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# Oregon Agricultural Experiment Station.

CORVALLIS, OREGON.

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## THE WALNUT IN OREGON

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BY C. I. LEWIS.

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## INTRODUCTION.

The following pages from the pen of one who has been within the state a comparatively short time cannot pretend to constitute a complete treatise on the subject of walnuts and walnut culture in Oregon. It is hoped that they will nevertheless be found adequate to our present urgent need.

Walnut growing is rapidly becoming an important industry of our state and there is a dearth of reference material upon the subject for the information and guidance of growers. We are at the present time at the Station receiving many letters requesting information concerning walnut culture. For these reasons I have been making a close study of the subject, gathering data from as many sources as possible. I have visited as many orchards and trees as were accessible; have freely consulted all available references in the form of reports, reference books, and articles written on the walnut; and especially have drawn suggestions from agricultural publications, from speeches, and from personal interviews with such men as Mr. H. M. Williamson, editor of the Oregon Agriculturist, Mr. M. McDonald of the Oregon Nursery Company, Mr. J. B. Pilkington of Portland, Mr. Ferd Groner of Hillsboro, Col. Henry Dosch of Portland, Mr. Thomas Prince of Dundee, and many others. From these sources of information I have sought to cull such points as seem essential to our present need, and from these to draw such conclusions as are conservative. As such I present the following notes, realizing that they are not only far from complete, but that they will not agree in every detail with many of the ideas of our best authorities. However, the walnut industry is in its infancy, and, as with all new enterprises, there are many theories and suppositions concerning it that perhaps in later years will not hold true. So it is hoped that at least this bulletin may be of value in satisfying the demand for information upon the subject of which it treats; in helping many to overcome some of their difficulties; and in guarding uninformed persons against certain practices that will, if adhered to, hurt the industry.

## HISTORY.

The English walnut (*Juglans regia*) has been grown for centuries in western Asia, especially Persia, whence it has been introduced by invaders and traders to various parts of Europe, namely, Italy, Spain, France, Germany, and England; and it is moreover variously named, after all these countries. From Europe it was introduced into America and for over a hundred years walnuts have grown in different parts of New York State, and farther south; but the large planting has been in California. There the industry was introduced by the Spanish friars, who brought with them the Spanish strain, which is a soft-shelled type, such as the Soft Shell and the Santa Barbara. Walnuts have been introduced into South America also. In later years French strains of such varieties as the Franquette and Mayette have made their appearance, and the introduction of these bids fair to revolutionize the walnut industry in America. Not only will they be grown here in Oregon, but the chances are that the French nuts will in the near future be the chief nuts grown in California itself. They are the hardier nuts and come from climates much like our own.

### Present Condition of Walnut Culture in Oregon.

Scattered all up and down western Oregon we find the English walnut growing, in plantings ranging from isolated trees up to those of one hundred acres. The majority of these trees are in bearing and go to prove that we have conditions here suitable for growing the walnut. While many of the trees over the state never bear, or produce only inferior nuts, there seems to be ready explanation for their failure. The barren trees are either the California type, principally Santa Barbara, or they are trees grown from nuts picked up at stores. The climate here is such that almost invariably the frost catches these trees, at times even injuring the tree itself. In sheltered places the Santa Barbara occasionally bears. The trees bearing inferior nuts are chiefly seedlings which were not chosen with care. We also find in places quite old trees that have made little or no growth, and investigation shows soil conditions to be such that only failure might be expected. Thus we see that we must choose our trees with care and have soil of the right condition. With this care, orchards up to fourteen years of age are doing nicely. However, we have no old orchards. Our old trees are principally isolated trees and perhaps they are not a fair index of what

a whole orchard at their age would do. As regards young trees we find, for instance, that Mr. Thomas Prince has three hundred fifty trees planted in 1897, and two thousand trees planted in 1898. Last year he harvested between two and three tons of nuts and this year between four and five tons. Dr. Finck of Dallas has a tree now thirteen years old which two years ago bore seventy pounds of nuts. Mr. C. H. Samson of Grants Pass has two hundred fifty trees nine years old that began bearing at seven years. Mr. Tiffany of Salem has a tree fourteen years old which last season produced one hundred fifteen pounds of nuts. Mr. E. Britt of Jacksonville has a tree that has never failed a crop for twenty years. In addition to these there is quite a large acreage of young trees. In the neighborhood of Mr. Prince's orchard at Dundee we find about three hundred acres. Mr. Ferd Groner of Hillsboro has eighty acres. At Jefferson, Shedd, Jacksonville, Ashland, Merlin, and Grants Pass, are quite large plantations. From the crops taken from isolated trees at twenty years and over we might assume that the orchards at that age will be heavy bearers. However, we have not as yet the proof. While I myself have such faith in the future of the walnut in Oregon that I would feel willing to set out a walnut orchard, I would not want to give such advice as to lead anyone to stake his all in walnuts. Let us be conservative and plant in moderate quantities, and the near future will demonstrate without a doubt what the walnut will do. The future seems very rosy but until our young orchards have reached an age of about twenty years and have shown that they are heavy bearers, we have not the right to proclaim that the walnut in Oregon is a decided success.

#### PROPAGATION.

At present among walnut growers there is more or less controversy as to whether we shall plant nuts, seedlings, or grafted trees. Some maintain that only by planting seed in the place where the tree is desired can good results be realized; but broad investigations over the state do not bear this out. True it is that in situations that are not very favorable to the walnut a seed will establish itself sooner than the transplanted tree; but such conditions should not be accepted for the walnut. Ordinarily, where the seed has been planted, it does seem to make a better growth for four or five years, but after that no appreciable difference is noted. If seed is planted, great care must be used in its choice. We hear a great deal about

generation and the term has to the average person more or less of a mystical association. It may mean something and it may not. We have been told that the walnut is different from other trees in regard to the laws of heredity; but a careful examination does not prove this to be so. Now, original trees and their grafts are known as first generation trees, and nuts from these trees are called first generation nuts. These produce second generation trees, and their nuts are called second generation nuts. These nuts would produce third generation trees, and so on. We are told to plant only first generation nuts and it is held that the trees from these will bear larger and better nuts than first generation trees bear, but that after this the nuts rapidly grow smaller. The author holds that first generation nuts may be good and that they may not. In order for these to be valuable they must be procured under the following conditions: They must come from a grafted tree, or from a grafted orchard of one variety, which is isolated. Otherwise we can have practically no assurance that we can have trees that will bear good nuts. Even if the orchard is isolated, we cannot be sure that all the trees will produce good nuts. While in many cases the nuts produced are larger than those from the original grafted trees, on the other hand they are sometimes smaller and inferior. Accidental cross pollination and better or poorer growing conditions will play their part. As regards all this theory about walnuts and generation, it simplifies itself down to about this—the walnut is bisexual and self-fertile. An orchard, therefore, that is isolated, and of only one variety, will have little chance, of course, to become pollinated from other varieties. The result will be that a large percentage of its nuts will be fairly true to type; but we must expect more or less variance. A visit to the orchard of Mr. Prince will confirm this. We find there hardly any two trees of the same variety that are exactly alike either in tree characteristics or in nut characteristics, altho the parentage can be easily traced. Nuts from such an orchard as Mr. Prince has, containing a great number of varieties, would make poor seed, for the reason that they would cross, and the following generation would be a grand mixture, from which would doubtless come a great many inferior trees, as well as some trees with about the same characteristics as his varieties possess (such as Franquette, Mayette, Parisienne, etc.), and a few better in certain characters, probably, than the parents. Indeed, this has actually come to pass. Mr. Prince himself has a seedling of

exceedingly promising characters, while another such seedling has occurred at Salem, from the Franquette. As we proceed with other generations the tendency to vary would be greater and greater. The walnut, then, follows the general rule of plant life. This does not mean that good results cannot be obtained from seedlings from grafted trees, provided the said grafted trees were isolated, because the chances are that the planter would have enough good trees—say, five or seven to the acre,—from whatever he plants to meet all requirements, thus making allowance that some of the trees will bear inferior nuts and that some of them will bloom so late as not to have time to mature. But one can afford to sacrifice these. Again, these seedling trees are much easier to procure at the present time than the grafted trees. But if seedlings are being handled they should be taken from such an orchard as above mentioned, or else imported French seedlings of good character should be purchased. Otherwise, plant imported French nuts or nuts from an isolated grafted tree or orchard. Under no conditions plant nuts picked up from a store. Caution should be exercised in purchasing nuts from local trees that are called by the names of certain varieties. Plate 18 shows a nut that I found in Salem being sold as Mayette, which had practically no Mayette characteristics.

Another class of trees that could be planted is the grafted trees. These are hard to procure and are expensive, but undoubtedly if we are to put the walnut industry where it belongs, we must learn to graft with more success. Each walnut tree has its individual characteristics and we should choose with great care the scions from those trees which have the commercial characteristics as regards nut, and which are vigorous and prolific. An orchard of such trees would have many times the value of the average seedling orchard. The nuts would be of the same type and size and would be able to demand better prices.

#### GRAFTING.

Trees are grafted on their own stock (*Juglans regia*), or the California Black (*J. Californica*), and on the American Black (*J. nigra*). We also have several methods of budding and grafting, but none of the methods has so far brought a large percentage of good grafts. Occasionally we hear of men who claim that they can graft over 90%, but further investigation generally shows that such is not the case. Of the American grafters, Mr.

Geo. Payne of California is about the most successful of whom I have heard.

When trees are grafted on their own stock they make rather slow growth and for this reason the method has not met with much favor. When grown on California Black walnut stock they make a rapid growth and seem to come into bearing sooner, and will, it is claimed, grow in heavier soil. On American Black walnut they make rather slow growth. Mr. Prince, of Dundee thinks that a good deal of the failure in grafting has been due to the fact that too soft wood has been used, and that where two-year-old wood has been used better success will be met with, as the one-year-old wood is soft and tends to be pithy. Doubtless he is right. On the other hand, Mr. Payne of California, I believe, uses the yearling wood, grafting either the two-year-old or the four-year-old tree. The three-year-old tree is too large at the collar to be easily grafted and too small to be top-worked easily. The two-year-old tree can be easily root-grafted or collar-grafted, and the four-year-old can be easily top-worked.

As regards the kind of wood to use, it will probably depend largely upon the system of budding or grafting employed, as we should as nearly as possible have stock and scion or bud of nearly the same condition. The French are having considerable success grafting in the southern part of France, and in northern Italy, while in northern France little success is being met with except in the greenhouses. Mr. Gillet, of Nevada City, California, states that the common mode of shield budding as employed on fruit trees fails with small walnuts, say three years from the seed, and rarely succeeds on the larger stocks. When used on the latter he advises removing the wood from the inner side of the strip of the bark on which the bud is set, making this strip at least two inches long, and as broad as possible; but even under these conditions he has had very little success. Flute budding has been used as much as any form. This was recommended for nuts by Mr. J. L. Budd, of the Iowa station, and the method is shown in Plate 3. Grafting by this method is generally done in summer, about June, when the bark slips easily. Choose scions from one-fourth to three-fourths of an inch in diameter, removing a ring of bark one and one-half to two inches long. This should have a good strong bud. Cut off a limb of the stock, leaving a stub from which a smaller ring of bark is removed. Carefully split the ring from the scion and apply



it to the stock, taking care that it neatly fits the remaining bark or stub and that the split edges unite. The parts should be nicely united and not bruised. Cover the whole with a paper sack, being careful to see that it is tied below the wound. This method has been more or less successful in top-working. For use in small trees in the nursery or for top working small branches on large trees, a modification of this form, known as ring or annual budding, is often used. In this case the top of the stock is not removed until after the bud has grown fast. Crown grafting is the most successful method used with young trees and can be successfully done with either whip, cleft, or sap. Any seedling not greater than four inches is chosen. Before grafting, remove the earth for several inches around the base of the tree, and then smoothly cut off the base several inches below the ground line. The graft is then bound with wax, cloth, or the tying materials, and then earth banked up to the top of the scion. Sometimes cleft grafting is used, such as is shown in Plate 4; but this rarely meets with success when carried out by the method illustrated. When cuts are made through the sap wood instead of through the heart wood, more or less success can be expected. Another method of top-grafting is the prong grafting or budding. This is much like shield budding, with the exception that a prong instead of a bud is used. There are, of course, many other methods of budding and grafting that might be used but they have no particular advantage.

Where seed is planted, several methods can be used. Good success was obtained by Mr. Prince by planting nuts at various times from the first of February to the middle of April, in good rich, but loose soil, planting the seeds on their side at a depth of two and one-half inches. It might possibly be better to plant them a little deeper than this (See plates 1 and 2). It is also noted that the later plantings—about April—seem to give better results. Others recommend that the seeds be planted in boxes and sprouted first and then planted in nursery rows four feet apart and one foot apart in the row.

#### SITE.

It is sometimes stated that the walnut will grow on almost any soil. This statement is not true. There is no tree that demands as much care as the walnut in the selection of the soil, especially when grown on English walnut roots. It is claimed, and reasonably, that, when grafted on either American Black or California

Black, the tree will stand heavier soil. The walnut is a heavy feeder and the soils that suit it best are the good, deep, rich, moist loams, at least fifteen feet deep and well drained, altho these are not necessarily the only soils upon which it will grow. Mr. Prince of Dundee is getting splendid results on his red hill land, which is the typical red soil, hut is deep. This perhaps will not produce as rapidly growing trees as similar land a trifle heavier, such as we find, for instance, in and around Salem (See plate 6). The soils to be avoided are those which are underlaid near the surface by hardpan, and those underlaid near the surface with rock, cement gravel, or loose gravel. In the former the tap root will grow for a short time but cannot penetrate the hardpan, and the tree will cease growing. The latter soils should never be selected—they are too light and thin. Much of our valley land is too heavy and poorly drained. Probably the best site as regards soil will be found in the rolling land such as found in large quantities in the Willamette Valley counties. On the rolling lands we will get better drainage of soil and also the chances are better for good circulation of air around the trees to keep them in good health and at times avoid frost. The preparation of the ground should be about the same as for a fruit orchard—good deep plowing and thorough harrowing will bring their rewards. We find fine illustrations of this in visiting Mr. Prince's orchard, where every precaution was taken in preparing the ground and handling young trees, while in that vicinity are several neighbors who did not take these precautions. Today Mr. Prince has handsome trees, while some of the neighbors mowed down their trees with a mowing machine.

#### PLANTING THE TREE.

It was formerly thought that it was disastrous to the walnut to break or cut the tap root, but it has been found that it causes no injury to cut off the tap root in planting, as this action generally induces new tap roots to appear and also produces a better, healthier root growth. In all cases remove the tap root with a sharp instrument, making a clean cut. The tree should then be carefully set, taking care, as with a fruit orchard, to have the trees thoroughly lined and firmly set. As regards distance to plant, great errors have been made, and we shall probably have to go through with the walnut exactly what we have done with the apple. Many walnut growers were led to believe that it was to their advantage to plant

trees from twenty to thirty feet apart, and later to remove some of these trees, realizing a fortune from the lumber. These persons will generally be doomed to disappointment because such walnut wood is not of good quality. Where the trees grow in the forest they make straight smooth trees. Out in the open we find that they make strong lateral growth, and such trees do not make good timber. Mr. Prince has his trees thirty-six feet apart and some of the trees are now nearly touching. The author would recommend the proper distance to be from fifty to sixty feet apart. Under some conditions he might plant the trees thirty feet apart and later take out every other tree. Eventually five to seven trees to the acre would be sufficient, and the yield from these would be from three hundred to a thousand pounds, which, at present prices, would bring handsome profits. In some cases it might be profitable to plant these trees as Mr. Prince has done, putting them out in his prune orchard, and later, as the trees begin to crowd, removing the prunes. See plate 7. Just what trees should be removed would depend, of course, upon how close they were planted; but aim so as to have at least fifty feet between the trees permanently. To be convinced that the walnut responds to tillage and cultivation, one needs only to visit those orchards in which such care has been given, and then notice trees of the same age that have been set out and neglected. The walnut is a rapid grower and a heavy feeder and should receive the same intensive culture that is given to our fruit trees. The soil should be plowed or disked in the spring, and as soon as it is possible to get on the soil after the rains of winter without danger of puddling, it should be cultivated to a depth of two or three inches with some kind of cultivator or harrow. The underlying principle of this is simply to conserve the moisture. The moisture can be made to come up through the trees and be given off through the leaves and not allowed to escape into the air from the soil. Take a pan of water and place some glass tubes in it. You will find that the water rises in the tubes higher than it stands in the pan. Little particles of soil form just such tubes, which, reaching to the water table, cause the water to rise. By shallow cultivation we break off the tops of these tubes and do not allow the water to escape up through the ground. The function of water is principally to dissolve the plant food so that it can enter the roots and be taken to the leaf, where it is manufactured into building material, and the water is sent off into the air. Tillage should be carried on thor-

oughly during the summer months up to about the first of August, when probably in most cases the weeds can be allowed to grow. In most cases vetch can be sowed at this time. This will be plowed under in the spring, never being allowed to reach a height greater than two feet, if possible. This vetch adds a great deal of plant food, namely, nitrogen. It also produces humus, or decaying vegetable material, which helps the soil to hold more moisture, and which is of value in placing the soil in a better physical condition. If you break open a large lump of soil, you will generally find that it will fall apart along certain lines, and these lines are little fibres of vegetable material. A good supply of decaying plants on the ground will cause the soil to break up easily. It may be that in some cases, where the vetch is put in every fall, we shall get too strong a growth of tree. When this takes place, sow some such crop as rye, which will produce the humus and mechanical effects without adding much to the plant food. On some of the steep rolling land where there is great danger of loss from washing of the soil, it might be advisable simply to stir a small area around each tree, leaving the greater part of the soil in sod, and from time to time mowing the grass, allowing it to remain on the ground; but never remove it. Otherwise we cannot save the moisture in our long, dry summer. It would probably also be necessary to add extra straw to spread on the sod to conserve the moisture. We have yet to experiment to determine the value of this practice. While, in some conditions, it works well with apple orchards, we have yet to demonstrate its utility in our climate. But we do know that with good tillage plus the use of cover crops we obtain splendid results. Clear tillage alone in time destroys the humus. The methods to employ will in time demonstrate their true value and we shall probably find that local conditions will be the factors that will determine method.

#### PRUNING.

The walnut will require little or no pruning. Care should be taken the first four or five years to keep nearly all laterals removed. This will cause the tree to make a rapid terminal growth, and when the laterals do begin to grow they will not come down close to the ground as is the case with the young trees where the laterals are allowed to remain (plates 9 and 10), necessitating the cutting off of quite large limbs. This keeping the laterals off also, of course, gives a much larger tree, as the growth that would naturally go

into the laterals is forced into the terminal growth, the young tree sometimes making seven or eight feet of growth in one season. The young trees should always be staked and tied with broad strips of cloth to prevent cutting. Plate 8 shows a three-year-old tree properly treated. From time to time dead wood will need to be removed from the tree and occasionally a few limbs taken out to guard against having the tree grow too thick; but care should be taken not to remove large limbs. When this is done be sure to make a slanting cut so as to shed the water, and then wax it to keep it dry, as exposed pith will rapidly decay. It has been the practice in some places, in harvesting the nuts, to handle the trees more or less roughly, it being claimed that the breaking of certain terminals forces out a lateral bud growth; and it may be that in some cases where the trees do not tend to be very fruitful the heading in of some of the terminals may be beneficial. We still need to do more or less experimenting along this line, but the walnut grower will find that his trees do not all begin fruiting at the same age. Here in Oregon the average is from four to ten years, but some trees that are considered to be barren at ten years old, later come into bearing. The yield of nuts the first year is very light—probably four or five nuts to the tree. The second year, two to five pounds; and trees from fifteen to twenty years old yield as high as three bushels on the average, while old trees yield from fifteen to twenty bushels. The walnut, if given proper treatment, will live to a ripe old age, as we know of trees in parts of Europe that are three hundred years old; but some California trees have been removed when they were thirty years of age, it being claimed that they had outlived their usefulness. This was probably due, in every case, to too close planting. When proper distances are allowed and the air circulates freely in among the trees, they live naturally for centuries, and this is one of the most attractive features of the walnut industry. In establishing orchards we are laying the foundations for prosperity for a great many generations.

#### HARVESTING.

The nuts are not harvested until fully ripe and the husks begin to split open. Light shaking of the trees will then cause most of the mature nuts to drop. As the walnut does not ripen uniformly, it will be necessary to gather the fruit at intervals for several weeks. In some countries it is the practice to beat the fruit off from the

trees but the California growers believe that this is more of an injury than a help as it often seems to knock off a great many buds. With care, however, a long, light bamboo pole may be of some service. When the nuts are gathered, the husks should be removed and the nuts washed and rinsed, for, if the hulls are allowed to remain on the nuts, they will cause a staining, thus depreciating the market value of the nuts. Where only a few nuts are grown, probably the husks can be removed by hand; but where nuts are grown on quite a large scale it may be necessary to make some kind of barrel or drum in which the nuts can be churned. One of these can be easily made by taking a common water barrel and making an opening on the side through which the nuts can be put in, and then revolving the barrel on some form of axis. In some cases it is the practice to add a little sand, and in France it is sometimes customary to give them a soapstone polish, which makes the shells very smooth and gives them somewhat of a greasy feeling. After the nuts are washed they must be cured. This curing is a matter that requires a good deal of care. The nuts are generally placed on platforms or trays—prune trays will serve admirably. (See plate 12). They are then allowed to remain out in the sun until properly cured, which will take about three days. It will be a good plan to stir the nuts several times each day, and, where they are left out at night, to have some kind of covering of canvas to throw over them to keep away the dews. In some cases they are dried by artificial heat, being placed in a temperature of at least one hundred degrees Fahrenheit for a number of hours, depending, of course, upon the degree of heat. After the nuts are cured they should be placed in a rather cool, dry atmosphere, where they can be kept until shipped. If not cured and kept in good condition the nuts will become ransid and be unsaleable. It is the practice in some parts of California, and also abroad, to bleach the nuts by means of sulphur. This practice, while whitening the shell, causes the quality of the nuts to deteriorate. If insisted upon by dealers, this may have to be done, but growers should try to discourage the practice. Some time ago the California Agricultural Experiment Station suggested the following treatment:—"The nuts, placed in small baskets such as the Chinese use for carrying, are dipped for about five minutes in a solution containing to every fifty gallons of water six pounds of bleaching powder and twelve pounds of sal soda. They are then rinsed with a hose and, after draining, again dipped into another

solution containing one per cent. bi-sulphide of lime. After the nuts have assumed the desired tint they are again rinsed with water and then dried. Instead of the second dipping, the nuts may be sulphured (fumigated) for ten or fifteen minutes. The cost of fifty gallons of chlorine dip will be about forty cents; the same bulk of the bi-sulphide dip, probably considerably less. The time occupied in handling one batch, two dips, is from twelve to fifteen minutes."

#### MARKETING.

The walnut is generally marketed in sacks. These hold from one hundred to one hundred twenty pounds. The more progressive growers screen the nuts, assorting the different sizes, as the prices range more or less according to size. The Chaberte nuts, however, and some soft shelled types, cannot be sacked, as the shell is too thin to warrant rough handling. These nuts are crated. With the reputation that we have established in the packing of fruit, we have a standard, in a way, to follow in handling the walnut. In other words, there will probably be a market for the better grade of nut handled in attractive packages. As the tendency is for small gift packages of fruit, so it will be with the walnut, and attractive packing and packages will undoubtedly bring splendid returns. In the countries where the walnuts are being grown in large quantities, quite a number are being picked green for pickling and catsup manufacturing. There is also quite a demand for walnuts for manufacturing oil and probably some inferior nuts could be used in this way to advantage. One hundred pounds of nuts will manufacture about eighteen pounds of oil. The French use this oil in manufacturing "olive oil".

#### VARIETIES.

The question of variety is one every grower must solve. At the present time there is practically only one point on which all growers unite in regard to varieties for Oregon, and that is, they must be the late-blooming kinds, known as the French varieties, such as Mayette, Franquette, etc. (See plates 13 and 14.) Each nut has its champions, but the two varieties named are the general favorites. Time alone will settle the supremacy of any variety or varieties over others; but it is only reasonable to suppose that the walnut, like the apple, will demonstrate that each variety is adapted to certain conditions, and fills a valuable place either commercially

or as a home nut. Already certain characteristics are being associated with each variety—thus, the Proepurturien bears while very young and the nut is of fine quality, being an excellent home nut. The Chaberte seems adapted to high altitudes and poor soils, and the kernels separate easily. The Franquette is noted for its good size and prolificness; the Mayette, for extra good quality; and so on down the list. These nuts also have their weak points, which will be brought out in the descriptions following. Not only do I expect to see each variety establish itself in some one of our varied conditions, but I also look for more varieties,—for seedlings superior to anything we now have. Already we see such signs in the seedlings shown in Plate 20, which were found in the orchard of Mr. Prince, and which have some excellent characters. The nut shown in Plate 16, Fig. 5, is a seedling, evidently of the Franquette, found at Salem. It is large, of fine appearance, but the shell is a little thick. Again, we can improve the varieties we already have by selection. They already show improvement over the foreign nuts in both size and flavor. Our nuts are now being sought for by the fancy grocers, being considered the best nuts on the market. Let us give these varieties a fair show, and time will demonstrate their value.

FRANQUETTE.—Originated by M. Franquette in the early half of the last century; a large nut, rather oblong, being pointed at apex and slightly flattened at the base. The valves formed by the joining of the two halves of the shell are very pronounced, bulging out to the extent that the nut can be lifted by the appendage. Passing from apex to base are suture lines, giving the nut a more or less ribbed appearance. The veining on the shell is not very pronounced. Shell, medium to thin, not being as thick as that of either Mayette or Parisienne, but being at the same time well sealed and thick enough to ship well. The inner partition shell separating cotyledons is thin and separates easily from the kernel. The kernel is plump, filling the shell and fitting rather closely along the valve lines, thus not allowing as easy separation of meat from shell as with either the Mayette or the Parisienne. The pellicle is pale yellow and glossy and is pronouncedly veined. The convolutions are quite large and coarse. The quality is excellent, having a rich, nutty flavor. The Franquette seems to show a tendency to be uniform in size and shape. It is a late bloomer, very hardy and prolific, and thus far has shown a tendency to be free from diseases. (See Plate 15).



**MAYETTE.**—An old, standard French variety that has been in cultivation for a long time. It is the Grenoble nut of commerce, and comprises fully half of the French crop. It is often spoken of as a medium to small nut, but this, I think, is due to the fact that we have, to my knowledge, no isolated grafted orchard here on the coast from which we can select seed, and much of the seed obtained abroad has been inferior. Again, we sometimes find nuts sold as Mayette which are not. Plate 18, Fig. 5, shows a nut sold in Salem as Mayette, but which is not. The true Mayette is above medium, to large, in size. In fact, some of the largest nuts I have collected in Oregon are Mayettes. In form it is not so oblong as Franquette, but slightly broader, and flatter at the base and more blunt at the apex. It is not ribbed as pronouncedly, but the veins are more prominent. Very deep pits occur in the region of the valve, which is less pronounced than with Franquette. The shell is somewhat thicker, the kernel large and plump, separating very easily from the shell and from the cotyledon partitions. The pellicle is dull and of a light brown color. The convolutions are not so large as with Franquette but are more numerous and more sharply pointed, while the veining is less pronounced. In quality, it is of the very best, being a dessert nut of the highest quality and bringing the highest price in the market. Fuller, in his description of this nut, states: "It is very large, with a light colored shell of moderate thickness, kernel plump, readily extracted whole, sweet and rich nutty flavor. Tree blooms late and is very productive. An old and standard French variety." At the present time we have very few genuine Mayette trees in bearing in our state. (Plate 17)

**PARISIENNE.**—Named after the city of Paris, but was originated in southern France and is now quite extensively grown in that country, and, with Mayette and Franquette, forms the bulk of the crop. It is a large nut of about the same size and proportions as Mayette but is more truncated at apex and does not bulge out as much in the center. It is sometimes slightly ribbed, and the pits, while numerous, are shallow. The valves are not pronounced. The kernel separates very easily from the shell. The pellicle is very light—from a straw color to nearly white. The convolutions are much as in Franquette and veins are quite pronounced. The kernel is smaller than that of either of the aforesaid nuts. In quality it is very good. Those who have seen this nut in the Prince orchard at Dundee are very much impressed with it, altho Mr. Prince himself

is as yet not sure that it can rank with Mayette and Franquette. These three nuts are promising from a commercial standpoint. (Plate 19).

CHABERTE.—Named after its originator. A medium sized nut, very flat at the base, and at the apex pointed in much the same way as the Franquette. The shell is thin, often to such a degree that it will not stand shipping in sacks, but must be crated. The kernel is smaller than that of the three above described nuts, but of about the same color as that of Mayette. It separates very easily from the shell, and this fact, with the small size of the kernel, makes it a favorite with confectioners. In quality, the meat is rich flavored and oily. Because of the large percentage of oil, it often is grown for this purpose. It is the hardiest of our French varieties and has grown at an elevation of twenty-seven hundred feet. It will also thrive on poorer soil than most of the other varieties. (See plates 13 and 14.)

PROEPURTURIEN.—Named because of its precociousness. The nut ranges in size from medium to small. In form it is something like a small Franquette, without the pronounced valves. It is a vigorous dwarf variety, often bearing in the third year, but only the grafted trees keep these characteristics. The seedlings tend to revert to the larger, less precocious, tree. In quality it is very fine and makes an excellent home nut. It is free from disease and is productive. Mr. Felix Gillet has introduced two improved strains, namely, the Large Pointed, and the Late, Proepurturien. (Plate 20, Fig. 4.)

MEYLAN.—A French variety that originated near the village of Meylan and is quite extensively grown in that region. This is a large nut, flatter and slightly broader than Mayette. The pits on the shell, however, are not so pronounced. Quite recently introduced into America by Felix Gillet. This nut can be seen growing in the orchard owned by Mr. Prince and is a very promising nut, being smooth and of fine form. It is somewhat lighter in color than most nuts. (Plate 13, Fig. 2.)

PARRY.—Medium sized, being rather flat on the base. Very few are as yet grown in our state but it may prove to be of value. (Plate 13, Fig. 4.)

Besides the English walnut we also have several other species that are useful chiefly as ornamentals or shade trees. The American Black (*Juglans nigra*), the California Black (*Juglans Califor-*

*nica*), one of the Japanese nuts (*Juglans Sieboldiana*), and *Juglans Manchuria*. are shown in Plate 21. There are also several cut-leaf and hybrid varieties that are ornamental and which may prove to be of value for stocks. (Plate 21.)

### DISEASES AND INSECTS.

So far, in our climate, we have had few complaints of insects attacking the nuts or foliage. However, there are in some regions certain caterpillars that attack the foliage. These can be easily treated by spraying with some arsenic poison. The nut in commerce often seems to be wormy and attacked by weevils, a condition which can be overcome by fumigating; but we have practically no destructive insects with us at present. We have one bacterial disease which is beginning to show itself and which is quite prominent in parts of California. It has attacked a few Oregon orchards in a light way. This is the Bacteriosis. (Plate 22.) The organisms of this disease winter over in diseased tissues of affected branches, and in fallen nuts. New infection will often occur in the spring, attacking young shoots, nuts, and opening leaves. If shoots are tender, canker-like spots appear. Black spots form on the leaves, which become misshapen and fall off. If the nuts are attacked early in the season, they will drop; if later in the season, they become marked by sunken black spots and will often remain on the tree until late in the fall. As yet but very few trees have been attacked in Oregon and the disease may never prove dangerous. In California, winter spraying with Bordeaux has proved beneficial. The disease seems to work more upon very rapidly growing trees; and therefore, if the disease appears in an orchard, it will be well not to try to force the trees too rapidly. Destroy all diseased branches, fruit, and leaves.

At times moss and lichens gather on the young trees and a winter spraying of Bordeaux or lime and sulphur will remove this. Occasionally nuts are sunburned. This is generally due to lack of moisture or a lack of thorough cultivation of the soil. In some cases nuts are being sent to the station, which are supposed to be diseased, having sunken black places on the hull. When examined, it is quite often found that these nuts are improperly pollinated.

## THE WALNUT MARKET.

Some persons have shown more or less alarm in regard to the walnut market, claiming that it would be very easy to overstock it. Now nuts are becoming more and more a staple of diet with the American people, due to several reasons—our increase in wealth, and the scarcity and increase in price of meat. The outlook now for beef is that it will tend to rise in price rather than to lower, and as our population increases the tendency will be for us to eat more and more fruit and nuts. The author of the bulletin can quite clearly remember when nuts were found on the table only at festive times; while at the present time the tendency is to have nuts nearly the season through. This means a great demand, and the figures given by the Government bear out this increase. In 1902 there were imported from Europe into the United States nearly twelve million pounds of walnuts, while in 1905 this figure had risen to over twenty million. These imported nuts are inferior to the nuts that we can grow. They are not graded as carefully. Plate 23 shows typical nuts taken from a pound of walnuts sold in one of our stores. Many of the nuts are not true to name, being a grand jumble of varieties. In California the production is increasing but slowly—less than four thousand tons in nine years; and it has been estimated that if it should double that amount in the next ten years, or, say, if the increase should be a thousand pounds a year for the next twenty years, that would mean only forty million pounds, or less than one-half pound for every person in the United States. This means that the population of the country is increasing more rapidly than the combined ratio of imported and native nuts. Again, let us consider the prices that California has realized. We find upon investigation that the price has steadily advanced. In 1896, seven cents was paid; in 1903, twelve and one-half cents; in 1906, thirteen to twenty cents. Even at the lower figure an orchard in full bearing would yield good profits, considering the amount of labor necessary, as at least six hundred pounds of nuts could be expected from an acre. It has been estimated in California that even a yield of three hundred pounds an acre would be profitable.

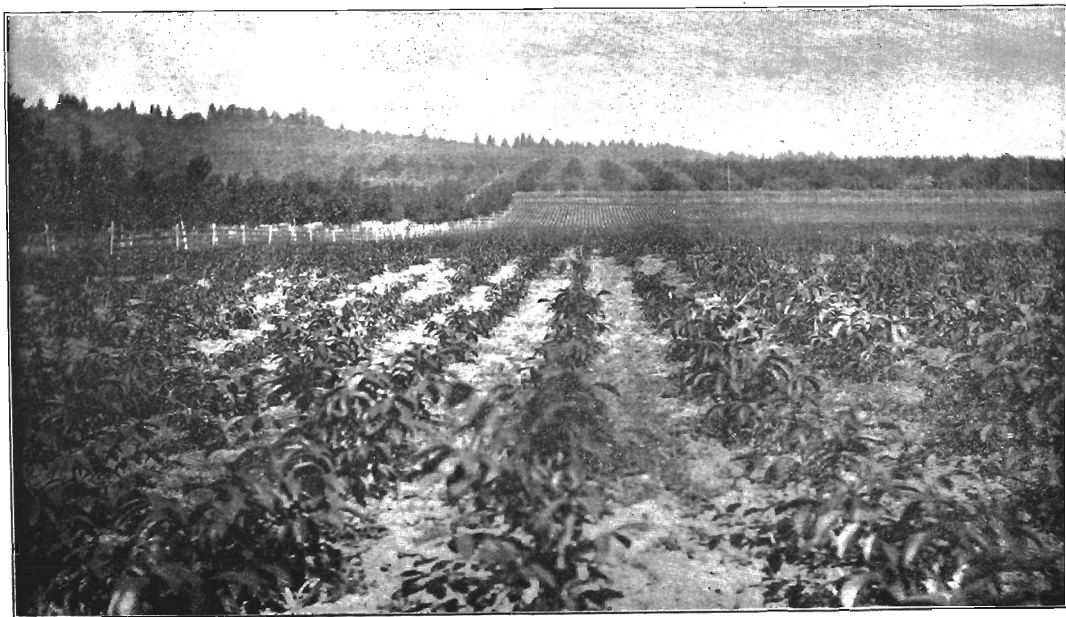


Plate 1.—View on estate of Mr. Thomas Prince of Dundee, a field of 45,000 seedling walnuts from imported nuts planted last April, photograph taken in October.



Plate 2.—A field of young California black walnuts on the Prince estate.

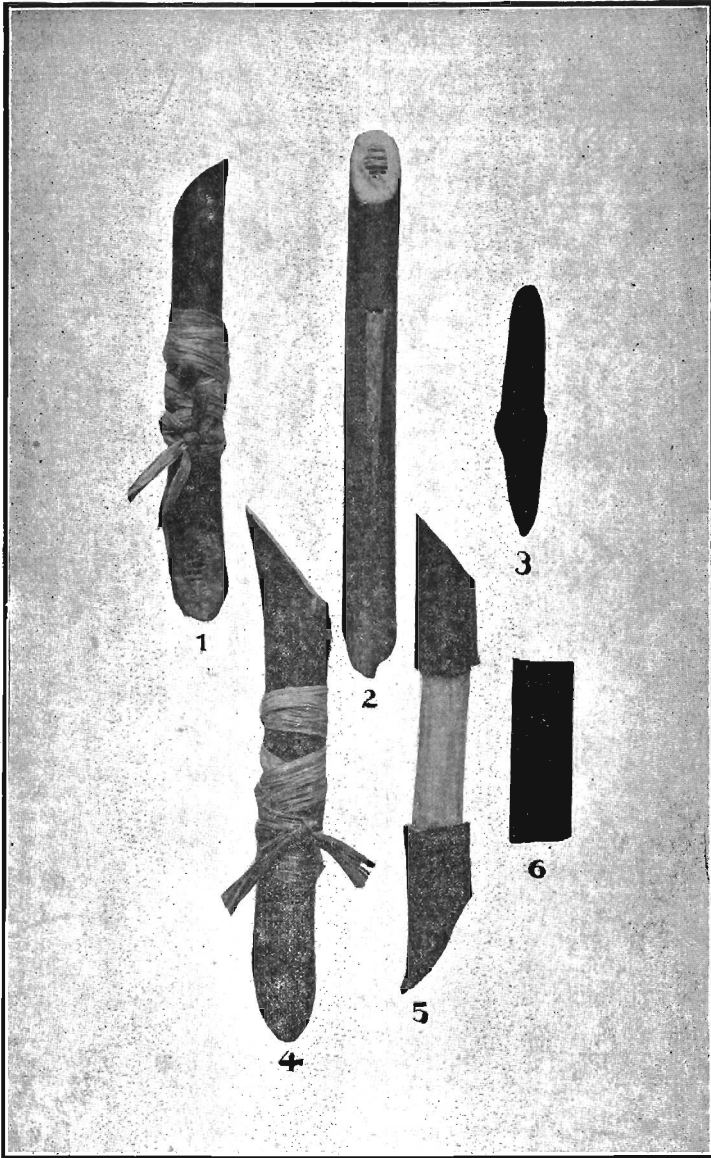


PLATE 3.—1-3 Shield budding. 4-6 Flute budding.

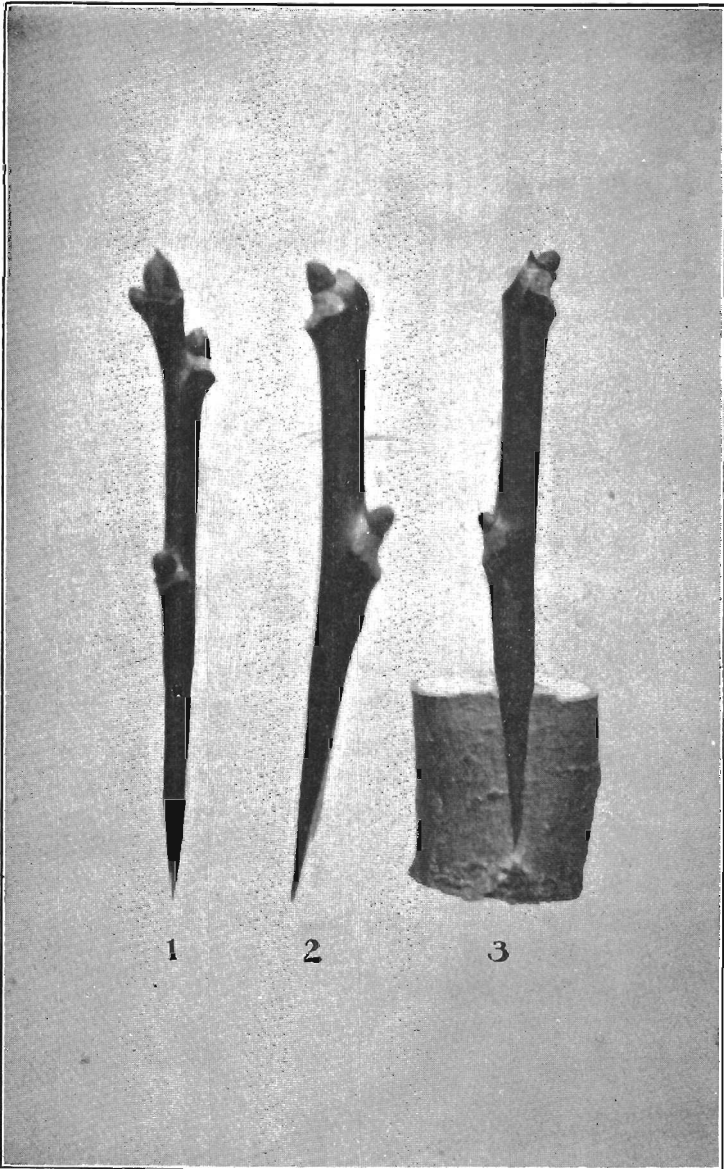


Plate 4.—Cleft grafting. Two cuts thru the sap wood when larger stocks are used is to be preferred.



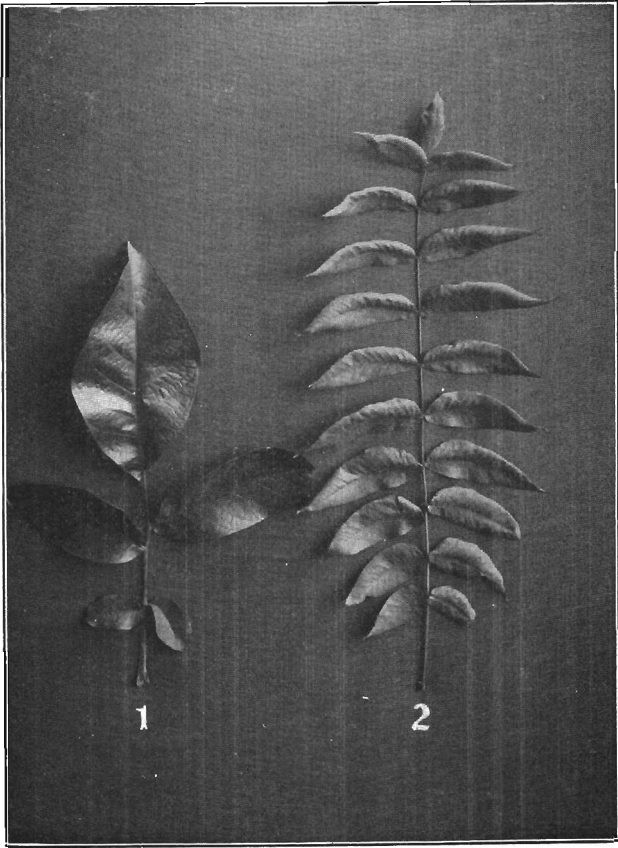


PLATE 5.—1 English Walnut (*Juglans regia*). 2. American Black Walnut (*Juglans nigra*).

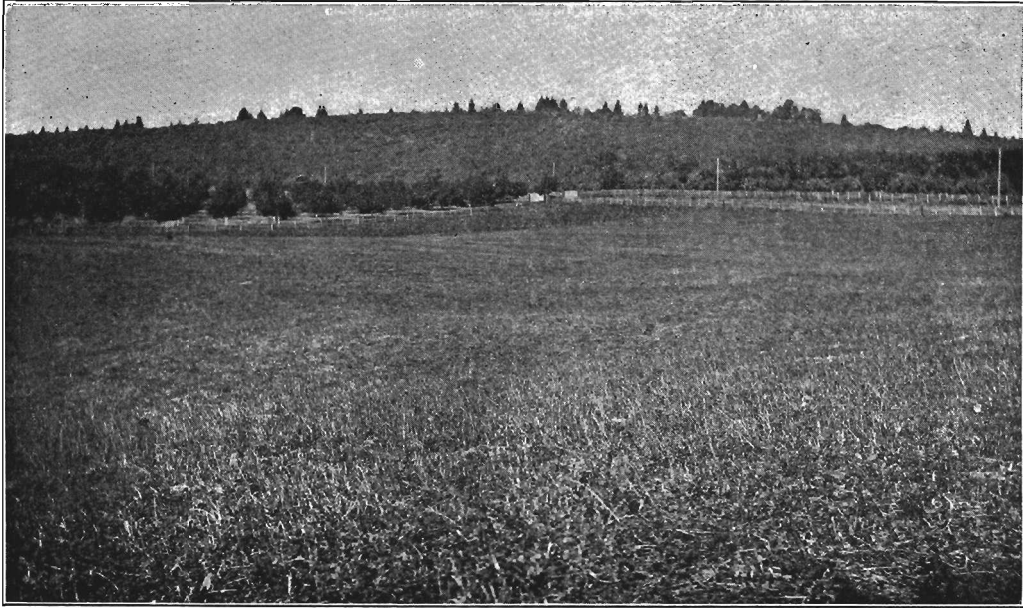


Plate 6.—A view of the Prince orchard showing nature of the site.



Plate 7.—View in orchard of Mr. Prince showing arrangement of walnuts and prunes. Every other row is set to walnuts. Every third or fourth row would be better thus allowing 50 feet between trees.



PLATE 8.—A typical 3 year old tree in the Prince orchard. Note that laterals are not allowed to grow, thus producing a strong terminal growth.

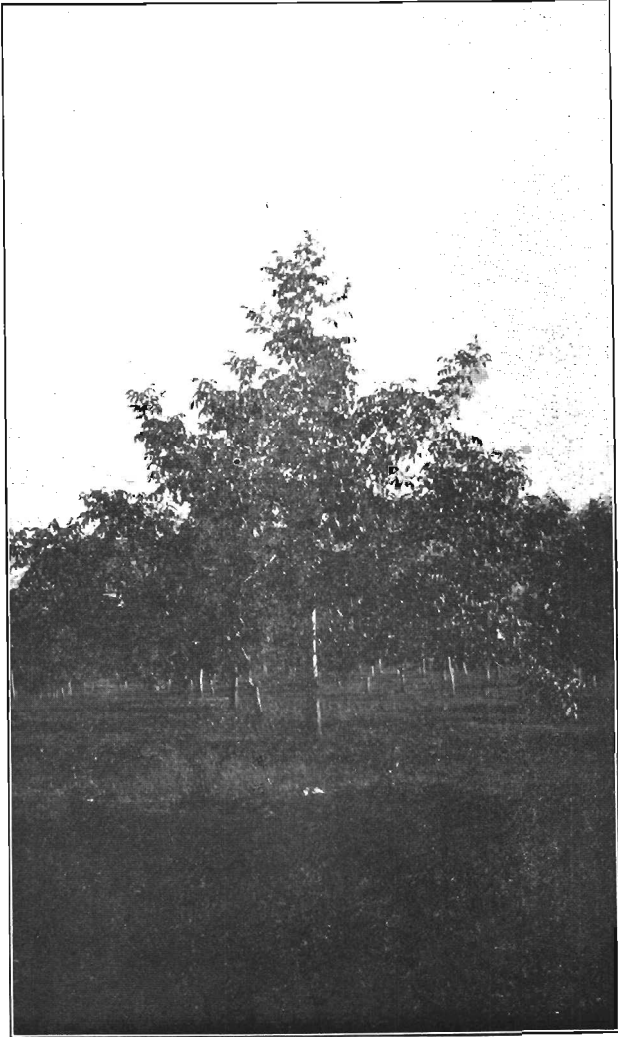


Plate 9. - This tree is headed too low, succeeding crops will bring the lower branches to the ground.

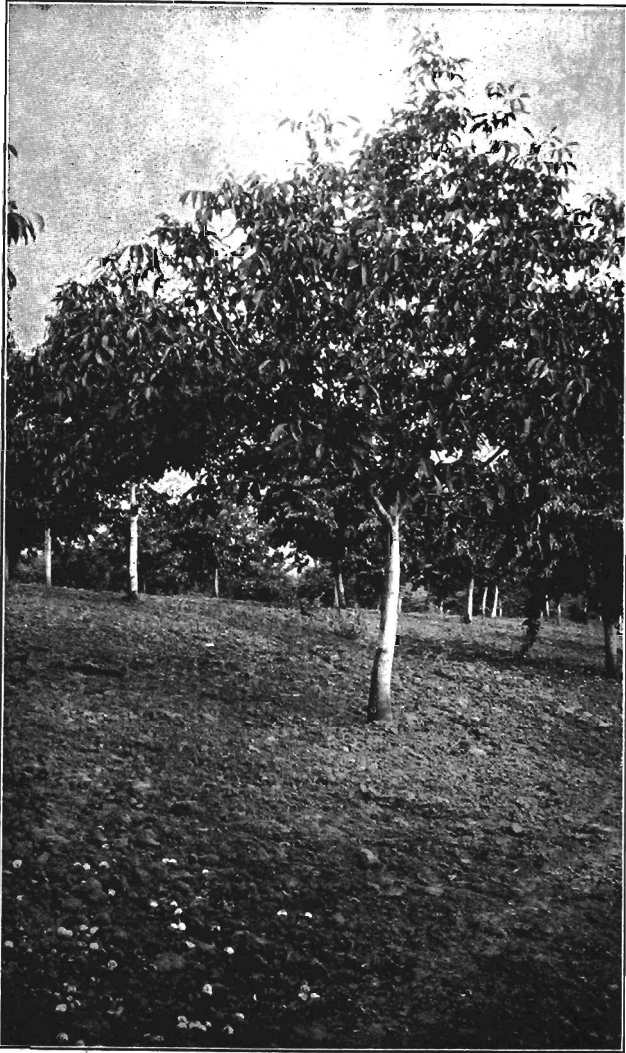


PLATE 10.—A well formed tree in Prince Orchard. Note that the lower branches are started high and trained upward.



Plate II.—General view in Prince orchard, fine form of trees at eight years old, but they are too close.



Plate 12.—Nuts curing in the sun.



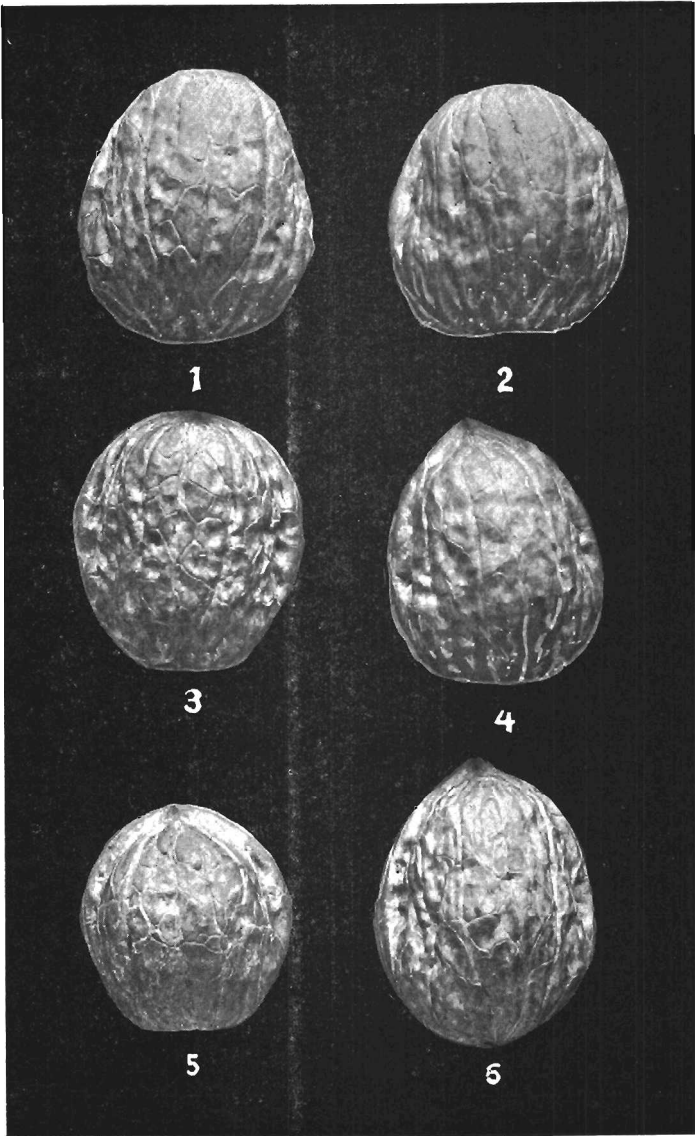


Plate 13.

1. Mayette. 2. Meylan. 3. Parisienne. 4. Parry. 5. Chaberte.  
6. Franquette. Natural size.

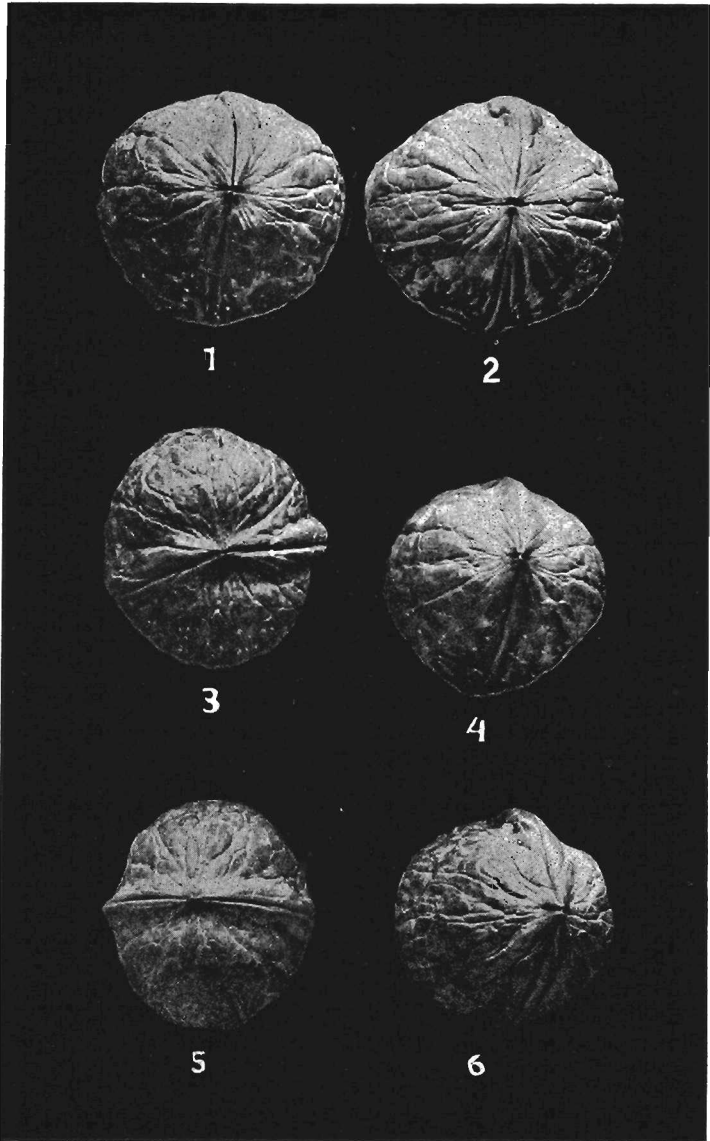


Plate 14.—1. Mayette. 2. Meylan. 3. Parisienne. 4. Parry.  
5. Chaberte. 6. Franquette. Natural size.

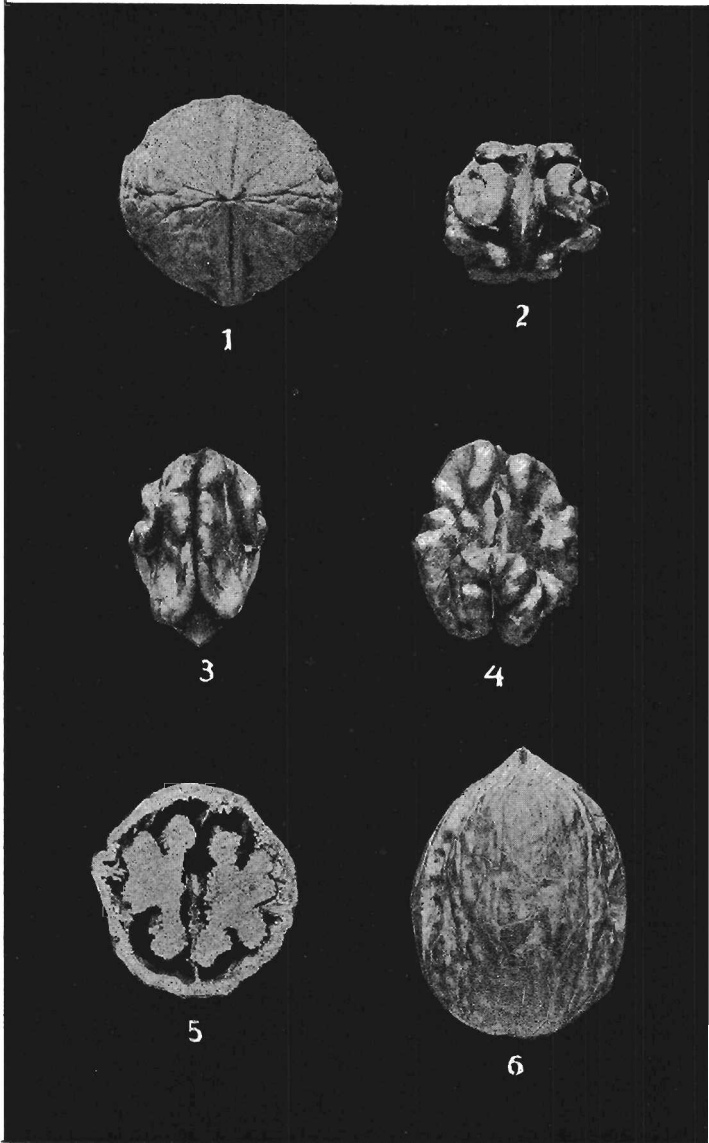


Plate 15.—The Franquette. Natural size.

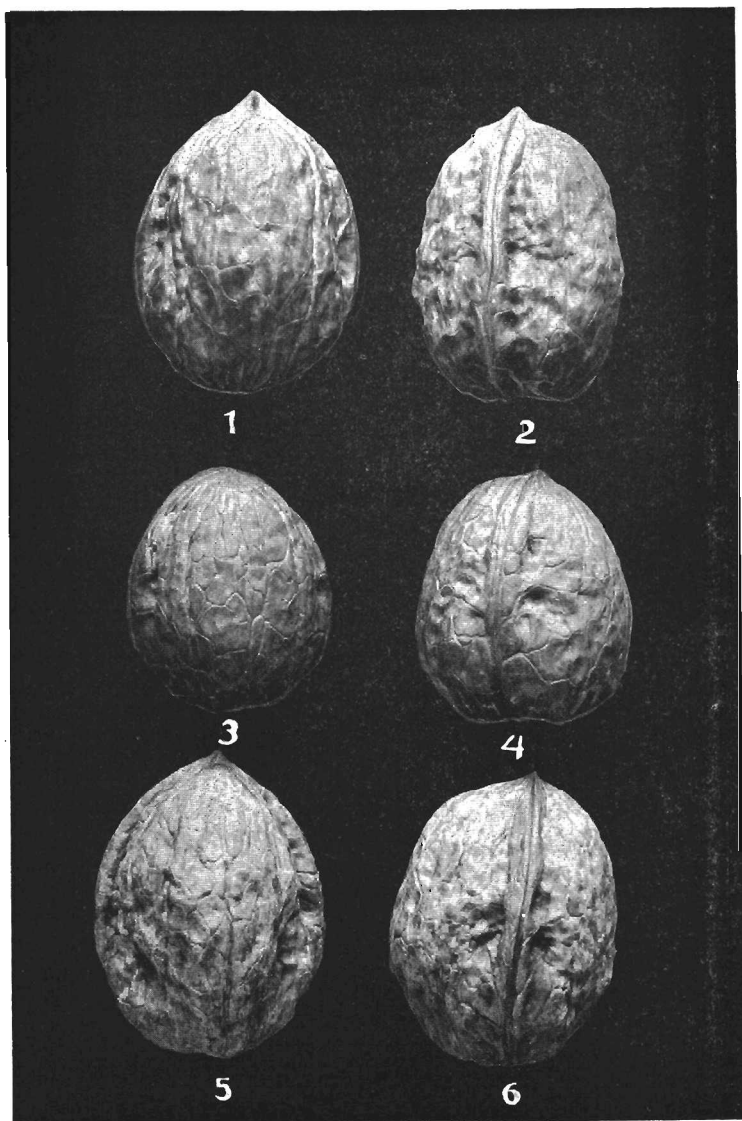


Plate 16.—1-2 Oregon Franquette. 3-4. Imported Franquette.  
5-6. Seedling found at Salem, probably from Franquette.  
Natural size.

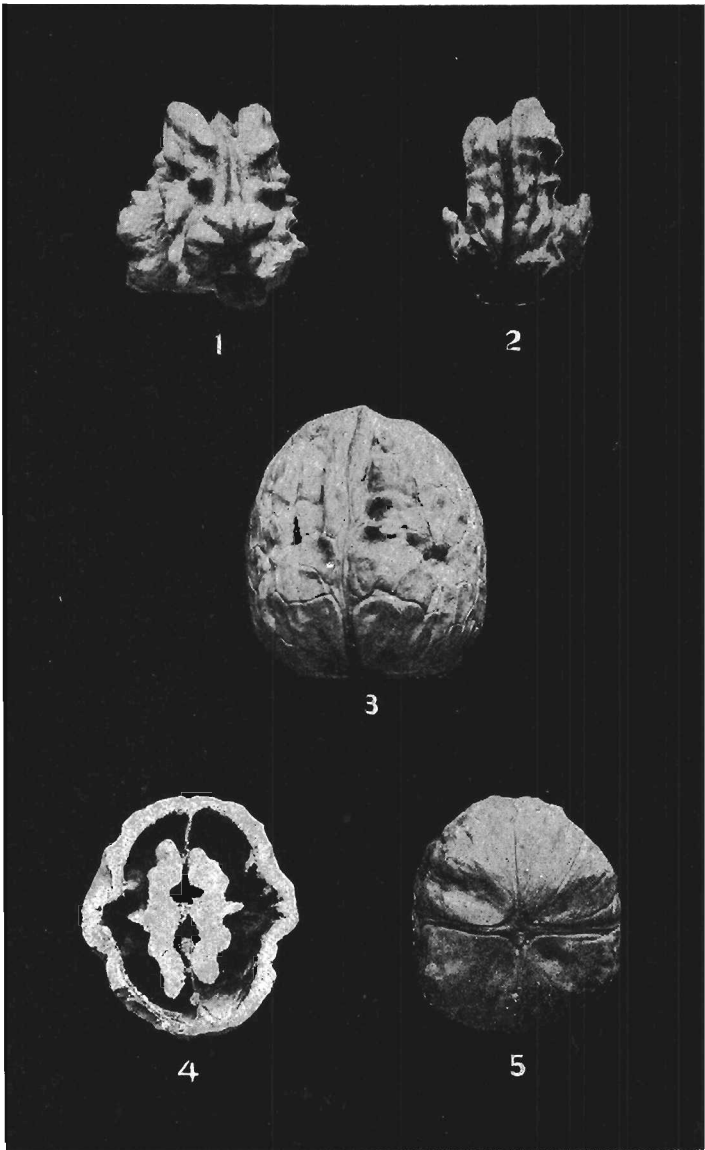


Plate 17.—The Mayette. Natural size.

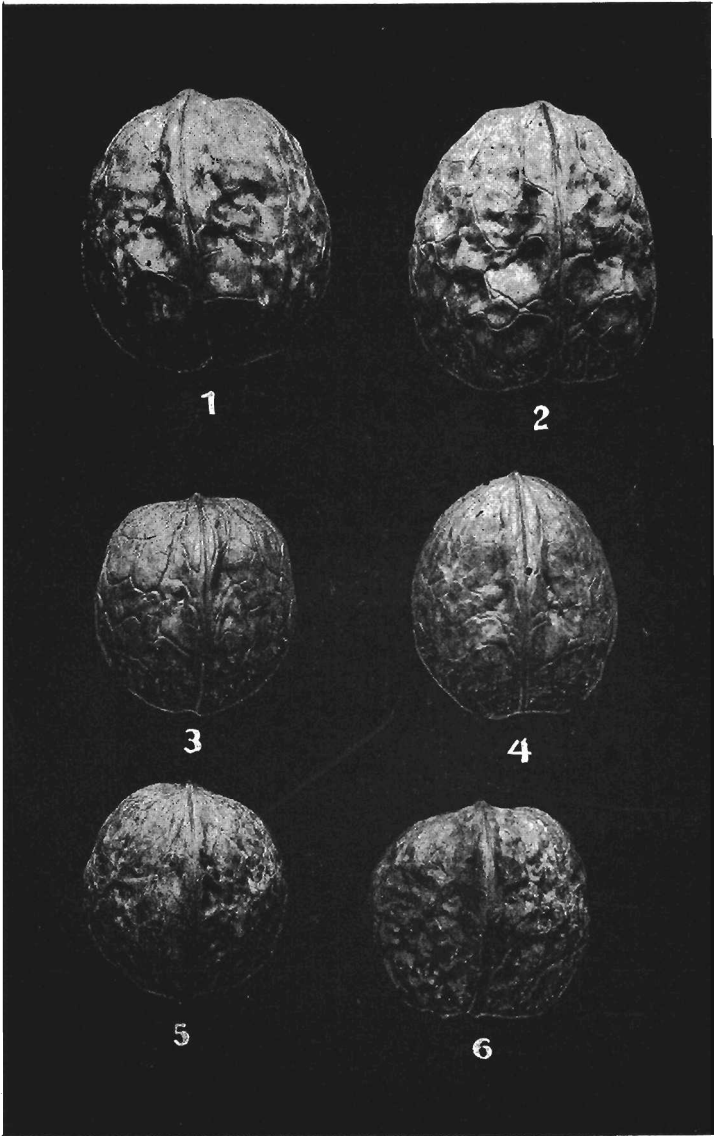


Plate 18.—1-2. Oregon Mayette. 3-4. Imported Mayette. 5-6. Nuts sold as Mayette, but which are not. Natural size.

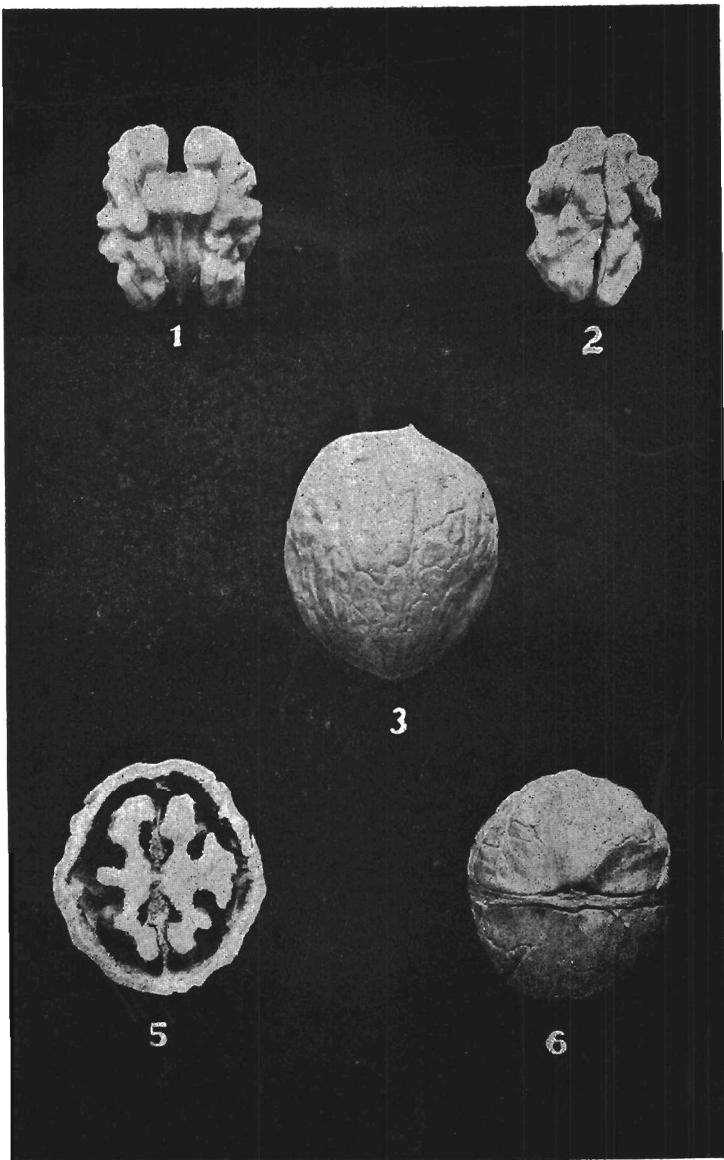


Plate 19.—Parisienne; number 3 slightly undersized.

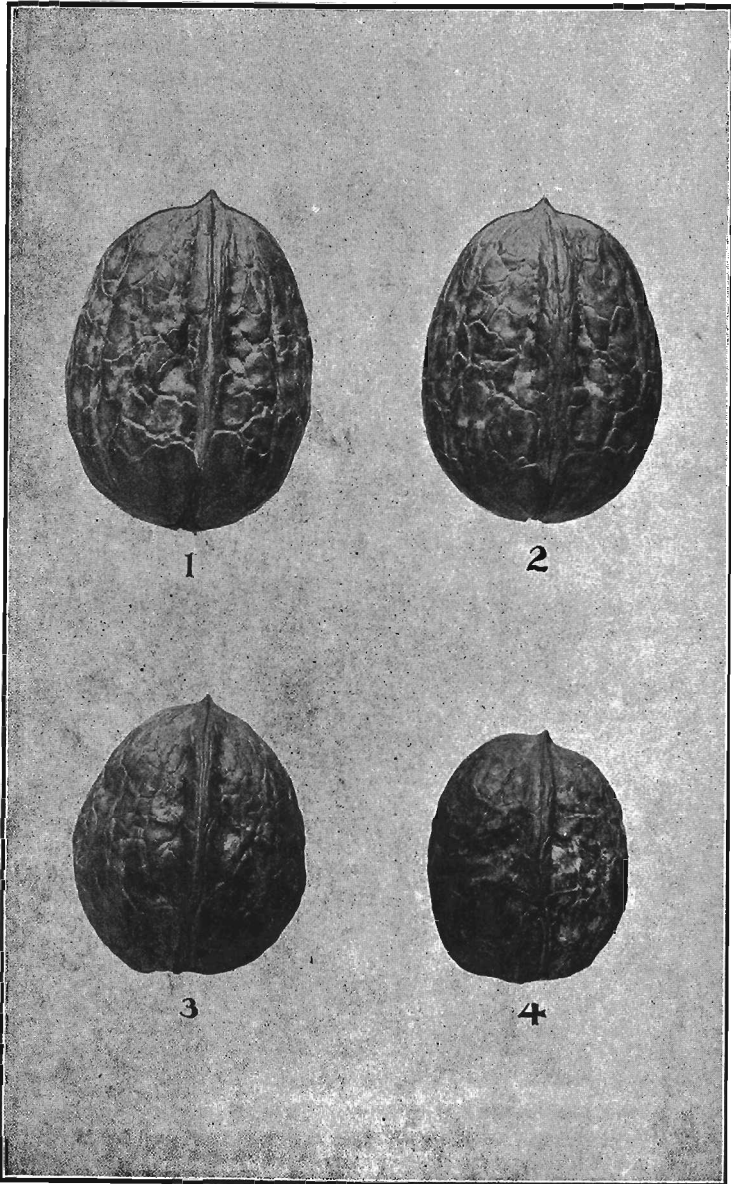


Plate 20.—1-2. Seedling from orchard owned by Mr. Prince. 3. Seedling grown by Mr. Britt. 4. Proepurturien. Natural size.



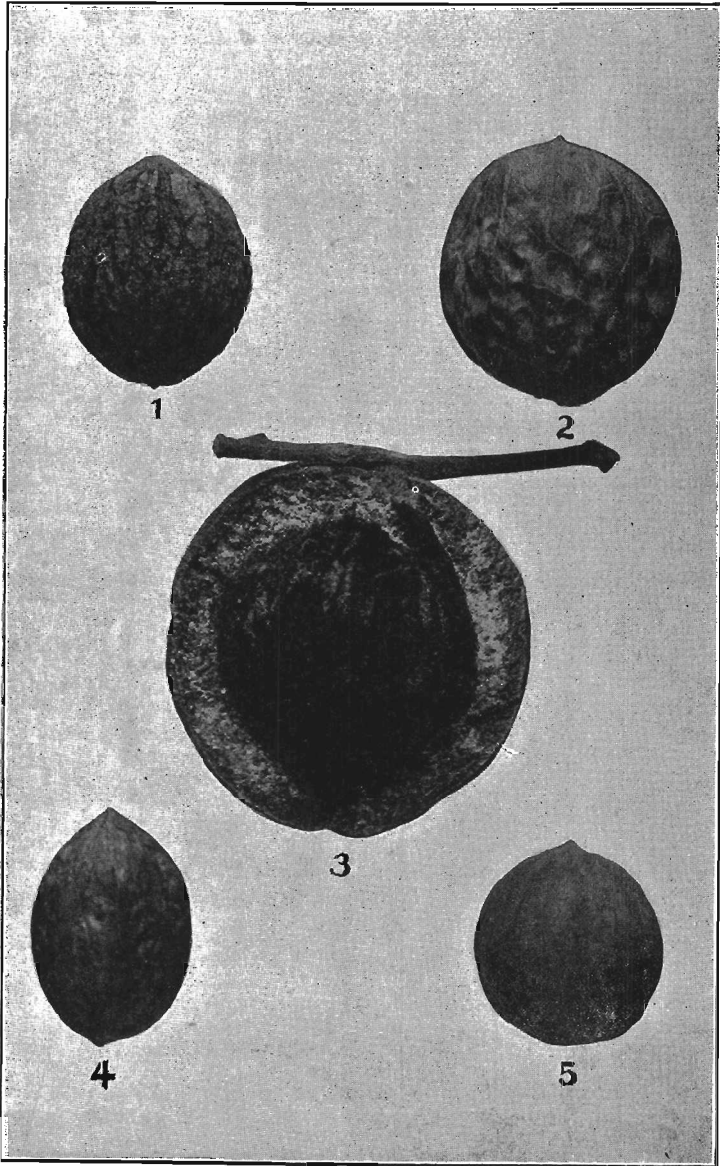


Plate 21.—1. *Juglans Nigra*. 2. *Juglans Manchuria*. 3. *Juglans Nigra*.  
4. *Juglans Sieboldiana*. 5. *Juglans California*. Natural size.

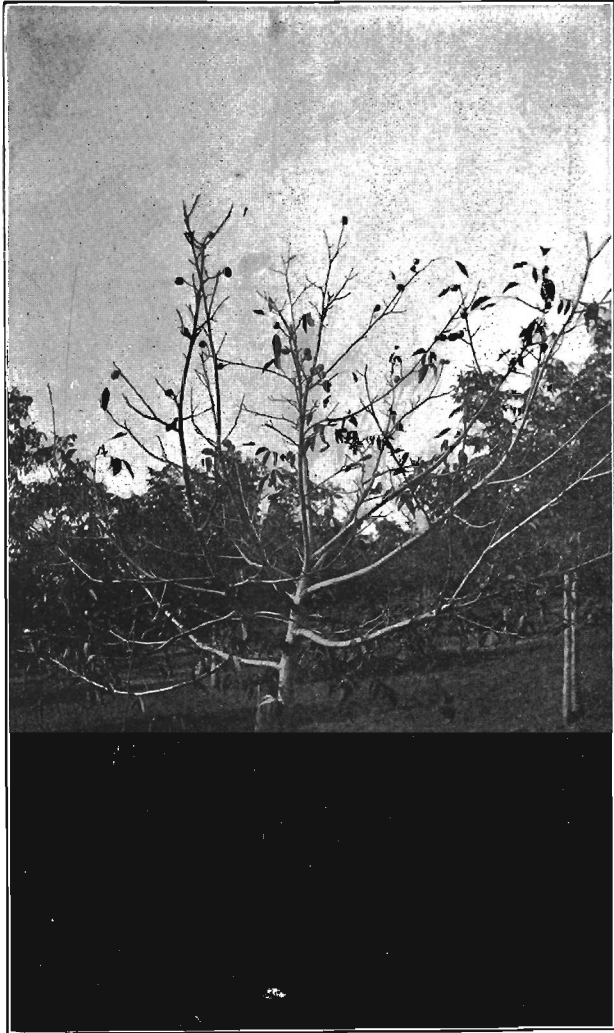


Plate 22.—A diseased tree. The appearance of a tree attacked by Bacteriosis.

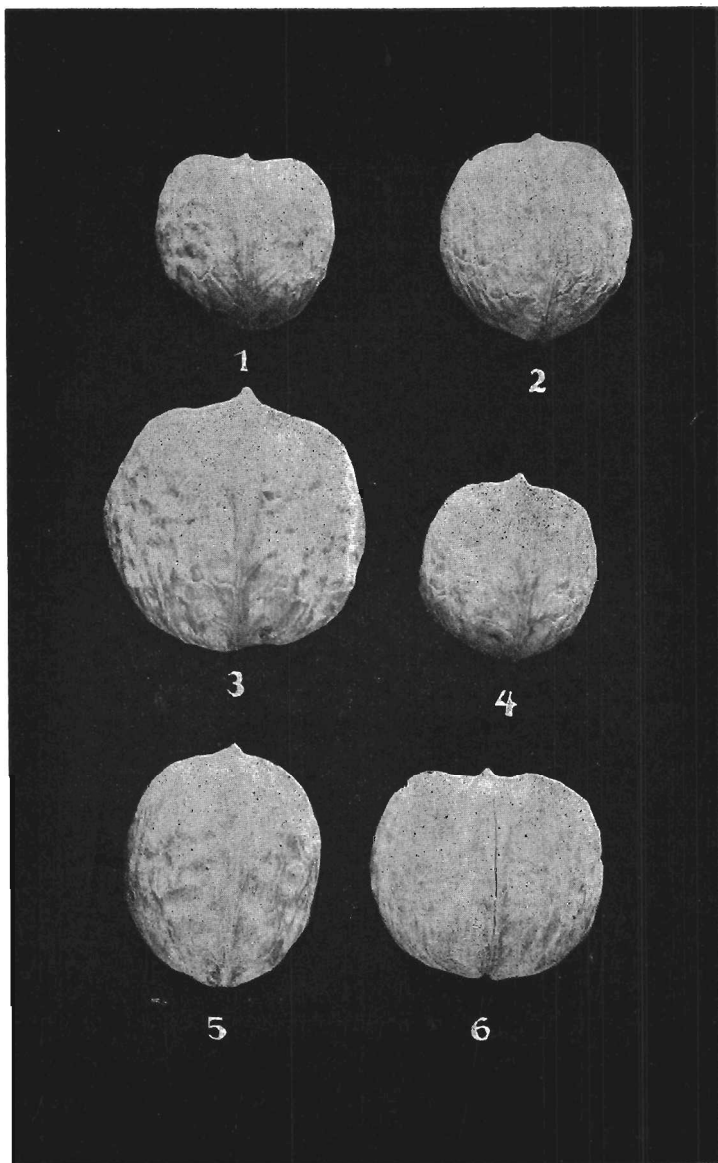


Plate 23 —Six nuts taken from one pound of nuts as purchased at grocery. Natural size.

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