Strawberry, Minnesota, and Briars Sweet are reasonably free from it, but all are too well-known to require description.

Yellow Transparent.—(This was omitted in its order and inserted here.) Tree, fairly good grower; shoots yellow; foliage light green; hardiness, 2 to 3; said to blight badly south and east but has not blighted here to any great extent; is an early and good bearer. Fruit medium or above; color, golden yellow; quality, very good; season, August.

CHAPTER XVI.

Evergreens.

THERE is a very general impression that these trees will not grow successfully west of the inter-river divide, especially in the north. It seems to be true of many varieties that they cannot be grown as easily, and do not generally grow as rapidly in this location as in places further east, and along the Mississippi valley. For instance the Norway Spruce, which is among the best and fastest growing of all in northeastern Iowa, is almost a failure in northeastern Nebraska and southern South Dakota. On the other hand, the Scotch pine seems to do as well or nearly as well here as in the more favored eastern locations. The western cedars also do quite as well, but are not quite as rapid growers. There are several other varieties that do well here and will be described hereinafter. The principal reason for the impression that we can not grow these trees here is that they have had, in transplanting such inexcusably bad treatment that the surprise is, more that any grow, than that some or many die.

It is in the first place of little use to bother with any other than a nursery grown tree to start with,

and this may not be what we are looking for either. If it has been transplanted several times, or cut under, so as to cause it to throw out a new system of small roots from near the tree, it is a proper tree for our purpose, and with careful handling we will make a success in changing it from the nursery to its new habitation. The object we attain by this transplanting or root pruning, is the cutting off of straggling long roots and compelling a new growth that we can secure when we lift it. If we could practically get all these long roots and preserve them carefully, the tree would be assured to grow as if we had given it the above described treatment, but this is so near impossible as to be so practically.

A tree for the lawn should be any where from 3 feet upward, according to the price the purchaser is willing to pay, and the risk he is willing to take with it. After a tree is 3 feet high it is as sure to grow as it will be at any time after, and as it gets more age and size the chances are that we shall get a lesser proportion of roots to the top and thereby decrease our chances of success. Unless staked solidly after planting, too, the larger trees are more apt to be loosened by the winds.

Another cause has added to the supposed uncertainty of introducing them, which is the practice of planting them in the lawn or front yard in the grass. This is where they want them, but they do not want to grow there, and will not without many precautions being taken. In many cases

this yard has been raised by earth from the bottom of the cellar, and as the bottom comes out last this top soil is apt to be too poor to grow even a fair crop of weeds. "Whatever is worth doing is worth doing well" and it is better to plant but a few trees and do it well than to plant many, half do it and lose the most of them.

In making these suggestions, and giving the directions that will follow, it is assumed that the tree is a good one and that the nurseryman has done his duty, which is not by any means the case always. Sometimes trees are sent out in such bad condition that no treatment could possibly save them.

If every one who reads the foregoing would heed it carefully, and follow the directions, there would be little loss sustained on account of the planter, but we feel like repeating, in order to give emphasis to this matter of protecting the roots of evergreens while out of the ground.

It seems that the ordinary planter does not believe that the evergreen grower has not exaggerated in the requirement of absolute protection.

When he says that under some conditions an evergreen will be killed by an exposure in the sun of ten seconds or less, it is not thought that it is to be taken literally, but to mean that more care must be exercised in handling them than the ordinary fruit trees. It does mean literally just that, and if the instructions are followed, thousands of trees will be saved where they are lost by pursuing a less rigid attention to the instructions.

Dr. Lyons says: "We must not even allow the earth to dry on the outside of the evergreen roots, if we want the trees to live."

There are plenty of these trees of the best varieties that will do exceedingly well in the northwestern part of Iowa, northeastern Nebraska and the whole of South Dakota and Minnesota, and when they are placed in the hands of the planter in good condition, and then handled by him as directed, they will be extensively grown as they should be.

Fruit and forest trees may be handled more carelessly and recover, but not so with the evergreen. The sap is resinous, and by some chemical combination is held in solution in the fluids so long as they are kept moist, but almost as soon as the outer surface of the roots and rootlets become dry, this resin is deposited in the cells which are thereby clogged, and the tree is as truly dead from that moment as it will be in a month after it is planted when the last needle has dried up and gone, and it stands there a dry and red monument to what was once a "thing of beauty."

There is another cause of the failure to meet evergreens here as we do in the Mississippi valley; that is the lack of adaptation of varieties to our climate. We have been groping in the darkness for more than a hundred years; longer than the children of Israel were looking for the promised land. We have tried to acclimatize to our dry atmosphere the eastern trees, and those from foreign countries,

where the air is constantly humid. Where the conditions even approximated those of the home of the tree, in this respect, there has been the nearest approach to success, as in the Austrian pine; and where these conditions were the most dissimilar, the failure has been the greatest; as in the Irish Junipers. The white pine is an illustration of the value and vitality of our northwestern kinds, but this has been neglected, for the reason that it was "too common," exactly what should have crowded it to the front.

Now, and strange enough quite recently, we have discovered right here at home at the west of us, trees that are unapproachable in hardiness by any of the eastern or foreign kinds, and *peerless in beauty*. The scholars; the art students of the world; the critics of exclusive New England; the poet, the botanist, all worship at these shrines of beauty. Their loveliness cannot be described in words; one must see them to appreciate them, and if that one has one little spark of love of the beautiful, it will be kindled into a grand fire of devotion when for the first time they stand face to face. These are principally the western White spruce, the Pungens; Concolor and Douglass spruces described hereafter.

At present the scarcity and great demand for these trees hold them at high prices, but this will soon change, and when they can be procured abundantly and cheaply, all other kinds will retire before them, and the revolution will be an accomplished fact.

These hardy and beautiful evergreens are striking illustrations of "the eternal fitness of things."

For a grove of evergreen trees they may be from 1 to 1½ feet high without the necessity of shading, provided they have been transplanted as described. Better always send to the nursery where you know they are grown, than to give orders to unknown parties. This may sometimes do just as well but one time with another it will lead to disappointment. If a smaller tree of the ordinary kinds is to be used for the grove it will be safer to shade them in some artificial manner. It is not good to plant them as some do in an improvised nursery, along the north side of a row of willows, as they will reach out their roots and rob our plants. It is well, however, in such a case to plant them in nursery rows, running north and south and quite closely in the row with a view of protecting them partially by the shade of each other. Trees of the size last described can be planted in such a row about 1 foot apart. In massing them in this way they are more easily shaded, and after two years' cultivation can be planted out where they are to remain. In this way we shall get a full stand in the grove.

It will not be necessary to give minute instructions for handling them when first coming into the hands of the planter, he will keep in mind at all times that the roots must not be dried for a single half minute, it is not necessary, and any one can find a way to avoid it.

If trees are for the lawn it is still a good plan to plant them out first in some cultivated ground for say, two years, when advantage can be taken of a favorable time to remove them to their permanent homes, and it can be done with such care as to make success a certainty.

This treatment is not absolutely necessary, as they may with proper care be introduced to the lawn at first. To do this we must dig a hole considerably larger than the roots seem to require, and if the soil is not good carry it away and use earth from some other place where it is good for filling back. When refilled to the required depth, set in the tree with the roots in natural positions, and be sure that the earth is thoroughly worked in among the roots to fill all the interstices. This must be done with the ungloved hand. No water will be required if the earth is naturally moist so as to readily "pack" in the hand. If not it must be made so.

The earth being all back in its place and the roots all nicely covered to the depth of 4 or 5 inches, tread it as hard around the roots as it can be made by the stamping, and weight of a heavy man. It will not get too solid. Some use a paving maul, commencing as soon as the roots are sufficiently covered to avoid injury, and pounding as solidly as it can be done, but usually the weight of a man vigorously applied will be sufficient.

If in digging the hole it is found that the ground is very dry it should be filled with water and

allowed to dry away a few times before planting. For this reason it is well to have the holes dug some time before the trees arrive.

When they are planted with little care in the sward and fail, the nurseryman is assured that they were well watered all summer. This he thinks is true, but in reality it is more than likely that not one little drop of water has reached one root during the entire summer.

I have often likened this watering by throwing on a pail of water to throwing water on the roof of a house to water the house plants within. Try it sometime, throw down one pail of water on the sod, and after it has soaked away we shall find that it has soaked down only from 1 to 2 inches.

To water these trees in such a place we must prepare for it before the tree is planted. Bore two holes down about 2 feet, and about 3 feet apart, with a post auger, or other implement, and plant the trees between them. These holes may be filled with any coarse litter, brick bats, or cobble stones, and about once a mouth during the summer, if there is not a sufficient rainfall, fill them with water and after soaking away fill once more. A board may be placed over these holes to prevent accident as well as to fill them, only they are apt to be removed.

Shading will be found beneficial, or rather protecting from the severe drying south winds. This is done easily by nailing together a few pieces of old boards into a square shield some larger than

the tree is high. A stake is then driven into the ground on the south side of the tree, quite closely, and leaning heavily to the north, to which the shield is nailed. This is a very important precaution, and is of little trouble. These shields can be prepared at any time before the trees arrive, and if small trees are to be used one wide board will answer.

Some have been successful by using a barrel with the heads knocked out and a few staves also displaced on the north side. If staked up a few inches from the ground it will answer, but there is danger of placing it in such a shape that the hot sun will get full force into the barrel in a still day, and the protection be worse than nothing. The flat square board shield is the better. These will not be required there but one year, when they can be safely removed.

The artificial shading for the small row of trees may be made by setting small stakes at intervals in the row, nailing crosspieces to their tops, and then nailing a wide board to these, or branches of trees, or a lattice of corn stalks or lath.

Pruning or Cutting Back is done for the purpose of lessening the evaporating surface of the foliage to correspond with the loss of roots. It also will generally add to the appearance of the tree to shorten it in all around. It will do no harm to cut out the buds, even if the center shoot on such trees as the spruce and balsams are removed by accident or otherwise, new buds, called adventitious, will be

produced from the cambium layer under the bark and grow through it and replace the lost member. This shortening in should be done severely. Suppose a tree has a diameter of head of about 2 feet reduce it to about 1 foot, cutting so as to bring the tree into a symmetrical form.

If you have a hedge of any of the evergreens that is irregular, prune it to the desired shape, but do it while in the growing season, so as to stunt it and thicken it up.

Many evergreens make all their season's growth in a month or less, growing very rapidly during this time, frequently 2 inches per day. These are such as the spruces, pines and balsams, while the Cedars, Arbor Vitæs and Junipers grow like a deciduous tree through the most of the season.

Growing Evergreens from Seed is only performed successfully by experts, and is not profitable unless grown in such quantities as to warrant the planter in devoting his whole attention to it. These seeds mostly germinate very readily, but are destroyed by a hot sun in a short time. They require some sun, but it is admitted to them through lattice work, or screens of some kind that will alternate sunshine and shade during the day. Lath frames are made for this purpose, 4 feet wide by about 6 or 8 feet long, the space between the laths is the width of a lath, and the beds 3 to 4 feet wide. These beds should be run east and west, so the lath will be north and south, otherwise some

of the trees would be constantly in the sun, while others would be shaded the same.

Some seasons are much more favorable for doing this work than others. When we have frequent showers followed by hot sunshine, and hotter winds they are almost sure to "damp off," unless extra care is used to prevent it. Damping off is the killing of the young plants at the ground surface, while the roots and tops are all right. This does not occur when they are self sown under the parent tree, and it is supposed that the thick bed of needles which always is found there is the secret of this. We may take a hint from this and cover our seed beds, as soon as the seed is planted, with these needles to the depth of a half-inch. The plants will find their way through. We have used coarse sawdust with fair results, but the nearer we can approach nature the better.

The seed should be sown quite thickly, and very lightly covered. The beds should be prepared by working the earth as finely as possible. Some sift all the earth that they use through a sieve of about 18 meshes to the inch. When the beds are so prepared, and the ground smoothed and patted level the seed are sown, and covered by sifting on more earth till they are covered to the depth of about ¼ of an inch when it is patted down again, the needles applied, and this is ready for the germination. The screens should not be placed on till there is a show of plants pricking through. Should the weather be very dry after the seeds are planted, it may be

necessary to water, as the seeds being planted so shallow must be kept in moisture to secure their growth.

These plants will remain in the seed beds two years, when the strongest will be removed and the weaker ones allowed to remain another year. They are removed to the open ground and there shaded as has been before described.

A light, sandy soil, well mixed with vegetable mould is the best for these seed beds, and if the soil is tenacious, it is improper and should be mixed as above. It will be time well spent to get leaf mould that is fine and well disintegrated and mix with sand, and then mix again with about equal quantities of this heavier soil, where such, or similar soils are not at hand for the beds.

The practice of Robert Douglass was to shade with artificial bowers, made by setting posts in the ground standing about 8 feet high; to these are nailed crosspieces to support boughs or trees,which are then placed on in sufficient quantities to make a natural broken shade.

In the ordinary lath frame seed beds, it will be well to set small stakes along the edges, to which will be nailed fence boards resting upon the ground on which the lath frames will rest.

A very small space will grow an immense number of these trees, and it has occurred to me that these beds for small plantations might be made in boxes and kept under cover in a well lighted

building. Here the sun, hot winds and supply of rain could be controlled.

A pound of Norway Spruce seeds will sow a strip about 4 feet wide by 20 in length and will be about 58,000 seeds.

The following table compiled by Mr. Douglass will give the number of different seeds to the pound, and will be a guide in sowing:

SPRUCES (ABIES).	
A. Normanniana, Nordmans fir	8,000
A. Pectinata, Common silver fir	8,000
A. Pichta, Siberian silver fir	40,000
A. Fraseri, Frasers Balsam fir	45,000
A. Canadensis, Hemlock spruce	100,000
A. Excelsa, Norway spruce	58,000
A. Alba,, White spruce	160,000
A. Concolor, Colorado spruce	
Picea pungens, Colorado blue or "silver" spruce	110,000
Pseudotsuga Douglassii, Douglass spruce	45,000
CEDAR.	
C. Atlantica, African Cedar	7,000
PINES (PINUS).	
P. Cembra, Cembran pine	2,700
P. Strobus, White pine	20,000
P. Austriaca, Austrian pine	28,000
P. Silvestris, Scotch pine	69,000
P. Laricio, Corsican pine	33,000
P. Rigida, Pitch pine	66,000
P. Pinaster, Sea side pine	12,000
P. Ponderosa, Yellow pine	16,000
LARCH (LARIX).	
Larix Europa, European Larch	70,000
ARBORVITÆ O. (THUJA).	
T. Occidentallis, American arborvitæ	320,000
ARBORVITÆ ORIENTALLIS (BIOTA O.)	
Biota Occidentallis	33,000
PEAR.	
Common seeds	12,000
Apple	12,000

Scotch Pine.—Is one of the most satisfactory of the coarser kinds and is very easily transplanted. At one time it was considered as a perfect tree for shelter belts, and even for ornament had a place with many. Time, however, has proved it to be less valuable than was supposed. Its fault is in becoming ragged and unsightly after it has stood about 20 years. It is when young very vigorous, and when pruned back occasionally to keep it within bounds is very handsome, and will for these reasons still occupy a prominent place in the lists.

White Pine.—Is the timber tree of the great northwestern forests, and for this purpose it has no rival. Those who have been brought up with it hardly appreciate its beauty, as the New Englander does not the *Hemlock.* He has become so accustomed to it, and perhaps fought his way to a very poor farm by years of hard toil over the ashes of these trees. It is nevertheless among the most beautiful of all. No other tree has such soft and feathery needles; no other tree can make quite the mournfully delicious music, as the wind sighs through its branches, and the manner in which the long lithe swaying branchlets pack together on the wind side to make it "air-tight" is peculiar to this tree alone. Long live the white pine, the great North American evergreen. It is one of the saddest commentaries on the greed and destructiveness of man, that this magnificent tree in its natural forest is slowly but surely fading away before his devastating and triumphal march. The white

pine forests of New England are of the past, and if the present rate of depletion in the northwest is continued, which it is hoped it will not be, many are living now who will see the last giant fall, and the last immense raft of logs float slowly down the Mississippi. Even now the devastation has reached such a state that the climate of that region is much changed. Where the beech, hickories and pecans grew readily within my memory, they now barely maintain their existence.

It is believed that this tree has been of greater value to mankind than any other, and its perpetuation in large tracts is the duty of mankind in return. It is readily grown, and over a very wide area, adapting itself to more different soils than any other conifer.

"Ours is no seedling, chance sowed by the fountain,
Blooming at Beltane, in winter to fade;
When the whirlwind has stripped every leaf on the mountain,
The more shall Clan Alpine exult in thy shade.
Moored in the rifted rock,
Proof to the tempest's shock,
Firmer he roots him the ruder it blow;
O that some seedling gem,
Worthy such noble stem,
Honored and blest in thy shadow might grow."

Austrian Pine.—Is so near like the Scotch, as to be distinguishable only by those habituated to seeing both, when the difference is marked. The branches are heavier and more rigid, and the general expression is more rugged and coarse. The buds are quite different, the former being lighter colored, sometimes so bubescent as to be

nearly white; plump at their base and running to a slim, sharp point, while the latter are longer, blunt and darker colored. It is not hardier than the Scotch pine, but holds its age better. It is considered very valuable in its native home in the mountainous parts of Austria, where it grows to the height of 150 feet in some cases.

Yellow Pine (Pinus ponderosa) Dougl., var. *scopulorum* Engelm.—A medium-sized tree with reddish bark, and a yellow, rather resinous wood. The leaves are from 3 to 5 inches long; and are in twos or threes. The cones are 2 to 3 inches long, and ripen in the fall of the second year.

This interesting tree, which occurs so abundantly in the Rocky mountains, is the only pine native to Nebraska. It forms quite dense forests in the northwestern and northern portions of the state, extending from the Wyoming line along Pine Ridge and the Niobrara river to Long Pine creek in Brown and Rock counties. It occus also on the North Platte river as far eastward as Deuel county. In the Loup valley it originally grew in many canyons, and remnants still occur in Valley, Greeley and Custer counties. It appears to be wanting in the Republican valley.

This is one of the hardiest of the pines. Fine trees occur abundantly upon the sides and summits of the rocky hills of the north and northwest portions of the state. Good trees may be seen in Dawes county, growing in the tough prairie sod, with nothing to protect the trunk or roots from the

heat. A study of the tree in its native habitat shows that it requires very little moisture either in the soil or the air. It appears to be one well suited for planting in the central and western portions of the state.

This tree grows in the higher altitudes of the state, ranging from more than 5,000 feet above the sea on Pine Ridge (in Sioux and Dawes counties) to about 2,500 feet on the Niobrara (in Rock and Keya Paha counties). On the North Platte it ranges from nearly 6,000 feet (in Scott's Bluff county) to about 3,500 feet (in Deuel county). In Custer county it grows at an elevation of about 2,500 feet, while in Valley and Greeley counties it descends to about 2,000 feet above sea level. (*Univ. Bulletin* No. 18. Prof. Bessy.)

This tree must be handled with great care as it is not easily transplanted.

Mountain pine. (P. Montana or P. Mugho).—Is a dwarf species found growing throughout the Rocky Mountains, and in Montana. Its foliage, or needles are like the Scotch pine, and its expression is that of a dwarf tree of that species. It grows but a foot or little more in height, and spreads out by the weight of its own branches bringing it to the ground. It holds its color well in winter, and is valuable for such situations on the lawn as require evergreen bushes of this kind.

Red Cedar.—A medium, rather slow growing tree that is well known. There are two species found in the west, that, although quite closely

resembling each other, prove to be practically very different, as that from the north, sometimes called Platte river or Niobrara river cedar is entirely hardy, and among the most valuable of all the evergreens for a hardy wind break, while the southern cedars are tender in the north. The objection to it for ornament is its discoloring so badly in winter when it becomes unsightly. Its timber is valuable for posts, or other uses that require an indestructible material. Fence posts have stood in sandy lands for forty years, and been still quite sound.

Silver Cedar.—This is a species from the Rockies, and like so many of those mountain evergreens, has the same silvery cast, which makes it quite distinguishable from the foregoing. It is not hardier, but holds its color better in winter, and is a more beautiful tree at all times.

American Arborvitæ.—This makes the best and largest trees of all the Arborvitæs, though there are others that, for ornamental purposes, are superior. The Arborvitæs do not have a foliage of needles like the other evergreen coniferæ, but have a two-edged branchlet, with inbricated leaves, is pungent, and the aroma from the bruised leaves is pleasing. It stands shearing into any desired form, and for this reason is much used in ornamental architecture. In its native state it grows well up to the Arctic ocean, generally in low or swampy places, where it attains a height of 40 to 60 feet, and is much used for telegraph poles. Is fairly

successful in the west, though on dry soils and dry exposures it grows slowly, and browns considerably in winter.

Siberian Arborvitæ.—This is a variety of the above, has darker foliage, is more compact, and holds its color better in winter. It grows very slow, and is useful on the lawn where trees or large shrubs of this sort are needed. It has no connection with Siberia.

Globosa Arborvitæ.—Called also "Roundhead." Is in habit much like the foregoing, but much more compact and symmetrical, being frequently almost perfect globes without shearing. It is lighter color, and valuable as a lawn tree, seldom growing beyond 2 or 3 feet in height.

Pyramidallis Arborvitæ.—This is one of the best of all these sports from the American, for ornamental uses. Its habit is sharply upright, trees 10 feet high, being naturally but 2 or 3 feet in diameter at the ground. It holds its color as well as any and better than the most. It has a habit of sending up several central stems, but they do not show as they hug as close to the main body as if they were tied there. It should be in every good lawn, and will always attract attention and admiration.

This variety like all the other sports is propagated mostly by layering, or from cuttings with bottom heat. There is another tree of the same name on the foreign lists that reproduces from seed. We have the plants but a foot high. It seems to be

hardy but browns worse if possible in winter than the red cedars.

Norway Spruce.—This has been in the near past perhaps the most popular of all the spruces. Bryant says it is more valuable than either the White or Black, and Michaux says it grows to the height of 150 feet in its native country, and requires 100 years to mature. As an ornamental tree in the State of Illinois and the eastern half of Iowa it is, when young, or was before the advent of the spruces from the Rockies, without a peer, where a grand stately tree of large size is required, but after passing twenty or thirty years it loses its symmetry, becomes ragged and unsightly, measureably, in the locations described, but to a very marked degree in the Missouri valley and west, where it has not the quality of thrift and beauty even while young.

White Spruce.—This is so much like the Norway that one accustomed to handling both might not see the difference, yet it is a distinct species and the difference easy to see when the attention is called to it. In Nebraska it is a very much better tree and much hardier and more valuable in every way. This is called the "White Spruce of Wisconsin". There is another variety of this, or it is claimed by some a distinct species, which is not established, and not probable. It will be described under the name of the following.

Black Hills Spruce.—Foliage is much darker, and more silvery than the foregoing, a slower grower, and the expression of the tree is entirely

different, being more rigid, and closer topped. Another important variation is in its ability to stand unaided where the Wisconsin variety which is very hardy, frequently fails. It is probably a seedling that has in some manner wandered away to the Black Hills country, where in the last hundreds or perhaps thousands of years, it has in conformity to the law of the survival of the fittest been adapting itself to that climate, until now it stands before us as a practically distinct species, but has not and never will lose its botanical identity. It is one of the most valuable and should and will be largely planted.

Concolor Spruce of Colorado.—This is one of the most beautiful of the Rocky Mountain spruces, having but two rivals, one a peer and the other a superior. We quote and condense a description from the Boston *Congregationalist*: "The tree with that bright foliage is the Concolor. As the name indicates it is even colored, the same the year around. But you say, 'What a marvelous beauty this has, ermine and emerald blended. Such a sheen; a tree dressed in glory! What is it?' It is a robe of matchless beauty the Great Horticulturist has given these trees, making them the most attractive of any thing on earth. They are held in reserve for these latter days, when nature and art unite to make home and lawn and landscape so attractive to the eye and taste. Note the contrast of this rare color with the deep green of the pines. They are true to their nature—some trees put on

wonderful beauty while young; but these retain their attractiveness down to old age. But in order to see these trees in all their glory, you should see them while they are bearing their cones. All are dressed in their marvelous attire of silver and green. On one tree the cones are of a deep red purple. What a contrast to the other hues—another has cones of lightest green, and another contrast. The cones grow erect at the top of the tree, and are perfect in form, about the size of an ear of Sweet corn. As they mature these colors seem to deepen, and then from the cones that clear gum exudes; the sun shines, and it seems almost too beautiful for earth. I note that these trees do as well at the east as they do in their own habitat and you will soon have these mountain treasures there. I have tried selecting seeds from the rarest specimen and find that among the thousands now coming up, most of them fairly sparkle with silver."

The above description was evidently written by a lover of trees, and while it is somewhat florid, it is not overdrawn, as words are poor for painting a beautiful tree or flower. This description will apply to the Douglass, and with greater force to the Pungens, the most beautiful and hardy of all.

Douglass Spruce.—In habit like the hemlock from which it acquired its botanic name, Seudotsuga, Tsuga being the hemlock species.

Seen at a distance good specimens are taken for the Pungens, and it is said that the specimens growing at the greatest elevations produce the

greatest proportion of the silvery tinted specimens.

It is a very rapid grower, somewhat inclined to

DOUGLASS SPRUCE

be straggling like the European larch when very young, but when they are 1 to 2 feet high they stiffen up and grow vigorously. In hardiness will rank about with the Norway spruce.

Colorado Blue Spruce. Or Colorado Silver spruce (Picea Pungens).—This tree was sent out from the Rocky Mountains where it was found growing in

COLORADO BLUE SPRUCE.

the best perfection on the eastern side, but on the north sides of the hills and peaks, and at great elevations. The oldest tree I have seen stands in Pilger, Nebraska, on the farm of I. R. Layton, and is supposed to be about fifteen years, possibly more. It is a very silvery specimen.

Douglass tells of specimens in Massachusetts, Illinois, Iowa, Kansas and Nebraska, that are 20 to 30 feet high. In color they range from dark to light green, and from light frosty to deep blue.

The following is copied from Hill:

"This is the king of all the spruces, clothed in royal robes of silver and sapphire, a very Kohinoor among the gems of the Rockies. It is a child of the storm king, growing at an altitude of 8,000 to 10,000 feet above the sea level. It is generally found where there are deep gorges, or on the north of the ranges. We would naturally suppose that it would not endure a sudden change, or thrive in a hot climate. There are fine specimens growing in Washington and also in North Carolina.

"The question arises, since it is not found on the lower altitudes, or among the foot hills, why does it endure such a diversity of soil and climate? The answer is, it could not possibly grow there. The Douglass and Ponderosa and Concolor, all have large seeds and send out a strong plant, and therefore they are found lower down. Pungens seed is small, 110,000 to the pound. In the higher altitudes are frequent showers, and often moss in the woods, and the ground is seldom dry. It is not hot enough to kill the plants, and so, on the north side of the hills and ranges, nature has provided for their propagation.

"The cone of the Pungens is about one-half the size of the Norway, and the needles are short and sharp-pungent, hence the name. They are polished like glass."

The length of the needles as given above is not as I would give it, they in my specimens being much longer than the Norway.

This was formerly called Menzies spruce.

Hemlock. Abies (or Tsuga) Canadensis.—A very beautiful tree and should be in every lawn where they are hardy enough to stand. Holds its color well through the winter, and like the White pine is very soft and flexible. Mehan says, "It would not be exaggeration to pronounce this the most beautiful of all evergreens." But this was in Pennsylvania, where the climate was just fitted to it. It does not do so well in dry climates and dry exposures.

Balsam Fir.—In its younger days this is one of the most popular of the evergreens for ornamental planting. It is perfectly symmetrical, and nearly all trees are uniform in shade, being very dark green, and tapering regularly from base to apex. In the west it loses its beauty when 20 to 30 feet in height, becoming ragged, and limbing off near the ground. If the soil is kept very fertile there is less danger of this.

In conclusion let us add here what has been omitted, that there is no better precaution can be taken with so little trouble in handling evergreens than puddling. This consists of dipping the roots of the young trees *as soon as they are dug* into soft mud, made about the consistency of batter. If of quite stiff clay it is better. No one may claim that he has done his duty in sending out evergreens who has neglected this.

CHAPTER XVII.

Humbugs.

It is thought that some space could not be used better than in describing some of these "ways that are dark, and tricks that are vain." Before doing so we must ask your indulgence. This will not be of interest to all our readers, for the larger class are fully able to take care of themselves. But there is a large class that, through lack of time or inclination to inform themselves and who are very industrious and excellent citizens, will fall an easy prey to the deceptive wiles of itinerant humbugs of all kinds, and more especially in this line. It has been estimated that in the purchase of trees alone, through overcharges, and worthless stock some of the states are annually robbed of close to $1,000,000. Verily, "the American people love to be humbugged."

There is no class of people representing any special industry or *profession* that can show a larger percentage of honest, upright pains-taking and intelligent people than is found in the American nurserymen. While there are exceptions in individual cases, the rule stands unchallenged. If we deal directly with them, which can generally be

done, very few mistakes will be made. To determine where to place an order it is necessary to use the best judgment and not be overcome by the fine talk and blandishments of any one. There are "nurserymen" whose only claim to that name consists in their having bought and planted out a few root grafts, and whose knowledge of all other matters connected with the business is very limited.

The trees to be planted should be of proper varieties, well handled, and laid down in good condition. This is of more importance than that they are grown in any particular locality.

Dealers.—Palmerston said "Ireland is my difficulty." The nurserymen may well say the same of these middle men, and they do say it, and regret the apparent necessity of dealing with them, but see no way at present of avoiding it. Dealers are those who arrange as to terms, price, etc., previously with some nursery, then hire a lot of men as *their* agents, make the season's canvass, and then "pack out" at the place named. It is in its best sense a sale at wholesale. If these dealers were all honest there would be little harm done, but they are not always so, and the class of men that they hire are put on a strictly "revenue basis."

It will be seen that the nurseryman has no connection with any deals with the planter, yet these "agents" represent invariably that they are t e agents of the nursery. In some cases nurserymen of otherwise good standing have given to the agents of these dealers certificates of agency, of

such a nature as to relieve them from any legal responsibility, but drawn in such a way as to give a common person the evidence of *bona fide* agency. In return for this it is presumed that the dealer pays a better price for the stock. In other cases the dealers have refused to have labels put upon the stock, as they "prefer to make their own varieties." In one case a very large lot of pistilate strawberries were bought and billed out alone, either through ignorance or cupidity. This is worse than robbery. The plants will grow but they will not bear and the labor and pleasurable anticipation of seeing the wife and babies gathering in the heaping baskets of crimson beauties, as they looked in the pictures, will end only as it began, in the disappointment of a dream.

The better plan for all would be to sell through bona fide agents, giving to each one a certificate as such under the court seal, then employ only such men as would obey orders, and make a contract that to deceive any one should cause discharge.

The best way would be for every planter to send direct to the nursery, but this is out of the question. The nurseryman has the same right to live that any one else has, and if he depended on disposing of his goods in this way he would be compelled soon, either to give up living or change his vocation.

With all the ills surrounding the present system, it is still better than to wait for the trade that would never come. From this we see that under-

lying all other objections that may be made to this system is the fault of the public, which alone has the power to change it, but which never will. If we could eliminate the dealer and employ agents the system would be relieved of its worst objections.

The nurseryman, either through himself or his bona fide agent, is to be commended for going out and rustling for his share of the business.

The Salome Apple.—This is still being sold at two to three times its value on the representation that it is protected by a patent, and that but one nursery in the United States has the right to propagate it. There is no patent on any tree; never has been, and never will be as long as the people retain their senses.

Patent Process.—For the apparent purpose of deceiving, and for no other conceivable reason, a large nursery keeps this prominently before the people, thus inducing their salesmen and the public to believe that no other nursery can propagate in the way they claim to do it. It is only a trade mark; and no one else has a right to use these *words* as describing any mode of propagating; but there is no patent on any manner of propagating anything; never has been, and never can be.

Fancy Prices.—Strange as it may seem the local nurseryman does not suffer in competing against those who put prices down, but the reverse. There is an impression that the higher the price, the better the goods. The same goods are worth so much money, and selling them at double the

price does not enhance their value. A neighbor bought a bill of Concord grapes for $100.00 which could have been furnished for $10.00 at a fair profit.

The State Nursery.—This is another ingenious mode of swindling. The operator lives at the capital, or pretends to, and is the "Superintendent of the State Nurseries." In his attire he is gotten up regardless of expense, has a fine rig and driver. The latter calls at the house of the victim informing him that the state nurseryman has been sent there and he is invited out to see him. On being introduced he is met with cold but dignified cordiality. He tells his man that he is fortunate in having some influential friend at the capital who has secured for him some of the state's goods, which are not sent out till they have been tested and fruited five years. The common every day farmer is not proof against such dignity, style and patronage. He is flattered by the call of this great man and signs gladly whatever he is asked to, and will boast to his neighbors of his luck till he finds that they have all been "selected" in the same way.

There is no such thing as a state nursery, and no trees or other goods are grown, or bought and sold for profit, by any state (with the possible exception of S. Carolina).

Budded Apple Trees.—This fraud has been exposed so often that there ought to be few who are not posted in it. The operator travels with "two sticks," one he says is cut from a grafted tree, which is very much discolored, while the other is

sound, and he says was cut from a budded tree. He is made to believe, without a particle of evidence except the word of the stranger that budded trees are for that reason always sound, while grafted ones, for the same reason, are always unsound. A sale is made at two or three prices, but the ordinary grafted tree is delivered in every case. I have examined nearly 100 of these trees and have yet to find one not grafted. The wrong is in the deception, and exorbitant price, as the trees are actually better than if a budded tree was really delivered. Any one can determine by cutting one of these trees whether they are budded or grafted. Examine plate No. 10, which gives the form of a splice or root graft. Cut into the tree just above the roots, where there is usually an unevenness that will indicate the splice, this will be found and the parts can be separated, as the wood in a graft never grows together, but is encased in new wood which forms over it.

Prof. Budd, in State Register, Feb. 18, 1887, says: "As these budded apple tree chaps are well distributed over the state, the real facts should be kept before the people. Trees budded on any obtainable stock, or seedlings, are not worth planting in any part of Iowa, as not one seedling in 500 is as hardy as our common grafted sorts. Hence, if the Duchess of Oldenburg, Wealthy, or Whitney's No. 20, or even the crabs should be budded above the crown on common seedling stocks they will soon go out by root killing. But the wily agent

claims their trees are budded on French Crab stocks. If so, this is still worse, as the so-called French Crab seed is from the Perry making sections of south France, and their seedlings are as tender with us as the peach. Absolutely there is nothing in the artful story with which so many are now being gulled."

Tree Blackberry.—These are sold at the present time at the same price as the following, $3.00 each, or two for $5.00. One hundred should be bought for the price of one. They are made by cutting back a strong cane of any common variety and causing it to throw out branches. It resembles a tree, and is taken up in the fall and cellared. The next year it bears fruit, and like all other blackberries dies in the fall, so far as the tree is concerned, but the root lives, and the next year there will be a crop of sprouts or suckers, like any other.

Evergreen Blackberry.—This is not a myth, but is of no value in our climate. In its native home, Oregon, it is a partial evergreen.

Half down and balance in fruit when trees bear is another very ingenious scheme. The price is doubled, so that half price is full price, and the operator does not figure on his prospective profits on fruit.

Promises outside of the contract, are not binding. If one is promised anything that he relies on he should see that it is written in the order. The only safe way is to demand an exact duplicate of the order. A card with the names of trees and

amount all bundled into one amount under a "blanket" is of no value. This will also prevent "stuffing" or "padding" the orders, which is sometimes done.

Grape Vine Raspberry. Another myth. There is no such thing outside of the prolific brain of the vender. The only thing real about it is the price.

Tree Currants.—These are made as shown under "Propagation," which see. They are an oddity, but not worth as much as the bush. They cost but a trifle more and should be sold at the same price.

In General, pass by anything claimed to be new and of great value, if there is a great price attached to it. If new it is untried, and if it does prove to be of value, it will be on the general market soon at a reasonable price.

It is common in many places where a local nursery has established a good trade, and a good reputation, to try to break it down for the purpose of picking it up by outsiders. In such cases they, either by an explicit agreement or a tacit understanding, "double up" and all tell the same story, such as, "He has sold out," or "Hasn't some kind of goods that they are selling," or "Is bankrupt," etc. All such stories should be carefully investigated before placing confidence in them. I remember that when a boy, in going to a strange orchard after fruit, I always went first to the trees having the most clubs under them.

INDEX.