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The
Walnut





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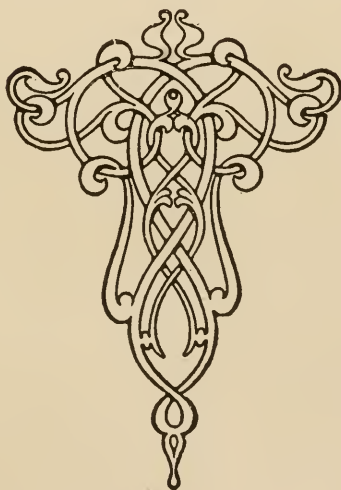
To my friend and neighbor, Thomas R. Smith of Westpoint, Calaveras County, California, whose success in horticultural pursuits made for himself and family a beautiful home, and provided it with a wealth of products from Nature's store house of nuts, fruit and flowers,—an example for every home lover,—the incentive to my work in this line,—as a token of esteem, this little volume is respectfully dedicated.

The WALNUT

ILLUSTRATED

A Comprehensive Treatise on How to Grow It

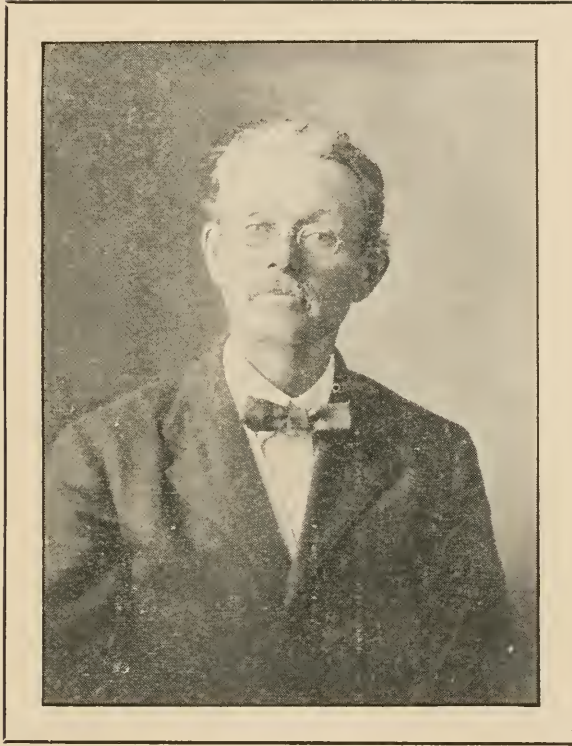
By E. M. PRICE
Westpoint, Calaveras County
California



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E. M. PRICE

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P R E F A C E



HIS treatise is based upon the experience of twenty years, in walnut culture, in the Sierras,—elevation nearly three thousand feet,—at Westpoint, Calaveras County, California. Had we possessed at the beginning of our work with the walnut the information to be obtained in this text-book, we could have accomplished more in eight years than we have in the twenty. That others who wish to engage in growing walnuts, may profit by our experience and thereby save years of valuable time and labor, is our reason for offering to the public this volume. The walnut industry in our country has only begun. With preper stock treated on scientific lines, it in time would respond in every state of the Union. When a variety of the Persian walnut will bloom the first of June and ripen a fine flavored nut in the early fall, we have only to get hardy stock and that walnut can soon be grown from the state of Washington to Maine.

Suppose the highways of the nation—roads and railroads—were bordered by rows of stately walnut

P R E F A C E

trees, how pleasant the ride thru them, either in automobiles, or on the cars. What wealth these millions of trees, when ripe, would add to the domain.

Besides the beauty of landscape; who can estimate their value? Again, what aid to the great work of conservation it would give.



The Walnut

*“Happy the one who studying Nature’s laws,
From known effects can trace the secret cause.”*



WALNUT—*Juglans*—name from *Jovis glans*—The nut of Jove or Jupiter. Because of its value to the people of that early age it was called “The food of the gods.”

Whether the different varieties found in various lands had a common origin we do not know. Trees centuries old grew in America, before the days of Columbus. The testimony from glacial drift in Ohio, Indiana and Illinois gives indisputable evidence, that forests containing red-cedar, beech, sycamore, hickory and the walnut grew thruout this vast section and were buried during the “Age of Ice.” So, thruout the great Mississippi Valley, the walnut grew thousands of years before the pyramids rose on the banks of the Nile, or the mythical deity for whom it was named—Jove—Jupiter—had his origin in the fables of men. Doubtless all kinds

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moved southward, growing, bearing seed, propagating their species during the ravages of the Ice-King, returning only when his reign was broken and climatic conditions necessary to their growth returned.

The writer has frequently examined wood fragments from glacial drift in Indiana and Illinois. See *Our Planet* by Gunning, page 172.

The commercial walnut—commonly called English—was brought originally from Asia (Persia) and cultivated thruout the Mediterranean countries for centuries. It was early taken to England. By some authorities—in the days of the Romans. From England it was brought to America, hence the name English Walnut.

In France (Gaul) it was called Gaul nut and probably the name walnut is an English corruption.

John Evelyn, in his “*Sylva*” (1664), says: “In Burgundy walnut trees abound where they stand in the meadows of goodly land sixty feet, and a hundred feet apart.”

Of the walnut in Germany he says: “Whenever they fell a tree which is only the old decayed, they always plant a young one near him.” He tells of a custom which would be well for us to heed. No young farmer can marry until he has grown a stated number of walnut trees. Think of the benefit such

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a custom would eventually yield. We have been the greatest vandals in the destruction of the finest and most valuable forests the earth has produced. We have sown to the winds and unless we soon check the waste and begin a sensible, practical system of reforestation, we shall ere long reap the whirlwind.

We may learn a useful lesson from a study of other lands. China, is a field for thought. Palestine once a land of milk and honey—but when her forests disappeared, became a desert waste.

The walnut lives and bears nuts for centuries.

A tree estimated to be one thousand years old in the Crimea near Balaklava bears annually from eighty to one hundred thousand nuts; two thousand lbs. or more. The estimate in lbs. being based on the weight of nuts in California orchards.

Information given by an Italian neighbor, that in his native village in Italy is a walnut tree over six hundred years old, which bears a bounteous nut crop annually.

An English walnut tree on the Morris Estate on Manhattan Island bore choice nuts for more than a century. Washington made his headquarters at the Morris mansion after his escape from the British on Long Island and doubtless ate of the nuts from that tree.

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Reports say it bore two cartloads of nuts annually. The land becoming too valuable to sustain only an old historic tree, it was destroyed in 1894 or 1895.

Juglans Californica, Watson

Another variety of the walnut family found only in California, and long considered of little value, simply adding one more to the list of edible nuts. But nut growers in California are beginning to realize that for stock purposes, it has no equal; and thousands of trees are now being grafted annually. It readily withstands the heat of the hot valleys of the Pacific Coast. It will also resist a great degree of cold.

Examine and compare the bark structure of the California variety with that of the Eastern black. If the two had a common origin, then the parting of their ways was in the distant past. It has taken centuries to produce this difference. The California is the better tree to resist heat, hence for this reason it is likewise the better to resist cold.

Majestic specimen of this walnut can be seen along the Sacramento River at various landings from Walnut Grove to Sacramento City, also some in



Growth of Graft in One Year on California Black.

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the upper Sacramento Valley at Chico from three to five feet in diameter. The trees at the latter place were planted by the late John Bidwell in 1862. We were informed by residents of Chico that occasionally during hot periods in summer the temperature is 115 Fahrenheit.

It flourishes in the Sierras at four thousand feet elevation and is not injured by the cold and snows of winter. It thrives best in deep moist alluvial soil. Yet, it is a wonderful tree, and seems to have retained every characteristic given it by its environment thru the ages of change and wanderings. It will grow wherever the oak can exist.

For twenty years we have studied its growth at three thousand feet elevation in the Sierras together with the Eastern black. And in similar soil and culture, it grew to twice the diameter of the latter. As a sap producer it is a wonder, and herein is its value for stock purposes. Owing to this quality, it can be more easily grafted than other varieties.

The illustration was made from a photo of a California black walnut, twenty years old, and twenty inches in diameter below the fork.

It was grafted to the Franquette April 5, 1908; and the photo was taken June 1, 1909.

JUGLANS CALIFORNICA, WATSON

Thirty scions were set into the branches of the tree, twenty-five of them growing and making the top as shown within the period of time given. This tree is in the orchard of the writer, at Westpoint, Calaveras County, California.

If nuts are taken from trees growing in the coldest sections, either of elevation or greatest latitude where it is grown, and planted thruout the Eastern States, we believe this species would soon become acclimated to our coldest sections, and in time grown anywhere thruout the United States. We had very little difficulty in getting good results in grafting the Franquette, Mayette and Calavette varieties into the California black at an elevation of three thousand feet in the Sierras. True, some of the limbs froze back some four or five inches at the ends the first winter. But an early severe pruning—taking out all the frosted wood, restored the grafts and the growth the second year was truly phenomenal. The yearly growth has not since been injured; altho the winter of 1909 and '10, was the coldest California has experienced for many years. The reason the tender Persian varieties are so readily acclimated is in the vigor of the California stock. The fluids coursing upward thru the cells of the tree partake of this vitality, and the new growth is soon enabled to overcome every obstacle.

Great Demand for Walnuts

California produces about half of the walnuts grown in the United States, and our imports equal our products. As an article of food it is growing into favor, hence the supply does not keep pace with the demand. The crop of the United States for 1909 was nearly twelve thousand tons, California producing about half. Suppose our imports equalled our production, we would then have had forty-eight million lbs., about one-half lb. for each inhabitant.

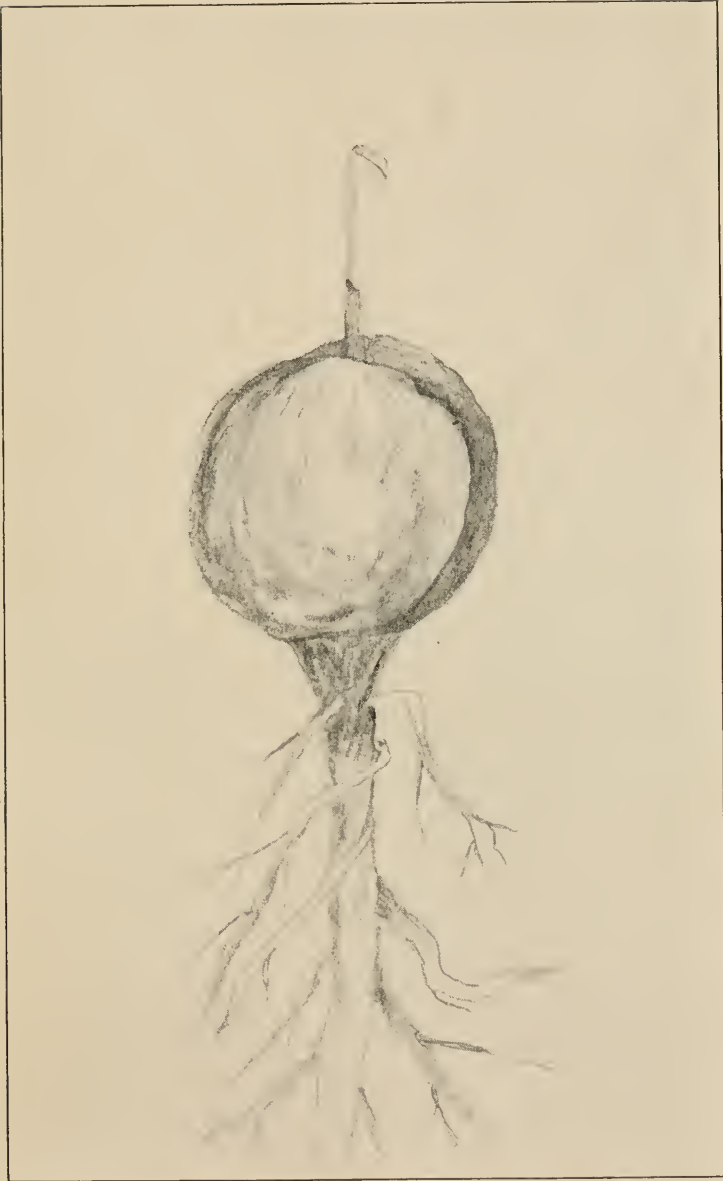
Is it not time that the cultivation of the walnut was receiving greater attention? How to grow it is the mission of this handbook.

How to Prepare Nuts for Planting

“Countless forests slumbered in a shell.”

Mother Nature, ever alert to care for her offspring, has carefully stored away into the protecting shell of the nut a germ of life which may be made to grow into a tree, a “Thing of beauty, a joy forever,” which gives shade, comfort, and food to men.

In growing walnuts for commercial purpose, the California black is the best root stock known. It is very hardy, makes rapid growth, thrives under



Walnut for Planting—Sprouting Nut.

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cultivation in any locality, hot or cold, moist or dry, and is the easiest to get results in grafting. This species is very prolific, hence any variety of the Persian nut grafted into it readily responds with bounteous crops; the nuts being larger and richer in oil and flavor than when grown on their native root.

On several occasions we made a test of the number of nuts to make a lb. grown on a seedling *Serotina* tree and a California, grafted with scions taken from this same tree. It took forty-two nuts from the mother and thirty-six from the grafted tree. The nuts were not selected, but picked up as they fell from the trees.

Select choice nuts from vigorous prolific trees. Put six inches of sand into a box, and lay nuts over the sand. Cover the nuts with two inches of sand and leave the box stand out in the winter rains.

Do not at any time permit the nuts to become dry. The germ lies in the blossom end of the nut, and the shell opens at this end when the nut sprouts. Usually the nut is laid on the side so a vertical line would pass thru the shell when opening.

Mystery of Plant Life Experiments

A knowledge of plant life being very essential to success, a good opportunity is now offered to make some valuable experiments. Under the influence of warmth and moisture germination begins. The radicle or tap root first appears and grows downward. With a sharp knife cut the point of the radicle of several of the nuts and put them into another box of sand to study from time to time their growth. The taproot grows several inches in length before the stalk starts. The point from which each part starts is the crown of the tree. Watching the plants for a few days, tiny stalks will be observed reaching upward for air and sunshine. Between the pair of unfolding leaves a bud (plumule) reaches upward and lengthens the stalk. Break off the stalk at the first pair of leaves and watch the result.

As observed in the taproot the various laterals branch out from the point where it was cut up to the crown; likewise other leaf buds will unfold from the point where broken down to the crown, to give other stalks to the tree.

Secure a microscope of sufficient power to show the cell and cell structure of the plant. Cut off the taproot near to the crown, and with a razor cut off

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as thin a portion of the rootlet as possible. Examine this under the microscope. Behold the great number of tubes thru which the sap ascends. Examine likewise a portion of the stalk cut off above the crown. Study the leaf,—its cell and structure—the lungs of the tree, which extracts nitrogen from the atmosphere and throws out as vapor tons of water. The query is how this water which holds in solution the substances necessary to the growth and development of the tree, depositing them in its journey, rises up thru the cells of bark, cambium and alburnum, from the millions of tiny microscopic mouths on its rootlets to the topmost bud and leaf. We realize that this silent force is powerful; but from whence that power and how applied is not thoroly understood. One suggests osmose of liquids, another capillarity, and still another hydraulics. Maybe all these forces unite to build the stately columns in our forests, as when we ride on the electric car forty or fifty miles per hour and think of the propelling force—only gravity carries us so speedily;—the weight of falling water transmitted thru the electric wire. Yet the force which lifted the water and bore it to the summit of the mountains was greater, tho only a sunbeam. This is the force which gives motion to glaciers, and chiseled out the canyons of the world.

MYSTERY OF PLANT LIFE EXPERIMENTS

Maybe each plant cell is an electron and the sun-beam playing with every leaf sends this silent force down thru every cell of the tree and lifts the water that the leaves daily give to the atmosphere.*

Continue these experiments until a knowledge of the cell and its structure has been acquired; also of the rootlets until the microscopic mouths which drink sustenance from the soil have been seen. These collapse when they come in contact with the air, then no power of the microscope can show them.

They must be examined in water during the season of vigorous growth to be visible. They disappear from the rootlets, as the leaves do from the tree, when the annual season for growth has passed.

*In early springtime, the sun throws the influence of its heat rays around and into every cell and fibre of the tree. All expand and this silent force reaches far out from the crown, and deep into the earth until every pore on each, and every rootlet has opened to admit the moisture held in the soil. The expanded cells draw in a flood of water until the heat within them is neutralized; then contraction is the result, and the sap rises rapidly into the trunk and branches of the tree. Again another quiver of the sun's arrows penetrates the cells, and another flood rises to give life and verdure; when another similar contraction repeats the throb; like the diastole and systole of the heart, which sends the life blood coursing thru our arteries and veins;—and this crimson tide is too propelled by radiant energy. So, Nature's simple work in the tree goes on. The line between the cells of bark and alburnum opens by osmotic force, and the new cambium forms, and repeats the work of the previous year. The millions of little mouths upon the rootlets grow to take in more readily a greater supply of liquid; while buds upon the twigs expand and soon burst into leaf and bloom. If the sun's rays transmitted thru vast masses of ice give motion to a glacier, which grinds the hardest rock into slime, soil, dust, is it not reasonable to suppose that this same force—ignoring the law of gravitation—builds the giant columns in our forests?

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In early springtime, new mouths must grow on each and every rootlet, before the young buds expand and open under the influence of the sunbeam. Some buds are not so susceptible to this influence as others. All late blooming varieties as the Mayetté, Franquette, St. John, and Chicoette must be courted by the sunshine long after the earlier varieties are in full bloom and leaf.

Hence, among the trees to show green foliage late in springtime we look for our hardy varieties for the cold climate. The power to resist the sun's rays rests in the bud, and those that resist heat, likewise are the best to resist cold. Graft a scion from the late St. John into the early blooming *Prae-parturien* and the period of bloom has not been changed. Again graft an early variety into the late stock and it continues to bloom as usual. Read in connection with these experiments some late standard text-book on botany. The work will be more interesting and successful from the knowledge acquired.

How to Prepare the Land

Prepare the land by thoroly cultivating it, plowing very deep along the line where the trees are to be planted. Stake it off either in squares or diagonals so the trees will be not less than sixty feet apart.

HOW TO PREPARE THE LAND

With a long handled post digger sink a hole not less than four feet deep, where each tree is to be planted. The deeper the hole and greater the diameter the better. Fill these holes with rich earth surface loam and some crushed bones if possible to secure them. Always avoid manure either green or decayed.

When the nuts begin to sprout plant one in each hole, heaping up the dirt slightly so the planted nut will lie at about the surface level.

If the soil is shallow, i. e., bedrock within four or five feet of the surface, cut off the point of the tap root. If the land contains much clay, considerable sand should be mixed in the topsoil with which the hole is filled. Cultivate as you would a field of corn. Plant corn, potatoes, melons, tomatoes, beans or sow to alfalfa, leaving at least eight feet on each side of the trees for cultivation. After three or four years give more space for cultivation. The roots of trees reach out faster than the limbs: hence, the small rootlets enmesh long before the limbs intermingle. Walnuts do not yield good crops and some varieties have ceased to bear after their roots have mingled. This is the principal reason why trees should be set never less than sixty feet apart. Planted as directed, they will grow vigorously, some attaining a height of three to five feet in

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a single season. Should the tops of some of the trees be accidentally broken off, as sometimes happens, they can still be made good trees by cutting off all the lower branches, leaving the one nearest the break, which will shoot up and become a new top. When the tree is ready to graft, it should be cut back to a height of from four to five feet. Here the scion is inserted, and there should be no branches below this point.

The fourth year after planting is the proper time to do this work. It is better to wait until then, even if they appear to be large enough at an earlier time. Nothing will be gained by grafting when the tree has been growing less than four years.

The accompanying illustrations are from photos giving two views of the same tree. The first shows the growth of the graft set the 11th of April, 1908, and the view taken the 1st of October. The second view was taken in October, 1909. The tree bore five lbs. of nuts that year. This is neither phenomenal nor exceptional. It only emphasizes the correct method of propagating the walnut.

A year's cultivating can be saved by planting in a nursery and then transplanting when the trees are about a year old. This transplanting should be done at the proper season for such work in the part of



First Year's Growth of Graft on Four Year Old
California Black.

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the country where it is being carried on. Every little rootlet should be preserved and the hole should be of sufficient size to give the roots plenty of room.

Irrigation

In some sections it is necessary to irrigate the young trees. If this is done by flowing the water around them, do not fail to cultivate before a crust forms. Water soaking into the earth makes a complete system of pores, and evaporation is very great, if these be not broken up, by thoroly pulverizing the surface. If flowing water cannot be obtained, tiling four inches in diameter and fifteen inches long may be set, one piece near each tree, the top being on a level with the surface. Fill these occasionally by hauling water and cover to prevent evaporation.

A substitute for tiling may be made of pieces of boards three and five inches wide, and of desired length. These give an opening for water three by three inches in the clear.



Second Year's Growth of Graft, Showing Nuts.

Neither Root-Graft nor Remove a Grafted Tree

The California stalk is just as necessary to a successful tree as the California root. It has never been known to be susceptible to borers, blight or sun scald, when allowed to grow where planted. Only the transplanted trees sunburn. Give this method of tree culture a trial and be convinced. Result, a fine nut orchard coming into bearing the sixth year, developing rapidly thereafter.

Varieties and Selection of Scions

In selecting varieties for grafting, know the locality. If subject to late spring frosts, choose late blooming varieties, as the Franquette, Mayette, etc.

Select scions from choice bearing trees, and from the most prolific limbs. Remember that environment has as much to do in shaping the destiny of a tree as it has in the child. Even from prolific bearing trees there are limbs from which scions should never be used. Nature is not perfect. Water sprouts from the bodies of trees usually make good growth. Never use them. True, they grow, are covered with leaf buds, but they rarely bear nuts. Their growth on



One Year's Growth on Four Year Old California Black.

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the tree was simply a relief from a copious sap flow, and to furnish more leaf surface to give nitrogen to the tree. Select scions from two year old wood. The last buds formed the previous year were principally fruit buds; use these. The wood is firm and buds respond readily. Be careful to select scions from perfect trees, i. e., trees that bear both staminate and pistillate bloom, which mature together. Many trees bear both kinds but the bloom does not mature properly. Catkins often shed the pollen long before the pistillate bloom is ready to be fertilized, hence nut failure. Avoid such trees in selecting scions.

Fertilize Imperfect Trees

Should trees as above described be found, select ripened catkins and scatter the pollen over them, when the pistils are ready to receive it. A fair nut crop may be taken from such imperfect trees, besides Nature is stimulated in correcting her faults. Some trees are thus brought to a perfect state, while others can only be made valuable by grafting. In an orchard of two hundred and fifty trees, but few were perfect. The greater number had to be grafted. Some bore nuts the third year, the bloom being fertilized by near-by catkin bearing trees. Yet some trees



Staminate and Pistillate Bloom.

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did not bear catkins until the fifteenth year; bearing however, a few scattered nuts after the ninth. Do not expect any returns under ten or twelve years from an orchard of seedling trees. Some choice varieties of fine nuts may be obtained, but years must be sacrificed to do it. Quick returns are desired, therefore plant the California black nut, grafting the tree the fourth year; using perfect prolific stock. Trees will commence bearing the sixth year. It does not require any great amount of skill to do the work. Skill comes with practice. Know how, then do. Success will equal the interest taken in and the thought given the work.

Cover Crops

If an orchard be located on rolling ground—as all mountain orchards are liable to be,—cover crops should be sown in early fall. They not only replenish the soil but protect it from washing away during the heavy storms of winter. Rye is excellent for this purpose. It withstands cold weather, makes good growth, and a fine crop of fertilizer is usually turned under in the spring cultivation. Peas are also excellent.

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Crossing

If new varieties are desired, plant the choicest nuts from any perfect tree; let them grow two years in the nursery; then graft a scion from this young growth into a choice bearing tree. Doubtless pistillate bloom will be observed on this scion the second year after grafting. This bloom will become fertilized by pollen from the foster parent. The resulting nut will indicate the new strain. This nut thus produced by cross fertilizing, if planted will produce a hybrid tree. Hybrids are new varieties obtained by crossing old varieties of different kinds or even species of trees. This crossing takes place in the bloom, by the winds blowing, or the bees carrying the pollen of the staminate bloom of one tree to the pistillate blossom of another.

Cross fertilization, plus environment have given the great variety of nuts, fruit and flowers we enjoy. Mother Nature has been working on this line for ages. The honey bees have been the friends of men in cross-fertilizing trees and plants.

Luther Burbank has given many wonderful creations of nuts, fruit and flowers to gladden the eye, and to add to the wealth of the world. He is the great leader in this line. As said of Franklin, "He tore the lightning from the sky and the scepter from

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tyrants," making possible the achievements of Edison. So, Burbank gleaning the secrets of variety and environment from Nature, has enlightened the world and made possible the horticultural Edisons of the future. He is loved in other lands than ours. It is said that if his name be mentioned before a German audience, every person will rise and bow with respect.

Esteem is the meed due his genius from the living. The future will rear monuments to his memory. Yet in our humble opinion his greatest achievement is not in the material things he has accomplished, but in the inspiration he has given to the thousands of people in all lands who are taking up this kind of work. Were it possible for the "war drum to throb no more," and for individual selfishness to be banished from the earth, what a glorious future would be before the human race!

Stock Improvement

The stock should be bred up by taking the best scions from the most prolific branches, and when these are bearing, again select the best from this selected stock and note the improvement in nuts or fruit.

STOCK IMPROVEMENT

By grafting we are supposed to keep strains pure; but such superior fruit can be obtained, that the strain appears to have developed into a new variety. Such superior specimen are usually designated "Sports."

As a rule, from sparse bearing trees we get our choicest nuts. Such trees can be improved by severely trimming them. "Be fruitful and multiply." "Bear seed and continue your species," is the fiat of Nature.

The tree severely pruned concentrates its great sap flow into the few remaining branches and they bend beneath a crop of nuts exceeding one's expectation. These nuts are superior in vitality. Plant them and propagate by grafting and note the improvement. Again select scions from the limbs of the pruned tree that bore the extra nuts, grafting these into other trees and note the results.

When to Cut Scions

After the yearly growth of wood has thoroly matured, in early winter, scions should be cut and the ends where severed dipped into melted wax, then put away into a box of cold moist sand and set in a cool cellar. They will keep thus for three or

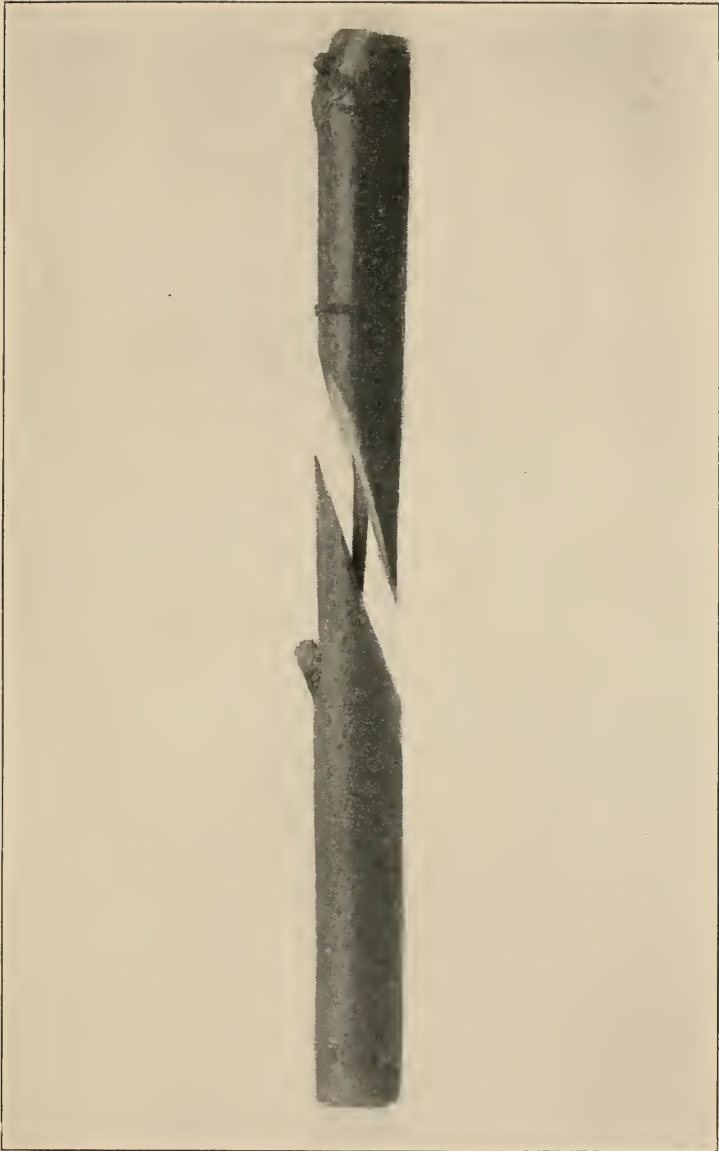
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four months. When taken out in the early spring-time to be used in grafting, they should always be kept moist and cool.

The Splice Graft

The splice graft, when stock and scion are of the same size, is the best method. It unites the entire cambiums of both, and is the easiest to make. Sever the stock at the point where you wish to make the graft, in a slanting cut forming an ellipse, the long diameter being about two inches in stock, one-half inch in diameter. Select a scion the same size, containing two good buds. Cut the scion to correspond to the stock, leaving the lower bud midway and opposite the cut. Insert into the pith cavity of the stock a toothpick made of firm wood, and force it down about one-third its length.

Force the exposed end into the pith cavity of the scion, forcing the two together until the cambiums unite. The pith cavity performs its function in the plant the first year. There is neither life nor circulation in it afterward. The tree is not injured and the union is the stronger. Parts are kept from moving while being bound, and are not so easily broken when the bandage has been removed. Wrap with strips of waxed muslin, or bind with rafia.



Splice Graft.

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Rubber bands hold the parts sufficiently firm, and give no further care, as they readily stretch under growth. Be careful to leave the bud exposed when wrapping. Cover the union and the end of the scion well with warm or melted wax put on with a small paint brush. The wax should not be applied too hot. The graft should be kept well covered with wax to exclude the air. If the wax is too hard it checks easily and permits the air to injure the scion; and if too soft it melts during warm days. Go over the grafts with brush and warm wax occasionally.

After the scion has commenced to grow, cut the bandage on the opposite side from the bud, using a sharp knife and cutting thru to the bark. Do not remove the bandage until the scion is making good growth.

The time for growth to appear varies much in the different varieties of the Persian walnut. The early blooming kinds may show swelling buds in two weeks; while six weeks may elapse before any signs of growth appear in the later varieties. A warm early spring starts the growth soon, while cool weather retards it. In some parts of California work may begin in January and continue until June. The first work might show no sign of swelling bud before April, and the last show growth within a week.



Method of Inserting the Scions.

*** The Cleft Graft**

The cleft is the method generally used, but when performed by splitting the limb and inserting the wedge-shaped scion best results are not obtained. The walnut, peach and even the cherry, when grafted late in the springtime, fail to respond by the above method.

If the operator, after making the cleft, would cut out a portion of the wood, thus opening up a greater number of the sap cells, he would be more successful. When the limb is split the rough bark prevents a good union. The cells are simply bent aside; but few are broken, hence scions are usually starved and make poor progress, should they grow.

Prepare the tree by cutting off all the limbs to be grafted. First cut on the under side of leaning limbs until the saw is "pinched." then cut the bark around the limb before sawing it off.

This prevents the bark from stripping down when the branch falls. Leave a limb on the southwest to shade and protect the young grafts from heat. Make a cut with a rip saw toward the center or pith cavity of the limb, and down the side about two inches. If the limb is small you may have to

*Method successfully used in grafting old trees, by the Tribble Brothers of Elk Grove, Sacramento County, California.



View Showing the Scions Waxed and Bound.

THE WALNUT

cut thru this cavity. Give no heed to it whatever, since it is dead, the work will not be injured in the least by so doing. If large scions are used, cut out the V-shaped cleft with the saw and smooth the sides with the knife. When the scions are small, shape the cleft with the knife after the first cut with the saw. Shaping the cleft properly is very important. Cut the top of the cleft in width to equal the diameter of the scion. Every motion of the knife should cut toward the pith cavity of the stock. Shape the scion to fit this cavity along the cambiums on each side; also the wood of the scion should fit firmly in the wood of the stock. The circulation is not alone in the cambium, but in the sap wood as well, hence, the better union, the better result. Drive the scion down firmly but not with sufficient force to close the cells. Fill the space back of the scion with rags or soft paper pressed in firmly, to absorb the sap, which would otherwise fill this cavity and destroy the scion. In grafting limbs six or seven inches in diameter, put four or five scions into each. Wax over the ends of the stock and the scions also along the face of the latter in the cleft. Cut the scion so a bud will be on the face about the level of the limb. Always aim to get two good buds. One is better than three. If scions are kept in good condition,

THE CLEFT GRAFT

grafting may continue into May, long after the tree is in full leaf. However, do not cut back the tree as severely as may be done in early springtime.

The test of any method is in the result. Our work being more successful when we cut out the cleft, than when the limb was split to insert the scion, we wished to know the reason for the better result.

Could it be possible that an improvement had been made on this method of our grandfathers? Securing a microscope of sufficient power to examine the cell and cell structure of the plant, we found an interesting field for study. The life zone of the tree is in the ends of rootlets and branches, and along the cambium and sap wood. The dark heart wood (duramen) is dead. Neither life nor circulation is in it. The only benefit it is to the tree is to give it strength.

The outer thick bark of the tree is also dead; and clinging to the inner bark it protects the tree from heat and cold. The cambium of last year has divided. The inner portion forms the last ring growth of the wood, the outer becomes the inmost layer of the bark. This year's cambium is thrusting the double annual ring of cells between these two. In every inch of the walnut there are more than

THE WALNUT

two thousand of these cells. They may be likened to as many small tubes reaching from rootlet to the topmost bud of the tree. Their function is to convey the sap and to deposit the substances held in solution wherever required in the growth of the tree.

Hence, using a scion one-half inch in diameter, one thousand or more of these tiny cells are cut; while in splitting a branch and springing the parts to insert this scion, but few are broken, the vast number being bent aside. Should we expect the thousand mouths to get sufficient nourishment from the few broken ones?

Cut out the cleft, opening up as many cells in the stock as in the scion, and note the result. In all of our work, whether on walnut, apple, pear, peach, plum, cherry, or even oak as stock for the chestnut we never split a limb too large for the splice graft. We are fully aware that in early springtime the bark parts easily from last year's growth, and some may think the sap flows readily around the stem; but immediately the double row of cells, the one to form the bark and the other the wood's yearly growth begin to form. The sap flows upward thru these cells and life's mystery goes on. The mystery which we cannot comprehend, whether

GRAFT OLD TREES BY THE CLEFT METHOD

in animal or vegetable life, had its origin in a cell, and continues by cell growth. We may modify it, create new varieties, but the Why, life's secret of the cell, is beyond our present knowledge.

Graft Old Trees by the Cleft Method

It is not difficult to graft over large trees, by inserting the scions into the large limbs seven or eight inches in diameter. When this is done a branch should be left occasionally to draw the sap and to shade the grafts. Such limbs may be grafted the following season or cut out to give the full sap flow to the new growth. Suckers will grow on the old stock for two or three years. It requires much care to keep them pulled off. This should not be neglected, if the tree is to be converted into a prolific bearing tree of the English variety.

The following illustration shows a stump twelve inches in diameter, four feet three inches high, grafted into the English. Six grafts were put into the stump, five of which grew. The tree was grafted about the middle of April and the photo was taken the first of September. The growth to that date was thirteen feet, and the tree will doubtless make a growth of sixteen feet during the first year.

Bark-Grafting

The bark graft is but a method of budding a scion. It is sometimes inserted on the side of the stock and sometimes at the top where cut off. Cut the scion the lower part in form of a right angle so it will shoulder on the wood of the stock. Make the part to be inserted under the bark very thin, taking off nearly all of the wood; then trim the edge of the scion, taking off part of the bark in a slanting cut from the edge of both sides to the cambium line. Slit the bark and lift it gently from the stock. Insert the scion, forcing it down firmly upon the wood stock.

Sometimes the bark is corrugated and by using a small wedge it can be lifted out from the stock without splitting. The scion is inserted as before. This way makes a better union and the growing graft is not so easily blown out after the bandage is removed.

Side Graft

The side graft is not so difficult to insert. Using a small chisel cut thru the bark into the wood at an angle of seventy-five or eighty degrees. Study the cambium and shape the scion to make as much as



Graft on Large Stump.

THE WALNUT

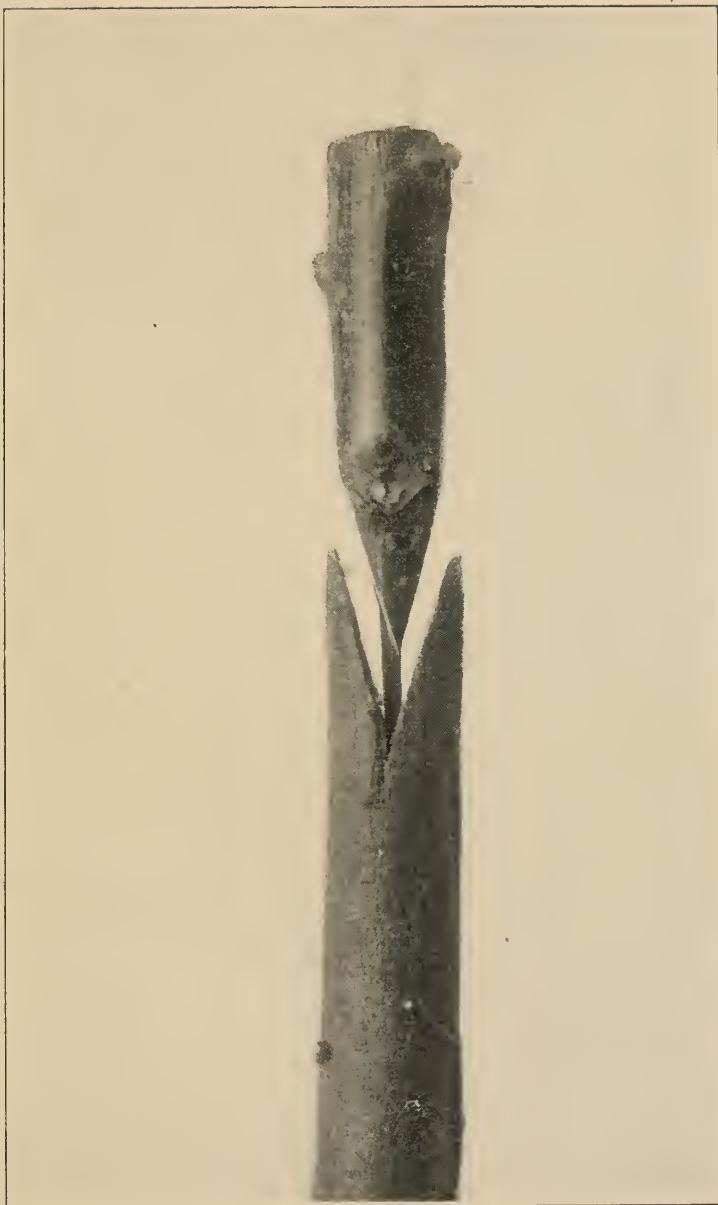
possible of its cambium to meet that of the stock. Drive the scion into the stock but not with sufficient force to close the cells.

Wax carefully and tie a band around the stock below the scion to hold it in place. These methods are used when the stock is larger than the scion.

Saddle-Graft

Another excellent method,—modification of both the cleft and the splice,—used when stock and scion are of the same size,—is named the saddle-graft. When using this method we always cut the cleft in the stock. We get no better results; but it is easier to make. Saw off the top, rip it down and cut out the cleft entirely thru the stock. If the work is on the ground, stand near, bend over the top and make a slanting cut down to the center of the stock. Change position and make a like incision on the other side. The top can now be lifted from the stock. Shape the scion to fit the cleft,—cambiums to meet; bind and wax. Care will give good results from this method.

Any method which unites a great number of the cambium cells of the stock and the scion will meet with success, if the grafts are kept well waxed over.



Saddle Graft.

Budding

There are several methods of inserting buds. Some varieties of trees respond readily to any method properly performed. Other kinds—as in grafting—are difficult to bud successfully. After the grafting season has passed—about the first of June, when buds have matured—you may use the new bud and get a fair growth during the present growing season. In order to force the growth, sever the budded branch just above the first bud, over the bud inserted. This calls for a continuous sap flow to that bud.

To cut the branch below the bud, means to divert the flow of sap from the bud just put in. Nature has arranged the cells leading to every bud on the limb, and when the limb is severed just below a bud the circulation ceases at the next lower bud and the wood above soon dies. Better results are obtained by inserting the new bud on a bud in the stock, i. e., make the cross cut below a bud and slit the bark down thru this stock bud, raising the bark over this bud to insert the new one; which is to make the new top of the tree. The cells being arranged to convey the sap to this point, the inserted bud is soon healed in and growth begins, i. e., if the sap be allowed to flow up the stock to a

THE SLIP BUD

healthy bud above the one put in. However, if the branch be cut between the new bud and the first one above, the sap will be diverted to the first bud below the one requiring it, and the bud doubtless will die. Always in cutting a branch above a bud, either to force the growth the same year when budded, or to start the growth in a dormant bud in early spring-time, cut above the first bud on the stock above the one put in to make the tree; then after growth is well started cut off the stub stock close to the young growth. It will soon heal over. Do not allow this stub to remain on the stock, as it soon dies and may injure the tree. Observe this rule always, regardless of the method of budding used.

The Slip Bud

The slip bud as usually made has the T or cross cut at the top of the slit. By careful experiments we secured a greater percentage of growths when we made the cross cut at the bottom of the cut or slit. We account for the better result as in the cleft graft; the sap rising up thru the living bark cells, pass readily into the cells of the piece of inserted bark containing the bud. This should be made as broad as it can be inserted, and cut on the line of

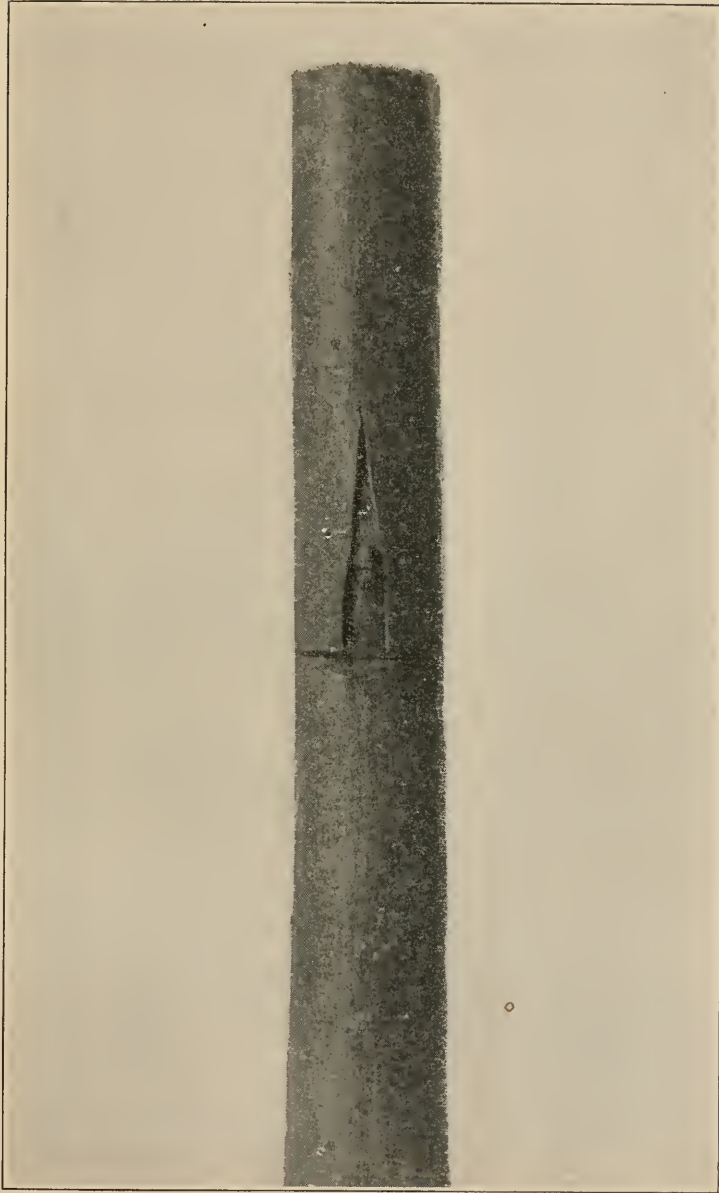
THE WALNUT

the cross cut, making a close joint. Cover with soft wax or bind with strips of waxed muslin, being careful to leave the bud uncovered so its growth will not be hindered.

Half Ring Bud

Two cross cuts are made about one inch apart, and a slit severs the bark between them. A piece of bark is taken from a scion by making similar cross cuts to those in the stock. Make parallel slits on each side of the bud and in taking it from the scion be careful not to draw the germ from the bud. Lift the bark on one side and insert the knife, cutting out a thin segment of the sap wood. Make a slanting cut on each side of the bud, leaning the knife to the bud; then lift the bark of the stock and insert this piece, joining the ends so the cambiums of the two parts meet. Press the stock bark down firmly; wax over the joints and bind with strip of waxed muslin, leaving the bud free.

The wood cut out with the bud should be removed carefully, if the work is done late in the season and buds are to remain dormant until spring; but if the work is done in early summer to get growth the present year, the wood is soft and need not be removed, as it unites readily with the stock.



The Slip Bud.

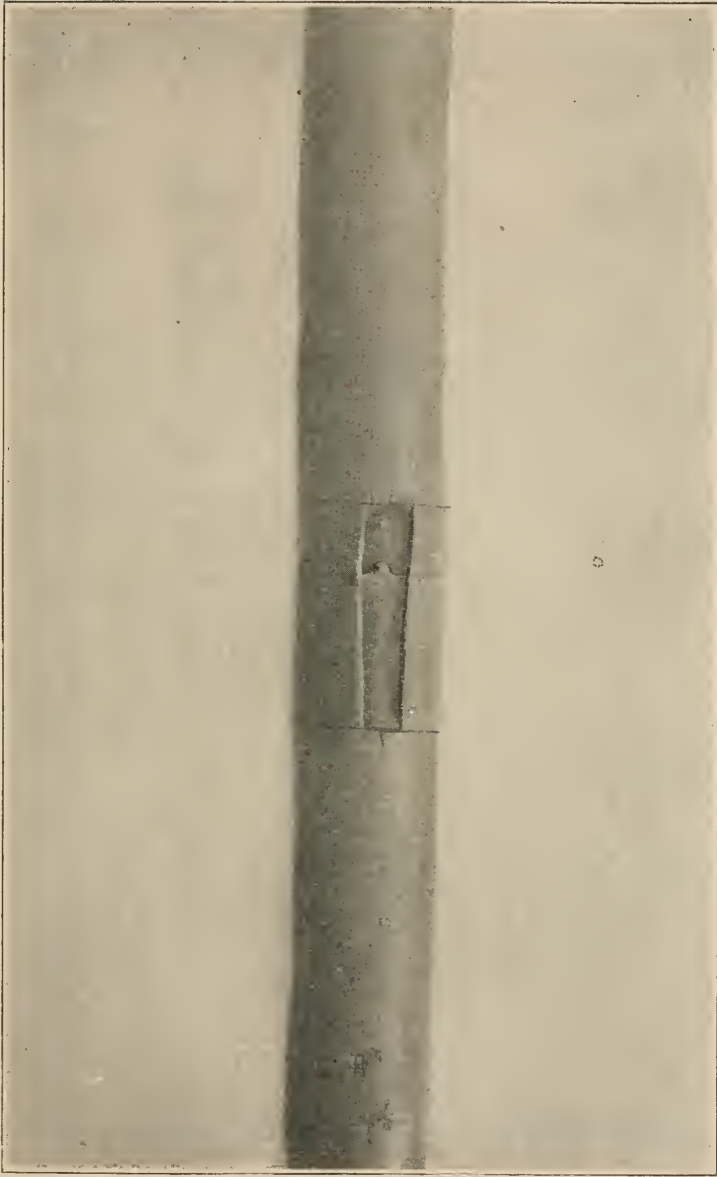
Ring-Bud

This method takes out an entire ring from the stock, and a similar ring of another variety containing a well developed bud is substituted. Bind as in the half ring method. The walnut can be budded very successfully by this method, in August; the buds remaining dormant until spring, when the branch is severed above the bud to start the growth.

Train Your Grafts

Scions usually make rapid growth the first year. Being soft and pliable, they tend to bend downward. A strong stake should be set up by the tree and the growing branch tied with thick coarse bands to the stake.

Small cords tightly bound interfere with the circulation or sap flow and sometimes destroy the young growth above the point where tied. If the top bud grows in one stem without throwing out side branches enough to form a good head, pinch off the top bud and side branches will soon grow out. Should one or more of these branches tend to make too much growth, thus destroying the symmetry of the tree, pinch the buds and a portion of the sap flow will be diverted into other limbs.



Half Ring Bud.

Many lateral buds will start into growth on the stalk below the graft; these must be pulled off, since their growth retards that of the scion.

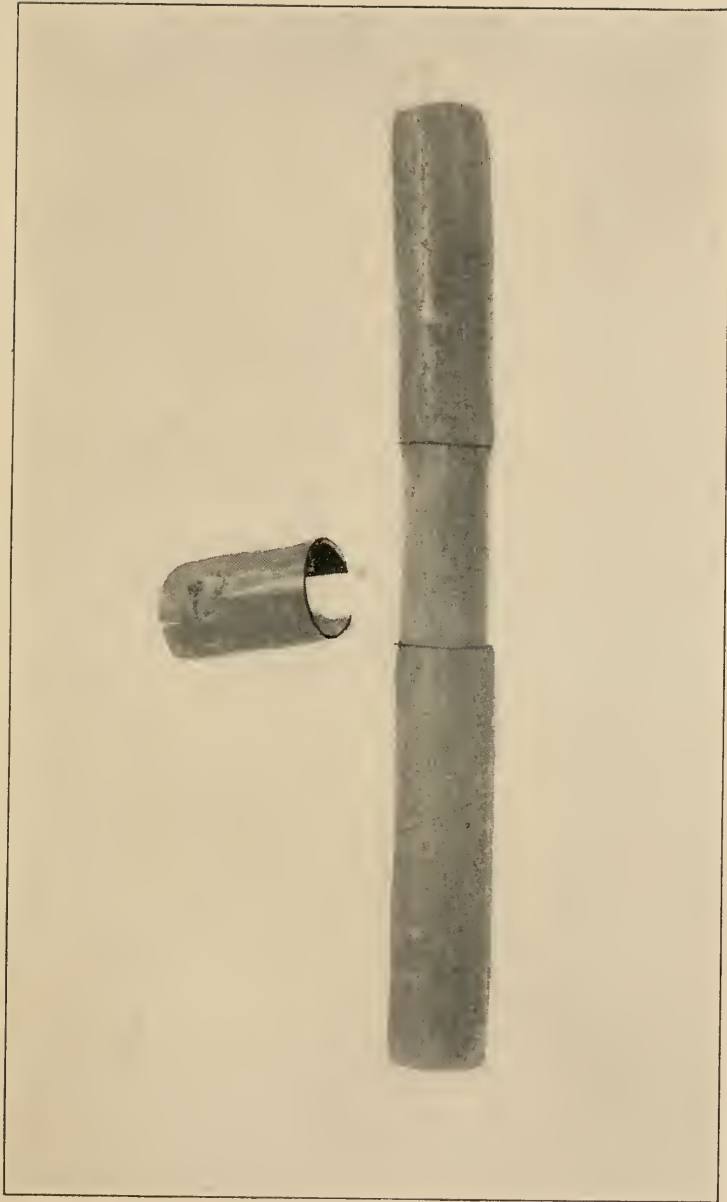
Mingle Varieties in Grafting

When grafting a nut orchard it is better to change the varieties in alternate rows, because trees thus arranged aid each the other in pollination. A late rain might destroy or wash off all the pollen of one variety before the bloom is fertilized; hence, the other trees whose staminate ripen later would yield sufficient pollen to fertilize all trees.

Do Not Graft Young Trees

A tree should have a well formed root system before it is grafted, as it usually commences to bear nuts the second year. Young trees forced into bearing too early by being grafted too soon are dwarfed and never recover. For this reason we do not deal in grafted stock. Graft the tree when four years old and note the growth. A fine top with branches eight, twelve and often sixteen feet in length will grow the first year; and yield from one to ten lbs. of choice nuts the second year after being grafted.

To remove a tree after it has developed a fine



Ring Bud.

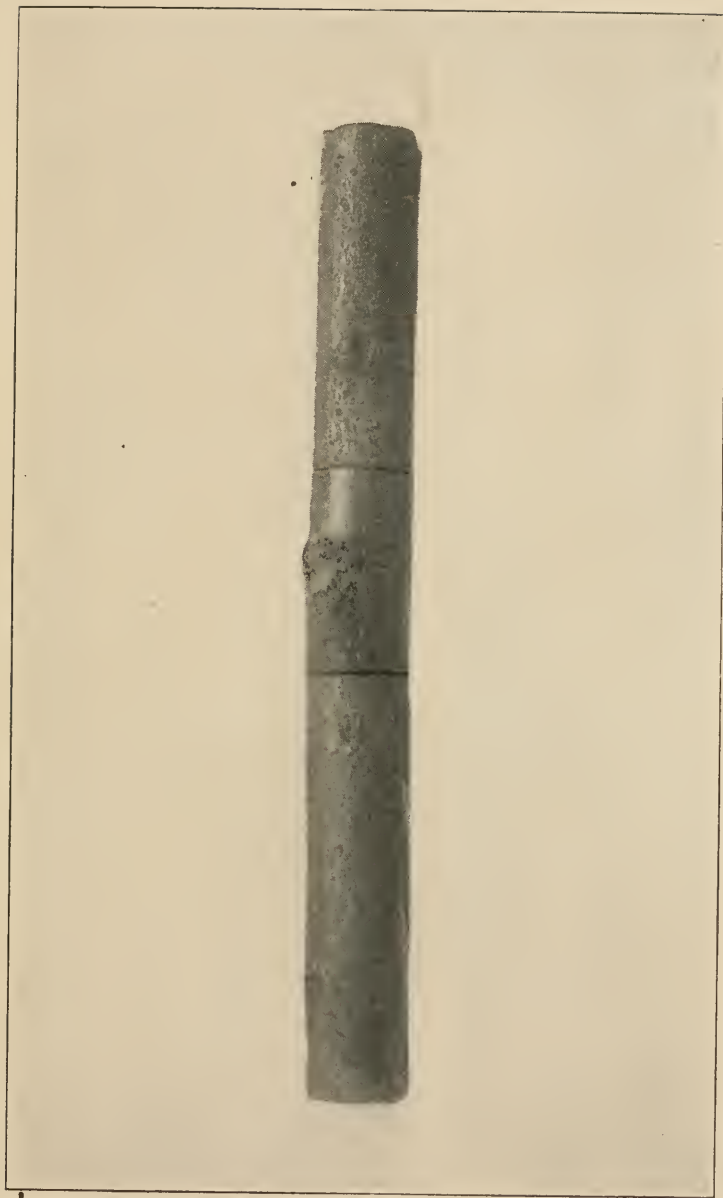
THE WALNUT

root system, means permanent injury. All of the small rootlets which contain the microscopic mouths that drink sustenance for the tree are destroyed; and the tree must grow other rootlets before growth in the stock can be renewed.

Pruning

It is not the custom of nut growers to prune the walnut tree to any great extent. However, our experience has proven that it can be improved by careful pruning. Give to it, as to any other tree, a shapely appearance by proper pruning. If the tree be permitted to grow two or three large branches they are liable to split apart sometime when loaded with nuts, and the tree destroyed or its beauty effectually marred.

Make the young tree grow in one strong central branch with well balanced limbs growing strong and upward. If trees are to be cultivated you want room beneath the branches. When bearing a heavy nut crop branches bend beneath the weight: hence, great care should be taken in properly training the lower limbs. Cut back the limbs to fifteen or eighteen inches before the sap flow in early springtime, cutting beyond an upper bud. Cutting back makes



Ring Bud.

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the branch strong and cutting beyond an upper bud causes an upward growth. Always cut close to the bud and the wound will soon heal over. This rule should invariably be observed in trimming any kind of trees or even rose bushes. Circulation ceases with the growing bud and the part of the branch left beyond the bud dies, turns black and continues to die along down the stem below the bud. If at any time it is necessary to cut off a large limb, cut as closely as possible to the main branch, and paint or wax over the wound. It in time may heal over, thus preserving the wood and preventing decay.

In early spring time before the buds have commenced to swell is the best time to prune the walnut tree. However, if the trees are not pruned at this time, then wait until they are growing fast in May or the first of June. At this period the cambium cells are forming and being filled with protoplasm, and there is no danger of loss of sap or the trees bleeding.

If a limb should be broken off, leaving an unsightly appearance in the outline of the tree, it can be closed up by judicious pruning. To do this the branches nearest the break should be cut back in such a way that the buds will send out new branches to fill the break. Remember to cut just beyond a

BEARING QUALITIES

strong bud. If nuts sunburn from excessive heat, thicken the branches on the southwest by pinching off the end buds when the tree is in vigorous growth.

Bearing Qualities

The most prolific bearing trees are those grafted to the California black. Two noted trees are the Wolfskill and the Payne, each having yielded as many as seven hundred lbs. of nuts in a single year.

The average yield for ten years from one large tree grafted fifteen years past has been three hundred and ninety-four lbs. From the above we may form some estimate of the value of a large orchard—properly put out, and cared for—in the coming years. It will commence bearing the sixth year and increase rapidly thereafter. Give sufficient nourishment to the soil, and with proper cultivation trees will make wonderful growth. Comfort, shade, beauty and value are created; and while walking beneath the ever spreading branches, the spirit drinks from the fount of perennial youth.

And besides the beauty of landscape there is the added value of food and timber. One large walnut tree has been sold for three thousand dollars.

Harvesting

The walnut usually drops from the hull, is gathered and given two or three washings in clear water, laid out on trays, dried and sacked for the market.

Frequently the outer hull dries, clings to the nut and it is difficult to separate them. When this occurs, knock off the nuts upon a large sheet spread out under the tree. Dump them into a wagon, take them to the drying shed and shovel the nuts into a vat of water. Stir them briskly for a few minutes and they will part from the hulls. They should be washed two or three times in clear water and spread out on the drying trays. Standing in the vat with the hulls, or permitting them to dry when taken out before washing, will give the nuts a dark stain. Wash the nuts in clear water as soon as they part from the hull.

Nuts properly gathered need not be bleached, as this injures the nuts having open shells. Such nuts will not keep, as they soon become rancid. Nuts should remain on the trees until the outer hull is dry. They should not be gathered into piles, nor put into sacks while this hull clings to them; they become soft, are very disagreeable to clean, besides the shells are stained and their market value injured.

THE WALNUT

Value for Timber

In most countries where the walnut grows the timber is very valuable for furniture, frames, gunstocks, mantels, etc. More than a century past France passed a law prohibiting the exportation of walnut lumber.

Yet in our own country, in Indiana, it had little or no value in the early settlement of the state. An encumbrance, cut down, rolled into log heaps and burned. One or two cuts of the finest trees split into rails. In boyhood many a noble tree have we seen thus disposed of in the valley of the Wabash. Today the lumber from similar trees would bring from two to three hundred dollars per thousand. The California walnut likewise makes very valuable lumber. The entire tree being gnarly, and when polished it has a very pleasing effect. It makes valuable veneers, the color a rich brown, but not so dark or heavy as the Eastern black.

Value of Nuts

As an investment walnut culture has many advantages over fruit raising. Trees do not require so much care, cultivation, and pruning, and are free from insect pests. The walnut can be harvested with less

THE WALNUT

expense than fruit and marketed at leisure. There is always a home market for it. Many years will elapse before the supply in our country will equal the demand. In hundreds of homes nuts are taking the place of meat, and the users are the healthier for the change. Nuts, nut cakes, nut hot cakes, blanched walnuts, walnut and banana salad, nut and fruit salad, nut cabbage salad, mock turkey, roast duck, (vegetarian style), imperial nut roast, walnut loaf, walnut roast, walnut lentil patties, walnut lentils, lentil roast (with walnuts), bean and nut loaf, candy (with walnuts), fudge, nougat, panoche and divinity are some of the viands on many tables. It was well named when called "The food of the Gods," this King of nuts.

The Analysis of the Walnut

Kernels	100 %
Water	2.8
Proteids	16.7
Fat	64.4
Carb.	14.8
Ash	1.3

THE WALNUT

The knowledge gained from a study of this treatise will be valuable in raising nuts and fruits of all kinds raised in a temperate climate.

All trees are subject to the same general laws; and will respond as does the walnut to Nature's method of propagation. The pomologist may change varieties in his orchards by grafting, and they will respond with a wealth of fruit which justifies the outlay and care. The life line is yearly renewed in every tree, and it is just as young in the tree that has withstood the storms of centuries as in the sapling of a single year.

The heart wood alone is old. The living tree is always young; and with sufficient moisture, containing the elements necessary to growth it continues to expand. It is not possible to give rules to meet all conditions. There is a cause for every effect; and the orchardist must always be on the alert. Climate is influenced by latitude, elevation, nearness to the sea, direction of prevailing winds, amount of rainfall, vicinity of mountains and ranges, etc., etc. Hence, the growing of orchards, and to be able to cope with the various conditions requires constant study and thought. But success is sure to come to the careful thoughtful grower.

Grafting Wax

The following formula will give an excellent and durable wax:

Bees wax	1 lb.
Boiled oil	1 pt.
Resin	5 lbs.

Put all of the ingredients into a vessel over a slow fire, and when dissolved pour the contents into a vat or tub of water. Work under the water until cool, then work the mass in the air until it is free from the water. One lb. of tallow may be used instead of the oil. If dark wax is desired lamp black may be added while cooking. If the wax should be too soft, rendering it liable to melt and flow down the stock, add more resin.

Walnut Trees For Stock Purpose

THE CALIFORNIA BLACK

is the hardiest tree known.
Will grow in any climate.

We have in our Calaveras Nursery a
limited number of these trees ready
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Prices on application.

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Scions or Grafts

For propagating, by grafting into the hardy California Black; we have the following choice varieties: Calavette, Franquette, Mayette, Hubbard, Stocktonian and Smith's Favorite.

MAYETTE.

French variety. Late bloomer. Kernel white and delicious. Considered a shy bearer. It will doubtless ere long be improved by careful selections of scions in grafting. Should be grafted into alternate rows with the Franquette.

HUBBARD.

A medium sized nut having many characteristics of the pecan. Very noticeable pecan flavor, and shaped like the pecan. The tree is hardy and prolific. The shell is well filled by the kernel. We studied this nut many years and have yet to see one injured by sunburn or blight.

CALAVETTE.

Hybrid. Praeparturien and Gant. Produced at Westpoint, Cal. Hardy and prolific. Very large nut of excellent flavor. Requires rich soil.

FRANQUETTE.

Late blooming French variety. Hardy. Good bearer. Fine flavor. Suited to localities subject to late spring frosts.

STOCKTONIAN.

Vigorous tree immune from blight and sunburn. We have watched this tree for years and have never seen a crop failure. The nut is as large as the Franquette but more symmetrical and better filled. The outside hull is very thick, hence its protection from heat. Nuts with thick hulls do not sunburn.

SMITH'S FAVORITE.

Choice walnut produced at Westpoint, Cal. Medium soft shell. Large nut. Full white kernel. Fine flavor. Good bearer. Immune from blight and sunscald. By Thomas R. Smith of Westpoint, Cal.

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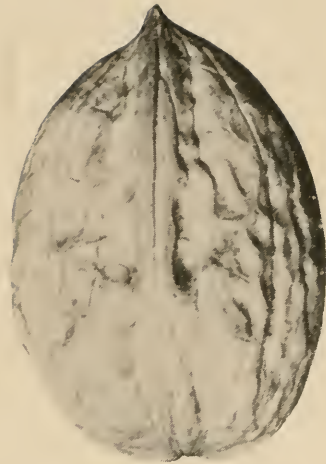
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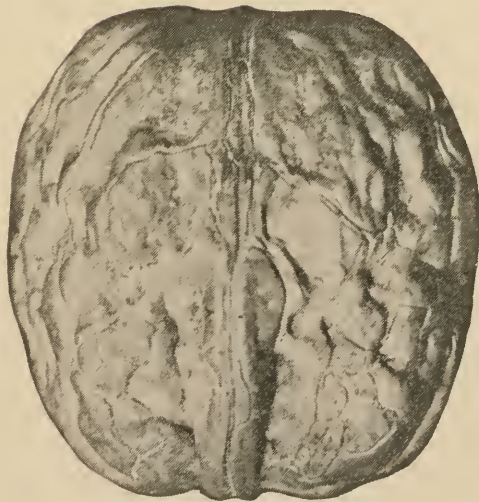
MAYETTE



FRANQUETTE



HUBBARD



CALAVETTE

Grafting Wax

Scientifically prepared and ready for use; also waxed grafting tape in any desired length and width ready to apply. These preparations have been scientifically prepared after years of research and have never failed. The waxed tape comes in rolls of suitable widths, prepared for grafting and budding, also for binding up wounds on trees, etc., etc. : :



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Sacramento, - California

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at Sacramento, California, and at
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We furnish only one year old trees, the California Black for stock purpose. These trees are grown from hardy nuts raised in the cold Sierras at an elevation of three thousand feet. We do not deal in grafted stock; but we will contract to graft trees for any and all parties who may wish to let out their work.

We also deal in scions, wax and waxed tape for grafting and budding purposes: : :

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SACRAMENTO, - CALIFORNIA

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General Value of Price's Book to Every Grower of Fruit Trees.



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Further than this

The process for grafting the walnut is precisely the same as for grafting any other fruit tree. There are no exceptions.

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Price's book is invaluable to every grower of fruit trees, whether he be interested in walnut culture, or not. Because the simple, succinct, and perfectly comprehensible directions for grafting are equally applicable to the *Peach, Apple, Orange, Lemon, Plum, Pear*, or any other fruit tree whatsoever.

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