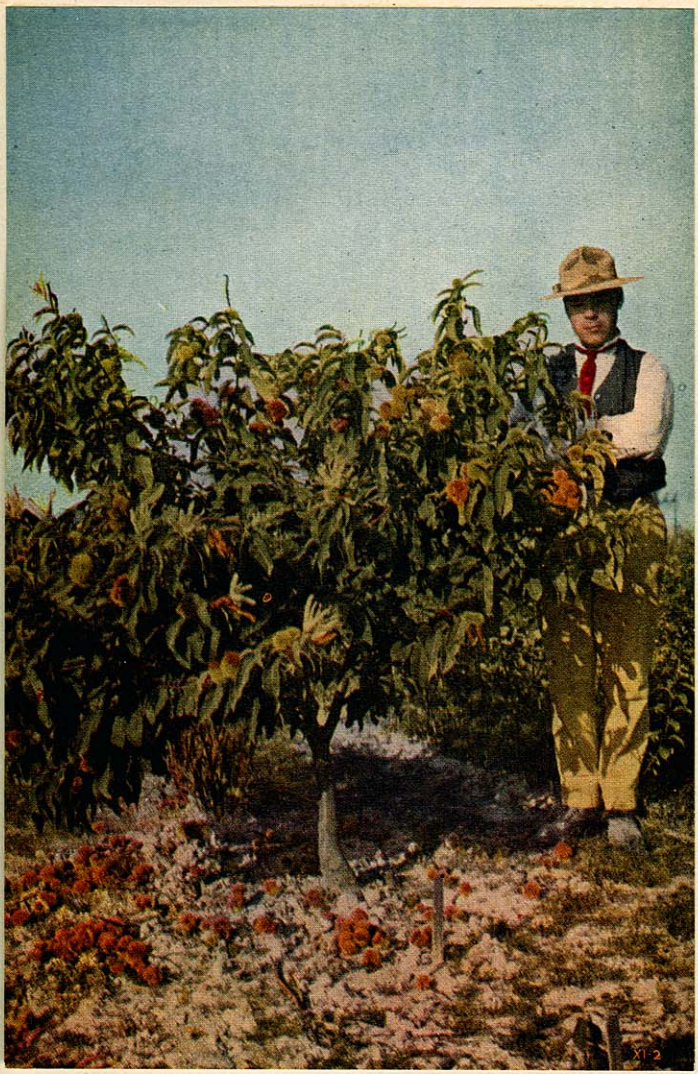


A Dwarf Chestnut Tree

This bush-like tree is a fine example of a Burbank hybrid chestnut. The workman who stands beside the tree is five feet seven inches tall. Note the abundant crop of nuts on the tree and under the tree. Gathering chestnuts becomes a simple matter when the trees are of this type.

Nuts as a Profitable Crop

The Business Side of Nut Growing

A CHESTNUT *bush!*" exclaimed a visitor; "that is the greatest marvel I have seen yet. I was brought up under chestnut *trees;* but when I see chestnuts growing on huckleberry bushes I am certainly having a new experience."

And I suppose this experience would be new to almost anyone who has not visited my experiment farm at Sebastopol. For, so far as I know, until very recently, there have been no chestnuts growing on bushes anywhere else in the world. But there are plenty of them in my orchard at Sebastopol; that is to say, if a sprig of a shrub only three feet or so in height and three feet across is entitled to be called a bush.

Moreover the nuts that are borne on these miniature trees are of the finest variety—large, plump nuts, at least as large as half a dozen of the nuts you are likely to find growing on chestnut

trees of the largest size; and they are sweet in flavor.

The manner of development of these anomalous dwarf chestnuts will be detailed in a later chapter. Here I refer to them only by way of introduction to suggest one of several modifications in the growing of nut bearing trees that have been brought about within recent years and that, jointly, are placing the industry of nut growing on a new basis.

If it is added that some varieties of the new chestnuts bear when only six months old, when grown from seed—rivaling corn or wheat, and seeming quite to forget the traditions of their own tribe—a further glimpse will be given of the modification that scientific plant development has wrought in the status of the nut bearing tree.

No other tree, to be sure, quite rivals the chestnut in this regard; but some of the new walnuts bear at eighteen months of age, which is quite remarkable enough. And in general the time of bearing of these nuts has been so hastened that the growing of a walnut orchard to-day is an altogether different matter from what it was a generation ago.

Moreover, a way has been found to induce the walnut tree to grow about ten times as fast as it formerly did; and the wood of the tree is of the

A Walnut Orchard

This is a California walnut orchard of forty acres, which earns nearly fifty thousand dollars a year. The trees are Persian walnuts of the variety known as Franquette, grafted on black walnut roots.

finest quality for the use of lumbermen and cabinet-makers. Of course the latter fact is of incidental interest only to the grower of nuts; yet it is not quite a negligible factor. And, from another standpoint, obviously, the wood-producing capacities of the new trees have a high degree of importance.

These and a few other transformations in the nut bearing trees, brought about by careful selective breeding, have, as I said, prepared the way for an entire change of attitude of the horticulturist toward the question of producing nuts as a business, comparable to the business of the fruit grower.

The Food Value of Nuts

Meantime there has been a marked change of attitude on the part of the medical profession, and, following them, of the general public, as to the value of nuts in the dietary.

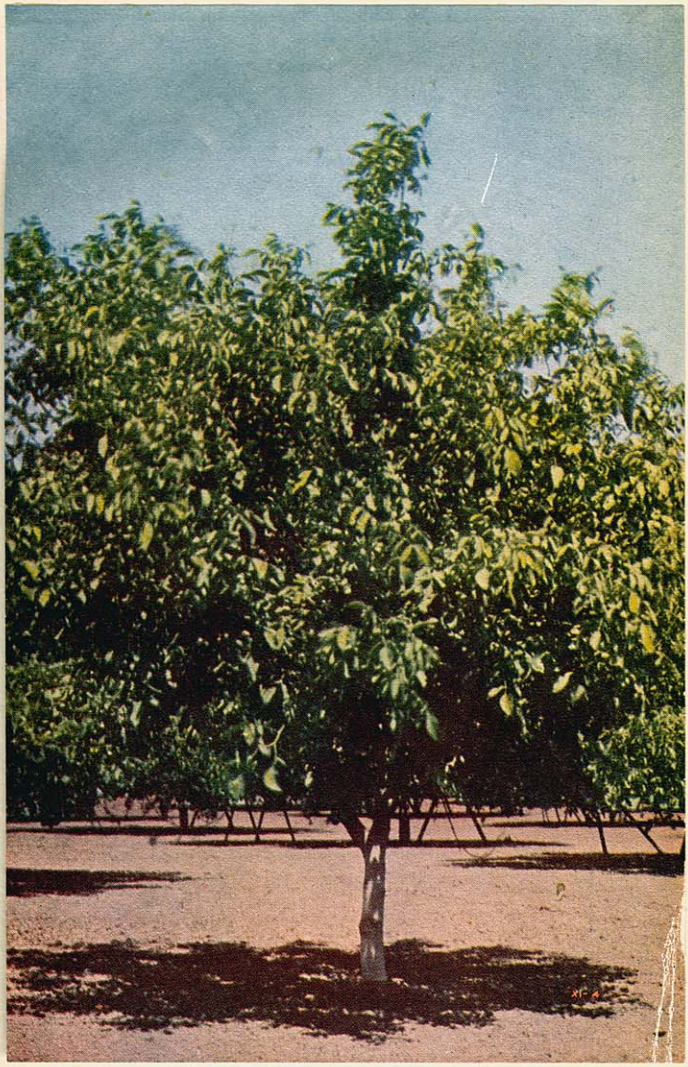
In point of fact, nuts have substantial merits as food-stuffs, and these merits are yearly coming to be more fully recognized. In the older countries, nuts have already assumed—indeed have long held—a position of economic importance, and convincing evidence of their growing recognition in America is found in the reports of experiment stations of the Agricultural Bureau, which in recent years have from time to time urged the merits

of various nuts upon the attention of agriculturists. A study of the market reports shows that nuts of many kinds are handled on a commercial scale in our cities.

There should be nothing surprising in this; for, of course, in a wide view nuts are fruits, and there is no obvious reason why they should not have dietetic value. Moreover they are for the most part grown on perennial shrubs or trees rather than on succulent and perishable annuals, and thus have close relationship with the fruits of the orchard.

But the fact that nut bearing trees for the most part receive no attention whatever from the cultivator of the soil, their product being gathered only casually, has caused them to be regarded as wild products not falling within the scope of the horticulturist. In most parts of the United States, indeed, the nut bearing trees have received no attention whatever from the cultivator of the soil, and their product has been regarded as a more or less superfluous luxury, rather than as having dietetic consequence.

In the Gulf States and in California, in recent years, there has been a radical change of attitude. In these regions the cultivation of nuts is already becoming an industry of importance. More recently, the industry has extended to New York and



A Franquette Seedling

The walnut, like most cultivated plants, cannot be depended upon to breed true from the seed. Nevertheless valuable trees are sometimes produced in this way. Here is a Franquette seedling that gives good promise, and which may have particular value for breeding experiments.

even to Canada. Meantime, the use of nuts on the table in all parts of the United States has become more and more habitual, and the shell fruits are beginning to take their proper place among the important products of the soil. Their recognition as really valuable foods is so comparatively recent, however, that it would not be superfluous to briefly run over the list of commercial nuts, with reference to their food values and their present and prospective economic importance.

Such an outline may advantageously prepare the way for the detailed account of the experimental work through which new varieties of several of the more important nuts have been developed.

The Chief Marketable Nuts

The marketable nuts include almonds, Brazil nuts, filberts, hickory nuts, pecans, Persian or English walnuts, chestnuts, butternuts, walnuts, pine nuts, peanuts, and cocoanuts, not to mention several less known and little used species.

The cocoanut, the fruit of a palm tree, is indigenous to tropical and sub-tropical regions, and may very likely have played a part in the history of developing man not unlike that ascribed to the date and the fig. It is still a most important article of diet to inhabitants of tropical islands, being prized not merely for the meat of the nut

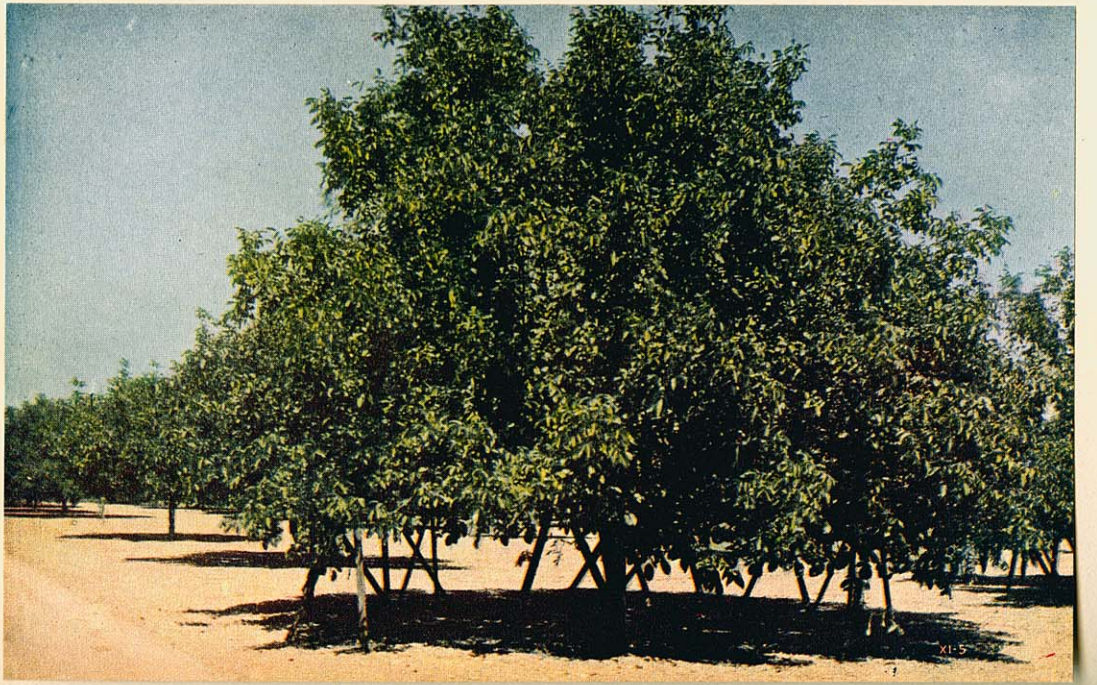
but for the milky fluid which it secretes in large quantity. The natives sacrifice the partially ripe nut for the sake of the milk, but most northerners find this a taste to be acquired with some effort.

The meat of the ripe nut, as it comes to the northern market, is extremely palatable, and in a dried state, grated, it is widely employed to flavor sundry delicacies.

The cocoanut is raised extensively in Cuba, and to a limited extent in Florida, the total number of these nuts produced in the United States in 1899 being 145,000.

Most of the other nuts are similarly used as accessories of diet, for variety rather than as substantials. They are capable, however, of playing a more important role, as the chemical analysis of their constituents shows that they are in the main highly concentrated foods, having little waste aside from the shells. They contain all the important constituents of diet—proteins, fats, and carbohydrates—and are thus in themselves capable of sustaining life. They do not contain the various elements in proper proportion, however, to make them suitable for an exclusive diet. Moreover, their highly concentrated character makes them somewhat difficult of digestion if taken in large quantities.

The chestnut differs from the other nuts in



A Heavy Crop

This grafted Franquette walnut tree is so heavily laden that it is necessary to prop the branches to save them from breaking. Note the wide spread of the branches and the beautiful symmetry of the tree as a whole.

having a relatively high percentage of starchy matter, 42 per cent of its edible portion being found in the carbohydrate division—a proportion which no other nut except the acorn approaches. The amount of fat in the chestnut is proportionately small—only about 5½ per cent., as against the 64.4 per cent. of the English walnut and the 71.2 per cent. of the pecan.

As to protein—muscle-forming matter—the chestnut has but a little over 6 per cent., while the English walnut has 16.7 per cent., and the American black walnut and the butternut head the list with 27.6 per cent. and 27.9 per cent. respectively.

Chestnuts when fresh have a very much higher percentage of water than other nuts—no less than 45 per cent., whereas the generality of nuts have but three to five per cent.

It appears, then, that the meat of the chestnut furnishes a less concentrated food than other nuts supply, and one that is rich in digestible starches, of which it contains six or seven times the proportion common to other nuts. This excess of starchy constituents explains why the chestnut is not generally relished so much as many other nuts in the raw state. But it explains also why this nut may be eaten in large quantities when cooked.

In France and in Italy chestnuts are very generally eaten, usually being prepared by boiling,

and they constitute a really significant item in the dietary of the poorer classes. Large quantities of the nuts are also dried and ground to a flour, which keeps for some time without deteriorating, and from which sweet and nutritious cakes are made. It is said that in Korea the chestnut takes a place in the dietary not unlike that which the potato occupies with us, being used raw, boiled, roasted, or cooked with meat.

Production and Value of Nuts

Until the chestnut blight came in very recent years, threatening the entire growth of chestnut trees in the Northeastern United States, there seemed a good prospect that the cultivation of this nut would become an important industry in the near future.

Details as to the blight and the probable outcome will be considered in another connection. Meantime, there is no present indication that the other nuts indigenous to the northern parts of the United States are likely to be extensively cultivated until they have profited by the experiments of the plant developer. The thick shells of hickory nuts and butternuts, and of the native walnuts, interfere with their commercial value. We shall consider in another connection the possibility of remedying these defects, but for the moment the nuts that are grown on a commercial scale are

Paper Shell Walnuts

These walnuts were picked before the shell had formed. The pulpy outlines of the future shell can be seen in the picture. The story of the development of the paper-shell walnut is told in the text.

solely those that will flourish in the warmer climates, and hence the industries associated with their production are confined mostly to the Gulf States and to the Pacific Coast.

To be sure, the aggregate wild nut crop of the Central and Northern States represents a considerable value. But no official estimate has been made as to the precise figures involved. In general, the nuts obtained from such trees are not looked upon as a commercial crop. They are for the most part consumed on the farm or in neighboring villages.

Only three kinds of nuts are grown on a commercial scale in the United States at the present time, these being, in the order of their productivity, the Persian or English walnut, the Pecan, and the Almond.

According to the official reports of the Census Bureau, the total nut crop reported for 1909 was 62,328,000 pounds. This was 55.7 per cent. greater than the crop reported for 1899, and the value, $4,448,000, was 128.1 per cent greater. "California is by far the most important state in the production of nuts, and Texas ranks next. No other state reported as much as $100,000 worth of nuts in 1909."

The Census Report takes note of nuts other than the three just named, but the total value of

all the others is relatively insignificant, the combined value of the Persian walnuts, pecans, and almonds, amounting to $3,981,000, or about nine-tenths of the total for all nuts.

Perhaps the most interesting feature of the report on the production of nuts is the very rapid increase in recent years. The crop of Persian or English walnuts in 1909, for example, was more than twice as great as that ten years earlier. The production of pecans in 1909 was more than three times as great as in 1899. The production of almonds, on the other hand, had decreased somewhat in the decade under consideration.

As to the actual number of trees under cultivation, the almond heads the list, the trees in bearing in 1910 numbering 1,187,962, and young trees not in bearing numbering 389,575. By far the greater number of these are in California, which has 1,166,730 almond trees in bearing, whereas Arizona, the second state, has only 6,639, and all other states combined have only 14,593. The total production of almonds in 1909 was 6,793,539 pounds, with a value of $711,970.

The almond is a native of western Asia, and has been cultivated from time immemorial. It is mentioned in the Scriptures as one of the chief products of the land of Canaan. In California it has been more or less under cultivation since about

A Comparison of Leaves

At the left, a specimen of the Franquette variety of Persian walnut; at the right a specimen of the black walnut. By hybridizing the Persian and the black walnuts, Mr. Burbank produced his remarkable Paradox walnut.

1853. The best manner of its cultivation, however, was not well understood, and the greater ease and certainty with which the walnut can be grown has led to the abandonment in recent years of many of the almond orchards.

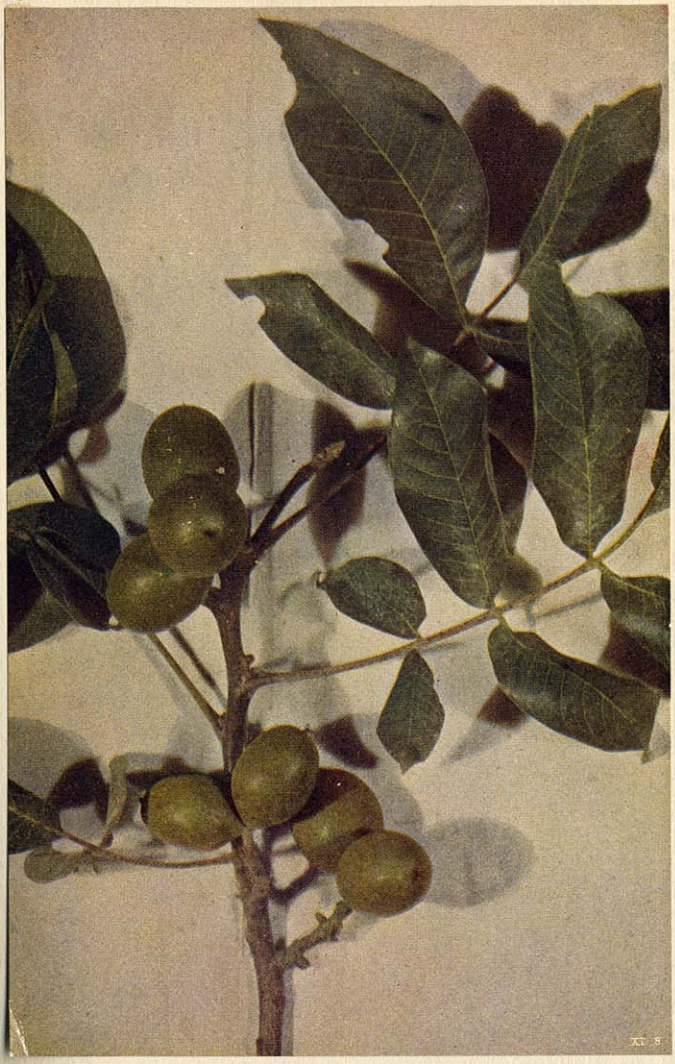
Nevertheless the crop is one of considerable importance, as the figures just given show.

The total number of Persian or English walnut trees in bearing in 1910 numbered 914,270, of which all but about sixty thousand are in California. The rapid increase of the industry, and its prospect of still greater increase in the near future, is shown in the fact that the number of young trees, not yet of bearing age, was reported in 1910 as 806,413.

The extension of the industry is shown also in the fact that of the trees not yet in bearing no fewer than 177,004 are in the single state of Oregon, and 5,513 in Mississippi. These figures forecast the spread of industry to meet the growing demand for walnuts in America.

The total production of Persian walnuts in 1909 was 22,026,524 pounds, with a valuation of $2,297,336.

It will thus be seen that the walnut takes rank as a commercial crop of genuine importance. The value of the crop approaches that of the total crop of apricots, although not as yet approaching the



The Paper Shell on the Tree

In the course of his experiments, Mr. Burbank produced walnuts that were almost devoid of shell, but this proved a disadvantage as the birds soon learned the secret. It was necessary, therefore, to select specimens with thin shells, instead of those with no shells, to continue the experiment. The ones here shown have shells of ideal thickness.

value of the half dozen more popular orchard fruits.

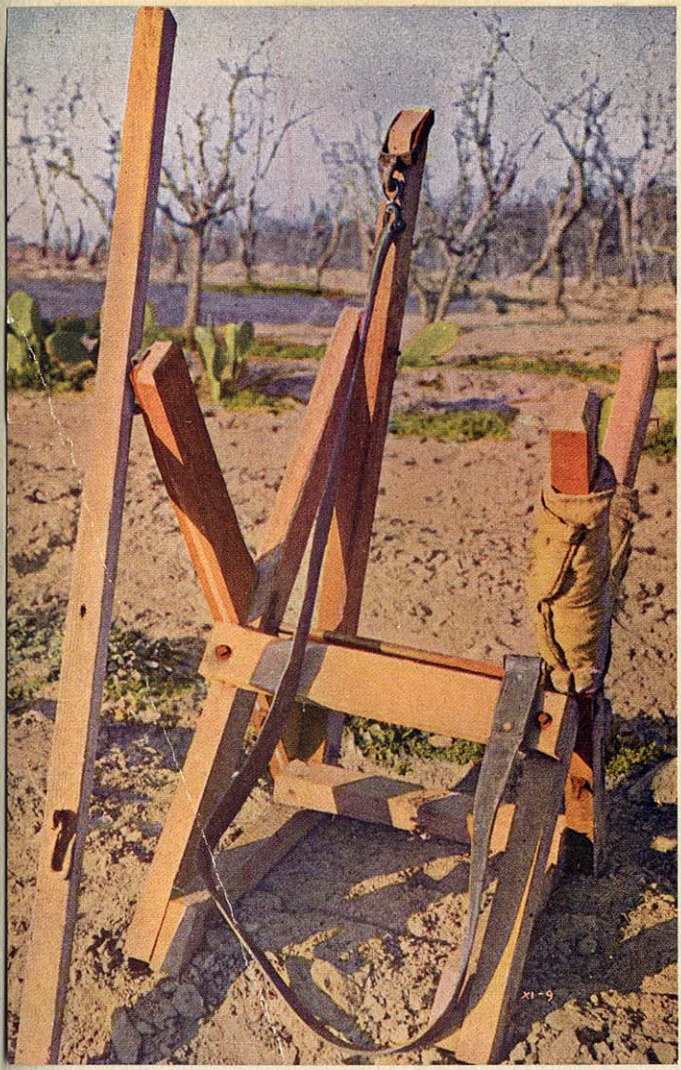
The Cultivation of the Pecan

In 1899 the pecan ranked third among nut-producing trees, both as regards number of trees under cultivation and actual product. The pecan trees in bearing at that time numbered 643,292, with a net product of 3,206,850 pounds.

In the ten succeeding years the pecan industry came ahead very rapidly, and in 1910 the pecan was second to the almond as to number of trees in bearing, and second to the Persian walnut as to poundage and value of its crop. Moreover, the number of pecan trees under cultivation, but not yet of bearing age in 1910, was actually larger than the number of trees in bearing; showing a surprisingly rapid increase of the industry.

The actual number of pecan trees in bearing in 1910 was 1,619,521, and the number of young trees under cultivation 1,685,066, making a total of 3,304,587, a number in excess of the combined numbers of almond and Persian walnut trees under cultivation.

The production of pecans in 1909 was 9,890,769 pounds, with a value of $971,596. The total production of 1899 was only 3,206,850 pounds. Thus, as already noted, the production increased by more than three hundred per cent in ten years.



The Burbank Tree Baler

This is a modified saw-buck, devised by Mr. Burbank to aid in packing trees for shipment to different localities. The succeeding picture shows how the apparatus is used.

There seems every prospect that the increase will be still more rapid in the coming decade.

Peculiar interest attaches to the pecan because it is the one nut indigenous to the United States among those that at present have actual commercial importance. The pecan, indeed, must be looked to as now holding the position in the southern portions of the United States that the chestnut should occupy in the northern—that of premier nut. In recent years its merits have begun to receive wide attention, as the figures just quoted show, and the cultivation of pecan nuts for the market is likely to become a really important industry. Already there are numerous named varieties on the market, each having its champions.

These varieties have peculiar interest because of the fact that each one of them represents not an artificially developed product as in the case of most varieties of fruits and grains, but merely the progeny of an individual tree.

It appears that here and there, particularly in the state of Mississippi, there has grown a pecan tree of unknown antecedents that became locally famous for the large size and unusual quality of its fruit.

These trees, it will be understood, are all of one species, and the nuts are obviously all of one kind; no one would think of mistaking any one

of them for anything but a pecan. Yet the individuality—the personality—of each tree is revealed in the average character as to size, shape, and peculiarities of shell and kernel, of its fruit, and also as to great difference in productiveness and earliness or lateness of bearing.

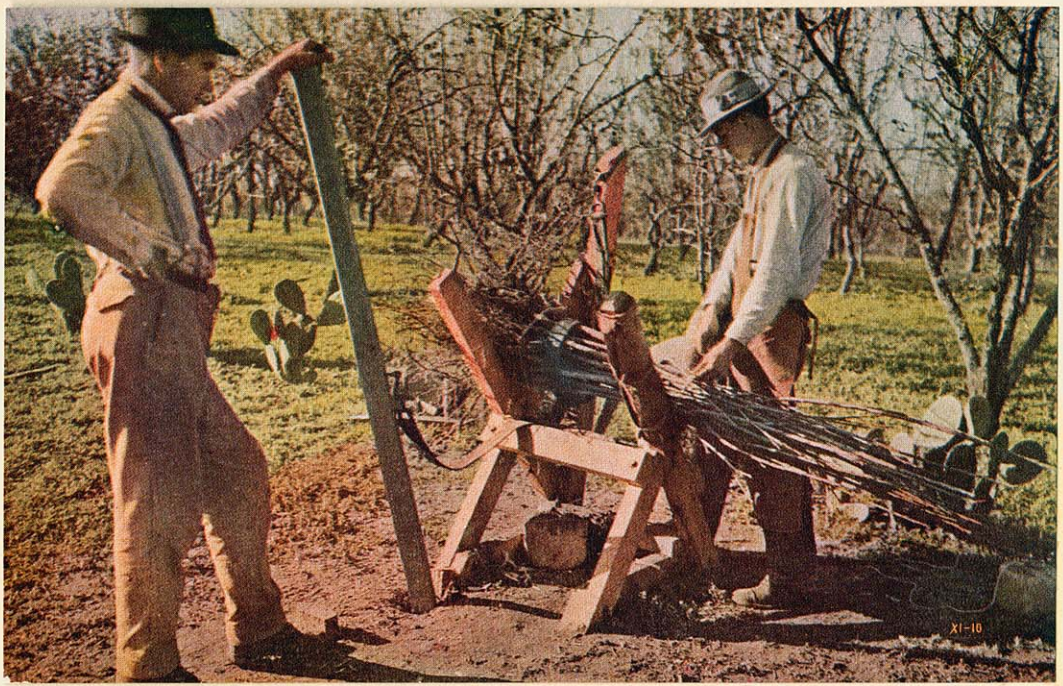
The Varieties of Pecan Nuts

Of course such individuality is precisely what we have become accustomed to expect in orchard fruits and other plants under cultivation. But until recently it has not been generally understood that such diversity is commonly to be found among wild plants. So the case of the pecan furnishes an interesting illustration of the variation of plants in the wild state. The pecan trees that show these individual variations are precisely like the cultivated varieties of orchard fruits in that they do not breed true from seed. Doubtless it might be possible to develop true botanical varieties from each of them by selective breeding, but this is not necessary any more than in the case of orchard fruits. For, like other trees, the pecan may be propagated by grafting or budding.

Nothing more is necessary than to make cuttings of twigs or buds from the parent stock, grafting these as cions on an ordinary pecan stock, to produce new trees in indefinite numbers, all of which retain the precise quality of the parent.

Tree Baler in Operation

Here the young trees are being packed, with the aid of the baler, in secure bundles for shipment. It is highly important that the operation of packing should be well done, even if the trees are to be shipped only for a short distance; doubly so, of course, if they are to be sent across the continent.



Such grafts were made in the case of each of a score or so of the famous individual pecans above referred to, with the result that as many varieties have been given assured permanency. For the most part, these varieties have been named after the location where the parent tree grew, as the San Saba, the Rome; or else after the original owner of an early cultivator, as the Jewett, the Pabst, the Post, the Russell, the Stuart.

According to a recent report of the Department of Agriculture, there are ten of these varieties that have now been advertised and propagated for a sufficient time to gain wide distribution.

Extensive orchards of pecans are now under cultivation in almost all of the southern states; yet the industry is so recent that, with a single exception, the parent trees of all the ten prominent varieties are still alive and in a more or less vigorous condition of bearing.

Unfortunately the pecan is restricted as to habitat, but it flourishes as far north as St. Louis in the Mississippi Valley, in all the gulf states, including Texas, and along the south Atlantic seaboard. Texas is the chief producer (5,832,367 pounds in 1909), Oklahoma second (894,172 pounds), and Louisiana third (723,578 pounds). Quite possibly hardier varieties, which may be grown farther north, may in time be developed.

Meantime it is held with reason that within the territory to which it is naturally adapted, no other nut, native or foreign, can be considered to compete with it.

The qualities of the pecan as a desert and confectioners' nut are familiar to everyone; but the best varieties have hitherto been raised in restricted quantities, and hence have not found their way extensively into the northern markets. With the increase of the industry to commercial proportions, this defect will soon be remedied, and the pecan may be expected to advance rapidly in popular favor. But for that matter, the demand already greatly exceeds the supply.

Other Native Possibilities

Observation of the deferred recognition of the merits of the pecan suggests the inquiry as to whether there may not be other indigenous nuts that have similarly been ignored.

It may well be doubted whether there is another of comparable merit, but there is at least one neglected one that the amateur at any rate might find worthy of attention, whatever its defects from a commercial standpoint. This is the familiar hazelnut, a near relative of the European filbert. The hazel-nut is smaller than its European cousin, but it is doubtless susceptible of improvement in that regard; and the hardy nature of the

Ready for Shipment

These are bundles of young nut trees, wrapped so as to insure entire protection, being shipped by Mr. Burbank to various localities for testing under different conditions, notably with regard to hardiness. Extensive tests are often made in widely separated regions before a new variety is introduced.

shrub makes it suitable for waste lands, or as an adjunct to the chestnut orchard, even far to the north.

The hickory, the black walnut, and the butternut, already referred to as of doubtful commercial value, are nuts that may well appeal more confidently to the amateur. They grow wild in many regions of the Middle West where the chestnut is not indigenous, and the black walnut and hickory in particular are widely famed for their lumber—or were before the vandelism of the early settlers practically exhausted the supply. As to palatability, there are many persons who would be disposed to place the butternut at the very head of the list of edible nuts; and no one will deny the toothsomeness of hickories and black walnuts.

All in all, the opportunity for diversion and profit in this unexplored direction seems peculiarly inviting; and it is one that is likely to be eagerly seized by an increasing number of votaries as the years go by. The fact that nut-bearing trees add permanent beauty to the landscape gives them an additional claim on the interest of that growing body of city dwellers who are nowadays harking back to the soil for aesthetic rather than for commercial reasons. Meantime the further fact that an unfruitful tree may ultimately be valuable as lumber should make additional appeal to those

nature-lovers who, though calling themselves amateurs, like none the less to have their hobbies bring them a certain monetary return.

—In general, the nut bearing trees have received no attention whatever from the cultivator of the soil, and their product has been falsely regarded as a more or less superfluous luxury, rather than as having valuable dietetic importance.