Title: Northern Nut Growers Association, Report of the Proceedings at the Fourth Annual Meeting

Editor: Northern Nut Growers Association

Release date: February 8, 2008 [eBook #24552]

Language: English

Credits: Produced by Marilynda Fraser-Cunliffe and the Online Distributed Proofreading Team at http://www.pgdp.net

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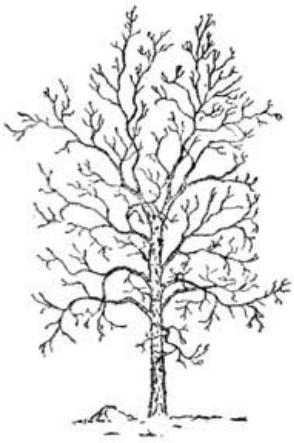
NORTHERN

NUT GROWERS ASSOCIATION

REPORT

OF THE PROCEEDINGS AT THE

FOURTH ANNUAL MEETING



WASHINGTON, D. C.

NOVEMBER 18 AND 19

1913

CONCORDE N. H.
THE RUMFORD PRESS
1914

TABLE OF CONTENTS

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[Pg 7]

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[Pg 8]

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[Pg 10]

CONSTITUTION AND RULES OF THE NORTHERN NUT GROWERS ASSOCIATION

Name. The society shall be known as the Northern Nut Growers Association.

Object. The promotion of interest in nut-producing plants, their products and their culture.

Membership. Membership in the society shall be open to all persons who desire to further nut culture, without reference to place of residence or nationality, subject to the approval of the committee on membership.

Officers. There shall be a president, a vice-president, and a secretary-treasurer; an executive committee of five persons, of which the president, vice-president and secretary shall be members; and a state vice-president from each state represented in the membership of the association.

Election of Officers. A committee of five members shall be elected at the annual meeting for the purpose of nominating officers for the subsequent year.

Meetings. The place and time of the annual meeting shall be selected by the membership in session or, in the event of no selection being made at this time, the executive committee shall choose the place and time for the holding of the annual convention. Such other meetings as may seem desirable may be called by the president and executive committee.

Fees. The fees shall be of two kinds, annual and life. The former shall be two dollars, the latter twenty dollars.

Discipline. The committee on membership may make recommendations to the association as to the discipline or expulsion of any member.

Committees. The association shall appoint standing committees of three members each to consider and report on the following topics at each annual meeting: first, on promising seedlings; second, on nomenclature; third, on hybrids; fourth, on membership; fifth, on press and publication.

[Pg 11]

Northern Nut Growers Association

FOURTH ANNUAL MEETING

NOVEMBER 18 AND 19, 1913

At Washington, D. C.

The fourth annual meeting of the Northern Nut Growers Association was held, in conjunction with the meetings of the American Pomological Society, the Society for Horticultural Science, and the Eastern Fruit Growers Association, in the new National Museum building at Washington, D. C, during "Fruit Week," November 17 to 22, 1913, the meeting of the Association being on the 18th and 19th.

The first session was called to order at 11 a. m. in Room 3. In the absence of the President the chair was occupied by Professor W. N. Hutt of North Carolina.

The Chairman: Ladies and Gentlemen: If you will come to order, we will begin the meeting of the Northern Nut Growers Association. It is unfortunate that our president is called away on important business. He has asked me to take his place and we will do the best we can. I will ask the secretary to read a communication.

The Secretary: I have this telegram from Mr. Littlepage, our president:

"Please express to the Northern Nut Growers Association my profound regrets that I cannot be with them. No organization has ever been formed that contained finer and more sincere men than ours. I invite the Association to come to Indiana next year. I will take you along the banks of the Wabash, the Ohio and Green River, where the pecan trees grow so big that the sun has to go around. I send best wishes for a successful meeting."

THE CHAIRMAN: Mr. Pomeroy has kindly consented to give us a talk on walnuts.

EXPERIENCES AND EXPERIMENTS WITH THE PERSIAN WALNUT

A. C. POMEROY, NEW YORK

When our secretary asked me to prepare a paper on this subject, I thought it would be very simple, but after making a beginning I found that about all I knew on nut culture was my own experiences—successes and failures—covering a period of about twenty-five years. [Pg 12]

During the past year better data have been kept of the behavior of the Persian walnut trees under my observation, than in former years.

Hereafter it is my intention to keep a more detailed record of the time of the appearance of the nutlet blossoms of each tree, which is of the utmost importance to those interested in the growing of the Persian walnut in the North and East.

In order to keep a better record of each tree I have numbered the old original trees, planted by my father, from 1 to 7.

Nuts from each tree are here in jars numbered to correspond with the trees from which they were gathered and may be compared for variation in size, shape, thinness of shell and flavor.

It would be impossible to keep an exact record in pounds of the yield of any one tree per year. One thing against any such record, is that many visitors come to our farm every year to see the walnut trees and the pockets of some of them look suspiciously bulky on leaving. (An ordinary coat pocket will hold a quart, an overcoat pocket more than that and there are only thirty-two quarts in a bushel.)

The new orchard is just coming into bearing. At one end of it there is an old black walnut tree, and the young Persians that were planted near this tree began to bear first. Near the center of this eight-acre orchard we planted a butternut tree. This will, I think, help to fertilize the pistillate or nutlet blossoms on many of the trees.

Of the original trees five stand where they can have care and good cultivation. The other two were put in the lawn very close to some old shade trees where they can not be cultivated and are kept pretty well in the shade. The five cultivated trees produced this fall over twenty-three bushels. The nuts were measured on November 10 when there were twenty and a half bushels. The snow was so deep the other few bushels could not be gathered.

Besides the walnut trees mentioned there are perhaps twenty-five more planted in small plots about the farm. Nuts from some of these young trees are here and comparisons may be made with the nuts from the old trees.

To get an idea of how the English walnut has done in some parts of western New York the following replies to enquiries are quoted.

Wilson, one tree thirteen years old, one and one half bushels. Sybrandt, has twenty-five or more trees thirteen years old, some trees a bushel, others over a bushel and a half. Eighme, one tree fifteen or sixteen years old, one bushel. Trippency, one tree fifteen or sixteen years old, two bushels. [Pg 13]

Nuts from some of the old and young trees were weighed. The results were somewhat surprising to me.

Tree No. 1 S. R. Long, well-filled nut, 48 to the pound.

Tree No. 1 N. R. Nut slightly pointed, well filled, 40 to the pound.

Tree No. 2 N. R. Nut nearly round, well filled, 37 to the pound.

Tree No. 5. Annual bearer, 64 to the pound.

The weighing was done on a druggist's scales about two weeks after gathering.

Those of you who have not seen a Persian walnut tree in full foliage, have something to live for. Imagine a tree, that was a nut in the spring of 1877, its branches now spreading full fifty feet, its topmost bough fully that far from the ground, its trunk measuring seventy-six inches around, well above the earth.

Imagine such a tree in its foliage of dense, dark glossy green, its branches loaded with fruit,

sometimes actually touching the ground.

The question is sometimes asked what is such a tree worth for cabinet use? I don't know, and I don't care. What I do know is that those five trees produced well upward of forty dollars each this year.

Our markets in western New York are good. The folks that use nuts as a daily food have increased greatly in the past few years. Niagara County has three cities, Erie County, adjoining, also has three cities. The population of Buffalo is about 450,000; improved highways and gasolene trucks have put us within an hour and a half of all these six cities.

While there are hundreds of young Persian walnut trees, just coming into bearing, in some of the counties of western New York, the supply of home-grown nuts will probably never fill the demand.

Professor Lake paid the farm a short visit this past summer and told of his grafting. I think he said he had a loss of 90 per cent. We beat that a little as our loss was 100 per cent.

The failure in grafting was due, I think, to the scions not being cut early enough.

Budding in August was done by budders expert with fruit trees. A Jones budding tool was used. Nearly all the buds took.

We do not have much trouble with disease or insects. [Pg 14]

We have had no trouble to speak of with worms. About ten years ago a few nests of the tent caterpillar were cut off and burned.

Some 18 or 20 years ago all, or nearly all, of the nuts dropped in June. I do not know what was the matter.

In 1906 the ends of some of the branches on the older trees turned brown and died back a few inches.

These were cut off and burned. We had but few nuts that year.

In fertilizing have used barnyard manure. When it was used it was at times applied too freely, perhaps, as some of the young trees put forth a growth of six feet in one season. I do not think it well to force them too much. The fertilizing should be done in the winter or early spring.

Trimming may be done at any time a branch appears that needs removing.

There is one pretty good sized tree on the farm with black walnut stem and Persian walnut top. Some horticulturists seem to think that this kind of a tree is hardier. My observations are that there is not a bit of difference. This tree and another on a near-by farm are the only two I know of with a black walnut stem and a Persian top, in my section.

The U. S. Department of Agriculture has issued a bulletin "Soil Survey of Niagara County, N. Y." By referring to this, I find that the soils that have produced thrifty, and prolific Persian walnut trees are, Dunkirk loam, Dunkirk sandy loam, Dunkirk silt loam, Clyde sandy loam and clay loam.

The winters of western New York are frequently quite severe. The winter of 1911-12 was a very severe one, zero weather prevailing most of the time and frequently it was way below zero for days. No injury was done to the Persian walnut trees and a good crop of nuts was harvested in the fall of 1912.

In May, 1913, on the nights of the 11th and 12th it was so cold that ice formed an eighth of an inch, or more, in thickness. The staminate catkins on the Persian walnut trees were fairly well developed and it was thought the nuts were gone for this year surely, but the last of May the pistillate blossoms came out, the staminates matured and the results have already been told you.

I think that Persian walnut trees pay better than apples, and that there is no danger of an oversupply.

The cost for labor in caring for the trees and in harvesting the crop is very much less than for any other fruit crop. No spraying and no picking are necessary. [Pg 15]

The cost of production is slight, yet the demand and prices for this nut have been steadily increasing for several years.

THE CHAIRMAN: I would like to have a good discussion of this paper, because it seems to me that in all the activities of the Northern Nut Growers Association the Persian walnut offers the highest possibilities. The Pacific coast people and southern people have always thought that only the hickory or black walnut could be raised in the northern parts of the country, and now we find that the Persian walnut also does well there. The Secretary has sent out a letter recently asking for information about the Persian walnut trees in the vicinity of each person addressed. This letter was gotten out for the reason that in the culture of the Persian walnut the Pacific coast people have distanced us, and it is probable that we have not learned the possibilities of these splendid nuts in the East. We have a few very fine varieties of these eastern nuts, and it looks as if, by use

of these varieties, the eastern part of this country can produce these nuts in as large quantities as the western. Mr. Pomeroy originated the walnut bearing his name, and we have another nut that offers very good promise, and I believe the originator is here this morning. Mr. Rush we would like to hear from you.

MR. RUSH: I am satisfied that Persian walnut culture can be made just as profitable on the Atlantic coast as on the Pacific and in France. We have varieties that have stood a temperature of twenty-three degrees below zero.

I have discovered another variety in Lancaster. This tree was brought in from Germany about thirty-five years ago and it has turned out to be an extremely valuable variety. I have seen these nuts selling in the open market at fifty cents a pound. As regards propagation of the Persian walnut, of course the black walnut is the most common variety on which to propagate. Another stock is the Japan walnut, in a sense better than the black for grafting. It has a better lateral root system and is not so fierce in going down to the center of the earth. Its root system is magnificent. Several trees budded on this stock a year ago last August and transplanted in November the same year, had a growth this summer of over six feet from the bud, showing that there must certainly be remarkable vitality in the Japanese roots. I have a young tree thirteen years old budded on black walnut that produced twenty-one nuts this summer. I have a seedling about ten years old which didn't have one catkin bloom. But a tree of the Rush variety, so named for me by Mr. Jones, the first propagator, stood about forty feet away from the first, and at the [Pg 16] end of the season this seedling tree produced sixty finely developed nuts. This seedling tree, however, had a great many pistillate blossoms, which received pollen from the neighboring variety that was prolific in staminate bloom. It would seem to be an advantage for a seedling Persian walnut to have a good pollenizer in its company.

PROFESSOR SMITH: I was struck by Mr. Pomeroy's statement that after apparent killing of the staminate bloom by frost the pistillate blossoms appeared and he had a crop. Evidently he got fertilization from some outside source. The Persian walnut in the eastern part of the United States is like many other trees in that its trouble does not arise from susceptibility to winter cold, for when it is dormant it appears to stand great cold. The trouble with the Persian walnut is its tendency to start growing at the first approach of warm weather and if the cold comes later it may kill the tree. Mr. Pomeroy's farm there near the shores of the lake has an immunity from sudden changes of temperature and therefore his trees are not likely to make growth which will be caught by late fall or early spring frosts. Unquestionably he can grow Persian walnuts better there than can be done five hundred to a thousand miles further south. It is also a well-known fact that one of the best of peach and apple regions is along this lake shore. There are many other Persian walnut trees growing in different localities east of the Mississippi, but nobody seems to think them worth propagating because they winter kill at times. Yet seedlings of the hardiest trees often do it. A new variety of the tree has been discovered which is wonderful in that, whereas the ordinary Persian walnut tree comes into leaf rather early, this tree comes into leaf in June when cherries are ripe. I have seen similar trees in France. I have no doubt there are ten or fifteen different varieties of this tree growing unappreciated in this part of the country. These particular trees we do know about happen to belong to gentlemen who are propagating them for our benefit and we owe them our thanks; but I have no doubt there are many other trees equally as valuable growing in the Eastern States. I have no doubt that the experience of Mr. Rush could be duplicated, in discovering right near him in his own town something better than he had ever known before. We need reports on all these trees.

MR. RUSH: In connection with Mr. Smith's remarks as to late vegetating varieties, it may be that this feature is not altogether desirable. I have been in correspondence with a gentleman in Colfax, Washington, who has some late vegetating varieties and he tells me that he lost his whole [Pg 17] crop. They were caught by a frost at the end of the season before they had fully matured.

MR. DAVIS: Mr. C. A. Sober has, on his farm in central Pennsylvania, about five hundred Persian walnut trees and has had them for ten years. He has not been able to get a nut. Every year they freeze back. The trees live but they freeze back. I don't know whether this is because they start too early or not.

PROFESSOR SMITH: I do not know that there is any better nut than these which we are now propagating, but I think the chances are ninety-nine to one against our having found the best walnut trees for this region.

THE CHAIRMAN: I think Professor Smith's point is well taken. We are just starting in this business. I want to get the experiences of men from different parts of the country. Is Mr. Stabler here?

MR. STABLER: Thirty years ago three trees, probably seedlings were planted in our neighborhood. One is on my father's farm, one is on my uncle's farm, and one is on our farm. The one on our farm, I think, has never borne a nut. My uncle's has borne many times, although an apple tree and a cedar tree are very near it. This walnut tree comes out so very late in the spring that no spring frost catches it. It is in Montgomery County and we often have late spring frosts there. The nuts are all ripe in the fall too before the frost comes.

PROFESSOR SMITH: Mr. Stabler told me that this is the fifteenth successive crop from this tree.

THE CHAIRMAN: This is certainly a very important point—the maturity of these trees. It is the general impression that the Persian walnut will not mature in certain sections of the country, but as a fact there are certain varieties that will mature anywhere in the country. We have similar

evidence in the experience of the pecan growers. The Indiana pecan is dormant later than the southern varieties. This is true of the hardy peach also which comes out later in the spring and is ripe sooner in the fall than the southern varieties. These seem to have accommodated themselves to the climate.

Professor McHatton: In Georgia we are prone to be hurt by the late spring frosts—that is our great trouble. The other day there was sent into the office a number of specimens of the Persian walnut, said to be from a seedling grown at Sharp, Georgia, in the apple country just below Chattanooga, at an elevation of eight hundred to a thousand feet, and it gets cold up there—they have heavy freezing every winter. This tree began bearing at seven or eight years, the owner [Pg 18] said, and has borne a crop every year for the past seven or eight years, and he had several losses of fruit crops from late spring frosts during that period. The nut was very well filled and of fair size. If any one is interested sufficiently and will write to me as soon as I get back to the college I will send the name of the grower. I do not recommend it as I have never seen more than a dozen of the nuts. This was of interest to me, because I have not been recommending the Persian walnut there on account of the late spring frosts, but now it looks as if there was a chance of our getting into the walnut game ourselves.

Mr. Pomeroy: A prominent expert who came to the farm once said to me that the Persian or English walnut came to this country through two routes: one through Greece, Italy and Spain, and taken by the Spaniards to Mexico and southern California, and the other route through Germany and England into the United States from the north. He said he would rather have his walnut trees come from the northern route trees than the southern.

Professor Smith: Any one who has a good tree ought to write to our secretary. I hope everybody will report these trees. The information will be published in bulletin form and sent out to every member of the Association. I fully believe that this information gathered and disseminated will greatly assist in developing the walnut industry in the eastern part of the United States.

Mr. Frost: Mr. Pomeroy said that the pruning might be done at any time of the year. I pruned a walnut tree one spring and it very nearly bled to death.

Mr. Pomeroy: It seems to me that I have always pruned at any time. It might be that when the sap is just nicely started—just before the tree starts and the buds swell—it might not be wise to do that. I suppose that the nut trees might bleed then the same as grape vines and certain other plants and trees. I thought it never did any harm.

Mr. Frost: It very nearly killed mine. They were big trees, too.

The Chairman: I had just such an experience as that with grape vines. We found that if grapes are pruned at a certain time in the spring they will bleed profusely, and sometimes actually bleed to death. I never had any experience with walnuts, but with vines we prune in the fall just as soon as they are dormant. At that time the energies of the plant are at a minimum and you can prune more safely than at any other time. As we go on toward spring the moisture becomes greater and [Pg 19] the sap starts, so if you prune late in the spring there is great danger of injury to all plants. If you prune in the fall you have no trouble.

Mr. Wile: I would like to know if any one has had experience with California varieties here in the East.

Professor Van Deman: Professor Close has had more than any one else. I have also heard of some in Florida.

Professor Lake: We have had three years' experience; we have had also the experience of others who have had them a longer time than that. Some three years ago we grafted a number of California varieties on the eastern black. In view of the eastern conditions, these are all making splendid growth—some of them made a three-foot growth last year, some a five and one-half foot growth this year. They went through last winter splendidly; they are holding back finely in the spring and we had no trouble with spring frosts on the grafted portions, even though many of the seedlings were injured.

The Chairman: Will the Persian walnut fertilize itself under eastern conditions?

Professor Smith: I think we will have to trust to outside fertilization by the black walnut or butternut. They all bloom at the same time. One fertilizing tree will do, but it is better to have more than one because sometimes it might turn out that the staminate catkins came a few days too early or too late to fertilize the nut. The more trees you have, the better the chances; the more trees in a group the better. The reason a five or six-year-old Persian walnut tree does not bear many walnuts is that there are no staminate catkins. It takes old wood to produce them. There is not enough old wood.

Mr. Stabler: The Stabler walnut which I have just mentioned, bloomed from the tenth to the twenty-fifth of June. The black walnuts of that neighborhood all came out from a month to six weeks earlier than that, and not a single black walnut tree had blossoms on in that neighborhood, nor a single Persian walnut at the time the Stabler tree blossomed. I believe I am fairly well acquainted there and there was not a single other tree had catkins on at that time, and yet that tree bore a good crop of catkins and a large number of pistillate blossoms and later a good crop of nuts which is fairly good evidence that it must have fertilized itself.

The Chairman: We would like to continue this discussion, but we have another paper that bears on

the subject, and I think it will bring out some points in connection with it. [Pg 20]

FORAGE NUTS AND THE CHESTNUT AND WALNUT IN EUROPE

J. Russell Smith, Virginia

The great task of American agriculture is to feed our beasts. Approximately nine tenths of the proceeds of American agriculture goes to nourish the quadruped, and man eats the remaining one tenth; therefore, if we want to get clear of the possibility of a crop being overproduced, let us grow something the beast can eat. To say that we will never overproduce food crops for man is ridiculous. It is quite possible, for instance, that we may produce too many Persian walnuts for man's food, but the tree that will produce nuts to feed the beasts is on a firm basis. Pigs are going up and they are going to stay up. If we can get something that will suit Brother Pig we are on a perfectly safe basis, and that is the basis of the chestnut industry in Europe. In large sections of France, from Switzerland to the Atlantic, there are thousands of acres of chestnut trees—a great forage crop. In a few districts it looks like a forested country, on account of the heavy chestnut tree groves. The tenant who takes a farm has certain restrictions placed upon him in the removal and use of the crop. He is not allowed to remove the chestnuts in France. The tenant who takes the farm, signs a contract that he will not sell the chestnuts but will feed them to the pigs so the soil may not be exhausted. They gather them carefully and use them in a number of ways. They make the main bread supply of the people. I have eaten chestnut cake. It is not bad. They treat it exactly as we do corn cake. When they can afford something better, they do so.

At harvest time the chestnuts are put in drying houses, a fire is built under them and after they are thoroughly dried they will keep indefinitely. We find them on the market as dried chestnuts; and I have seen people eating them raw in June of the year after. Chestnut meal is a standard article of consumption and the price is regulated by the price of cornmeal.

I have seen considerable areas planted out regularly in rows of young trees, and alongside of that older ones. They plant on perfectly fine, level ground hundreds of acres of chestnut groves and we find these groves anywhere from twenty-five to one hundred years old. They are very valuable property for the reason that when old there are many cords of wood to the acre, and chestnut wood is valuable. [Pg 21]

They have a disease over there called inky root consequently new plantings have largely ceased, though there are some going on. A great reason for planting is that timber means an increase in the value of land. A man who has an old chestnut orchard has land that is worth two hundred dollars an acre for wood alone and the temptation is very strong to sell off the timber and get the money, which process is going on faster than the setting of new orchards. These orchards are on high class agricultural land.

It is quite different in Corsica; the country there is very broken and rough. Some of the hills range up to 6,000 feet, and for a belt of 2,000 feet the chestnut forests are continuous and villages numerous. This island supports a dense population. The principal industry consists of gathering the chestnuts, and for a few weeks the people are very busy putting them away for the year's supply and sending them to market. I stopped at the home of the mayor of a little town and he went back in the barn where he had a bin full of dried chestnuts. He fed some of them to my horse. It is their one crop. Many people have nothing but twenty or thirty or forty acres of chestnuts and a little garden—a little garden made by retaining walls making a terrace that must be tilled by hand. That is the whole sustenance of the people. The value of the land is usually estimated on a tree basis, and very seldom put on a land basis. The value of land covered with trees is from two hundred to three hundred dollars an acre, and land along side of this without trees may be worth but ten dollars. The value of the chestnut trees for wood forms a large part of the sale value. There is some good pasture under these trees.

The renewing of these groves is perfectly systematic. The old trees, having attained their full size, meet overhead and right alongside of them are planted new trees, which under such circumstances make a very poor growth. The young tree may get as high as this room in ten or fifteen years, and the old tree being worth ten or fifteen dollars, is then cut down (in that country if you want money cut down a chestnut tree). The young tree takes the place very soon, and once established a chestnut orchard lasts indefinitely. Sometimes they plant the young tree beside the old one, ten or fifteen years before the old tree is to be cut down.

The contrast between the populous villages of Corsica and like portions of the Appalachian hillsides is striking. The inhabitants of the latter cut down everything, plant corn and in two or three seasons the rain simply carries the earth away and the farm has to be abandoned. In contrast to that the orchards of Corsica have been there for many centuries. I asked one man [Pg 22] how long this thing had been going on. He said "two hundred, three hundred, five hundred, one thousand years, always." Nobody knows when they began to grow chestnuts. How the land continues to grow them is more than I can understand. As an example of permanent agriculture, that has everything I have ever heard of beaten out. Those people had not fertilized the trees, as it would be a physical impossibility to carry anything up those slopes; everything comes down.

They have been taking off wood and nuts always, nothing has gone back. I have not been present at harvest time but I have consulted with the representatives of the Department of Agriculture in France and they tell me this land produces a ton to three thousand pounds to the acre, with the big years doubling that and the little years halving it. This without taking anything away from the land apparently. The land is as good as when they began, and is supporting a dense population and has for centuries.

Another forage nut which struck me as even more important than the chestnut, because of its much wider possibility in America, is the acorn. I have been through considerable areas in Portugal where they didn't care whether they had a cork tree or an oak. Land with such trees is worth from one hundred to one hundred and fifty dollars per acre. They assured me that the acorn oak forest was as valuable as the cork forest. Some of this land is wheat land. They will let an oak tree stand right in the middle of a field where the cultivation of the ground improves the tree. After the wheat harvest the hogs fatten on the acorns.

The evergreen oak of southern Europe is highly prized for its acorns. I have seen large areas of bearing trees. I have been told time and again that they bear at a comparatively early age. The oak is capable of grafting, about as easily as the chestnut. I have seen them grafted, all the way from those of this spring up to three hundred years old. The number of trees grafted is small, but that in no way affects the possibilities. Certain varieties are prized as much as chestnuts, or even more, and the price of acorns is set by the price of chestnuts, just as the price of cornmeal sets the price for chestnut meal. I never got crop records for a solid acre of oak trees, but the performance of individual trees gives rise to the belief that the acorn crop in Europe and America is worthy of careful study. I saw a tree—a single tree—that I was assured bore more than twelve hundred quarts in a single year, thirty-seven bushels. It is hard to get the yield in a large forest, but this tree was alone. Its sweep was seventeen yards, its yearly production seemed to average [Pg 23] over twenty bushels, which was worth as much as an acre of corn in any of our states. Wherever I found an isolated tree, I found its production to be surprisingly large, and I got my information from a variety of sources. It seemed to be one of the most important forage trees.

As to the Persian walnut, it is reported to be a small nut of almost no value in its wild state. It grows around the world between the belt of the orange and the belt of the white pine. It is unknown as a crop in large areas in Europe, where it might be grown successfully. In Italy there is only an occasional tree, and it is not grown much in Portugal or Spain.

It has centers in Europe as crops have in the United States and for the same reason—someone started the industry. The activities of Mr. Pomeroy have stimulated its growth in his immediate locality. When any one succeeds in a certain line, we find people about him taking up the same line and they conclude that this product can only be produced in that particular locality. This is usually not so at all. The thing that happened was that some one showed them that this soil would produce this thing. Near Naples there is a walnut boom. The value of the walnut as a crop is shown by the fact that market gardens producing three crops a year under irrigation are being planted to English walnuts. I have been told time and again that this is a very profitable crop. In this walnut district they have planted whole hillsides to olives and walnuts alternately, sometimes mixed up, sometimes twenty acres solid. In some places they can only be cultivated with the hoe, a very distinctly un-American job, and yet the English walnut seems to pay the people under those conditions of labor. It is spreading over that peninsula and you find it spreading in the lowlands. They trim the tree up to twenty-five feet, so that teams can drive below.

There are two important walnut areas in France; at one place an old crank named Mayette about two hundred years ago found a good walnut and he grafted some and planted out an acre or two, and his neighbors planted some, especially when his acre or two began to grow, with the result that the territory around that old man's planting is the center of the production of the Grenoble walnut. A little strip, on the foothills of the Alps and along the Isère river is sprinkled with walnut trees. They are now planting these trees in the midst of the best vineyards. In a field of wheat often-times you will find rows of little walnut trees. There are some orchards of Persian walnuts in this locality but I think no orchard has over five acres. They have come to grief along a line that is common to most people, that of overcrowding. It takes a great deal of nerve to plant a nut [Pg 24] tree sixty or seventy feet from the next—it looks as if it were wasting the land—and they have planted them so close that the tops of the trees and the foliage form a flat level green surface, and the sun shines on a very small part of each tree instead of all round and over it as it should.

The other walnut district is one more suggestive to me. I doubt if even those who have trees to sell are justified in advising the farmers to plant solid fields of walnuts, but we can recommend a row of them around fence rows and round the barn. I traveled a good many miles through the western part of France, from Lyons to Bordeaux, and I have seen thousands of trees, but I have not seen any orchards. They put one tree by itself and they raise wheat close up to it. The fertilization and cultivation help the walnut and make it produce a better crop. Those well-fed trees with plenty of sun, air and plant food are distinctly superior to the other trees. A good walnut tree rents for as much as an acre of ground. It is the product that is received without labor that appeals to me, and as the trees produce well, there is sometimes seven or eight dollars worth of profit to each tree, and the landlord is in the position to command most of the seven or eight dollars because he furnishes the trees. If a 50-acre farm with fifty nut trees stood on one side of the road and one of equal area without any trees on the other side, the one with the trees would rent for twice as much. A good tree will occasionally produce three or four hundred pounds of nuts, especially a fine tree out by itself. Once in a while we find a grove of them but more often there are six, seven, eight or more trees scattered round the house. The combined

result of that industry produces millions of dollars worth of nuts.

If there are any questions, I shall be glad to answer.

Mr. Evans: Can the pecan be used as a forage crop for pigs?

Professor Smith: I don't think we are willing to let him have them.

Mr. Evans: Would a pig eat them?

Professor Smith: Observations show that the pig will eat them if you give him a chance; he will eat with great gusto the hickory nuts and a grown hog will also crack black walnuts; the pecan he simply grinds up. I suggested the pig as a way out of the problem of overproduction; the pig wants the products when we don't.

Mr. Storrs: I come from a country where we grow the pig on corn, and it is hard for me to believe that he will get fat on acorns and chestnuts. [Pg 25]

Mr. Lee: I also would like to ask whether a hog will get fat on acorns. I had an experience this fall; a man on my farm had some pigs and he kept them in a pen and fed them corn. I was going to begin to feed my hogs, but I had a woods and I said let them eat the acorns. At the end of a month they had eaten the acorns but they were not as fat as they had been at the beginning. They had worked so hard to get the acorns that they had worked off all the fat.

Professor Smith: There are two hundred thousand hogs on the job in the federal forests today. The Portugese pig in the spring is a lamentable looking object. The method is to keep him alive until acorns get ripe and they count on a pig multiplying himself one hundred to two hundred per cent in the short season from the beginning of September to the first of the year. They keep him ordinarily eighteen months; they carry the spring or fall pigs through one winter, and at the beginning of the fattening season a pig that weighs fifty or sixty pounds is counted on, in the short time when acorns can be picked up, to jump up to one hundred and fifty or two hundred pounds. There is much evidence on both sides of the Atlantic to the effect that acorns fatten hogs if the supply is good.

PRESENT STATE OF THE CHESTNUT BLIGHT

J. Franklin Collins, Washington, D. C.

I presume that all of you who have any interest at all in the chestnut know considerable about the blight which has been killing these trees in the northeastern part of the country, so I will say nothing whatever about the general features of the disease but confine my talk to those points which have assumed, within a year, some special importance from the point of view of fighting the blight, or related topics.

Perhaps the first thing that I can allude to is the discovery of a certain disease in China which, at the time, was supposed to be identical with the chestnut disease in the northeastern part of this country. I say "supposed" because we had no positive knowledge at the time that it was the disease. Specimens were sent to this country by the agricultural expert, Mr. Meyer of the Department of Agriculture, for examination. Cultures and inoculations were made by the pathologists in the Bureau of Plant Industry and all of the tests that could be applied showed it to be identical with our American disease. [Pg 26]

Mr. Meyer's report upon this disease, as he found it in China, has some points which may be of interest to you. He said the disease apparently had been there for many years, as the lesions of the disease showed if they were examined carefully. The fact that it has been there for many years is, I think, questioned by no one at the present time. Its growth in China seems to be somewhat different, in fact in many cases quite different, from the growth on the American and the European chestnut trees. It is rather of the type that we are familiar with on the resistant Japanese trees. More-over, it appears on some of the trees as shown in the photographs which I will pass around. The appearance of the disease more closely resembles, in some ways, what we are familiar with in the European apple canker as it appears on the apple trees. I think those who are familiar with the apple canker will notice the resemblance, in at least one or two of these photographs. Now, I don't mean by that that it is the same as the apple canker, but I do want to call your attention to its appearance in these photographs, and at the same time, to tell you something that Mr. Meyer wrote about this disease as it appeared in China. He said he found no trees that were absolutely killed by the disease. This may mean, and probably does, that the Chinese tree is resistant, to a certain extent, to this disease; that is, it shows a certain amount of resistance, much in the same way that the Japanese chestnut tree does to the disease in this country.

For some years (as some of you will remember, I think) there have been two different views as to the origin of this disease. One is that it is a native fungus which, for some reason, has assumed a parasitic form; the other that it is an imported disease. The principal reasons for the latter view

are that it spreads in this country on the American chestnut in much the same manner that other imported diseases have spread on other plants. The fact is that this disease (so far as we can find absolutely identical with the American form) has been found in China; about this point there is no doubt at all, and I think we can safely say, although we cannot absolutely prove it at this time, that the disease in this country was imported from the Orient. What bearing this will have on the question of control of the disease in this country remains to be seen.

Have we any chestnuts which show immunity to this disease? The American chestnut is subject to it in its most virulent form. There are of course a number of varieties of the American chestnut which have been cultivated. Of these the two which I have seen most of are the Hathaway and the Spineless. Both of these are subject to the disease in the ordinary form. The American [Pg 27] varieties which have been originated within a few years, the Boone and the Rochester, I am not prepared to say anything about at the present time. The resistance or immunity of these varieties has not been determined so far as my own work is concerned. Of the European varieties we have a great many and they produce, as a rule, the large chestnuts of the market and are known under various names. Some are scions of named varieties and I will mention some of the more prominent. The first and best known, perhaps, is the Paragon chestnut. This is susceptible to the disease and takes it in almost as violent a form as does the American, and so it is with the Ridgely, a nut which originated near Dover, Delaware. The Dager and the Scott also take the disease, and so do many of the so-called French varieties—the Marron, the Marron Combale, the Early Marron and others—so far as I have been able to ascertain. I have not seen very many Numbo trees, but of those which I have seen, some have been diseased. Two varieties, which I have seen have not had any disease upon them. One of these I saw only once or twice and was unable to make a thorough examination. This is the Darlington chestnut which grows near West Chester, Pa. I have no reason to think this is immune in any way to the disease; all I can say is that I have not yet seen the disease on this variety. Another variety which I have heard a great deal about from the point of view of resisting the disease is the Hannum. I don't know anything about this. I have been unable to locate any trees which I could examine. Now these are all the varieties of the European or American sorts that I care to speak about, and we can say that they are all, so far as we know, with the possible exception of the one or two last mentioned, subject to the disease.

Now let me turn for a moment to two other types of chestnut. First the chinquapin, a small dwarf chestnut which grows in the southern Atlantic states but reaches as far north as New Jersey and perhaps farther for all I know. The chinquapin in the past has been regarded as a rather resistant species and my own observations seem to bear out this supposition. I have seen very few chinquapins which had the disease. It may be due partly to the fact that they are not so subject to the attacks of insects and injuries through which the blight might gain entrance, or it may be due to the resistance in the species—I cannot say about that. I had an opportunity this fall to see the Rush chinquapin. I examined these trees—there are two of them—and I think there is no question but that they are hybrids between the chinquapin and the American chestnut. One of these trees [Pg 28] was diseased, the other had no disease upon it.

The Japanese chestnuts have been known for a long time to be highly resistant to the inroads of this disease. Some may be immune, if we use the word immune in a very loose sense. It has been regarded as of rather coarse quality and some varieties as entirely unfit for human food. This is true of many of the Japanese chestnuts, but I have recently seen some which, so far as I could tell, were nearly as sweet as the American chestnut and Paragon chestnut which I tested at the same time and which were growing side by side. I could detect very little difference between them. The Japanese nuts were very large, considerably larger than the Paragon. Whether these will retain their sweetness in drying I cannot say. These Japanese chestnuts are seedlings, and are known as the Delaware, the Felton, the Kent and the Henlopen. Like all of the Japanese chestnuts they are highly resistant to the blight.

I wish to call your attention to a few of the standard Japanese varieties upon which I have made observations. These were all grafted trees, that is the Japanese variety was grafted on American stock. The McFarland is a rather well-known variety. Of five trees which I have had under observation, all of them became diseased below the graft but none above the graft, showing the resistance of the Japanese scion on American stock. I think this is given out as a Burbank variety. The Hale is another one which has the same record exactly. On the Coe I have seen two cases of the disease on the Japanese part and several cases where the trees are diseased below the graft. The Alpha, one of the Parry varieties holds about the same record as the Coe—two cases of disease on the Japanese part and several below the graft. The Parry Giant has been considered one of the largest nuts; in four trees observed there was one case of the disease on the Japanese part and two below the graft. The Superb had the disease below the graft but not above; the Reliance just the same way. Then along with these plots were one variety of European, the Scott, which was quite as susceptible to the disease as any other European, and another variety, the origin of which I do not know. This last appears to be something of a hybrid with some chinquapin blood in it—whether this is so or not I cannot definitely say—I can say this, however, that it takes the disease not as readily as the European but more readily than the Japanese.

Just a few words now in regard to the present distribution of the chestnut disease, or at least its extended distribution. The disease is now known to occur in Maine, New Hampshire, Vermont, [Pg 29] New York east of the Catskills and as far north as Lake George, and generally as far south as northern Virginia. Farther south there are some scattered infections, one nursery having been found in North Carolina which had the disease. The western distribution of the disease, if you

take isolated cases, is now carried to the Pacific coast. We know of an orchard in Agassiz, British Columbia, in which the disease has been found. Nobody knows how this was transmitted, but the chestnut trees upon which the disease occurs were supposed to have been sent to the owner from the Orient. They apparently are not of the usual Japanese type, however; that is all I can say about them now.

The chestnut blight has been found on all parts of the branches, twigs, trunk and the exposed roots. Last year we found the disease on the nuts themselves and on their burs and we were able to isolate the disease from the shell of the nut and we were also able to produce the disease on the bark of a chestnut tree through inoculation from the nut itself. So that the disease can occur on almost any part of the chestnut tree.

A Member: I saw quite recently that there were two cases of fatal poisoning in Connecticut from the result of using nuts said to have been blighted. I would like to know if that has been verified.

Mr. Collins: There have been, so far as I know, about fifteen cases of supposed chestnut poisoning in the vicinity of Hartford with five deaths. We have reports of disease and possible death in other portions of the country, particularly in the northeast. These reports come in such a way that it is impossible to say definitely that chestnuts caused the trouble, but this much can be said: our office here in Washington has a physician working upon this very point. At the present time all that I can say is that there is no doubt about the cases of illness and it is impossible to dissociate the eating of chestnuts from the possibilities. At the same time it is not possible to show that chestnuts were the cause of the trouble rather than something else which was taken at the same time.

The Secretary: I wrote to the physician near Hartford whose wife is reported to have died, but I have had no answer.

Dr. Metcalf: After following those cases up and finding that chestnuts could not be excluded as a possible cause, we have started experiments with various animals, also some chemical, to determine if there is any possibility of any definite toxic substance in the nuts; so far results are [Pg 30] negligible. We are not prepared to say whether there is anything in chestnut poisoning or whether there is not.

The Secretary: I think there are three points in relation to the chestnut blight of very great importance to the practical nut grower, and I would like Professor Collins to answer these questions. In the first place, how far are we justified in recommending planting of non-immune varieties within the blighted area, in limited quantities, with the understanding that there is a fair show of keeping them tolerably free from the blight by watchful care and cutting out? Mr. Roberts of New Jersey has a large chestnut orchard and he says he is not afraid of the blight. He has had a large crop of chestnuts this year, and he says that, while he has cut out, I believe, one orchard of small trees his large bearing trees are not seriously affected by the blight. This is the same testimony that we had from Colonel Sober last year.

The second question is, how far are we justified in recommending the planting of chestnuts outside of the present blighted area? It seems to me this is a very important point. Can we go so far outside the present blight area, perhaps beyond the present range of the chestnut tree, that we can hope to plant them without their being exposed to danger, or much danger, of contagion from the blight? Can we recommend their being planted in places where the chestnut does not grow now perhaps within several hundred miles?

And the third question is in regard to immune varieties. How far has the immune quality of any varieties been demonstrated?

Professor Collins: With regard to the first question,—planting of non-immune varieties within the chestnut disease area,—I don't feel like recommending it except on an experimental basis. Perhaps I am recommending something that I might feel like changing my mind about a little later, but, in the present state of our knowledge I would hesitate to recommend planting within the disease infested area. So far as the second question is concerned, the planting of non-immune varieties outside the chestnut growing area, I think there are some pretty good prospects in sight, provided the stock which is obtained is carefully inspected to see that it is free from the blight to begin with, and is watched carefully for at least the first year. The third question, in regard to immune varieties,—if there are any the immunity of which has been demonstrated sufficiently to warrant their being planted,—the Japanese, which are highly resistant, and what some people might consider immune, are the only possibilities so far in sight. The great trouble with the Japanese trees which have been grown in the orchards in parts of the country that have [Pg 31] come under my observation, is that they have been grafted on stock which is very susceptible to the disease, and I think it is safe to say that 80 per cent at least, possibly 90 per cent, of the trees that have been killed under these conditions have been killed by the disease girdling below the graft on the susceptible American stock. If we can grow Japanese seedlings under the same conditions, perhaps, that Colonel Sober is raising his Paragons—two years from the seed and then grafting—I don't see why we can't have a tree that is going to be reasonably resistant to the disease; now if we can find some Japanese nuts which are really palatable, really good and sweet, as these three or four that I have mentioned appear to be, I don't see why we cannot have a tree which will be reasonably immune to the disease and at the same time producing an edible nut.

The Japanese stock seems to be able to fight off the disease to a certain extent in much the same way that the apple tree can fight off the apple canker, each year the lesion increases a little but each year the growth of the tree overcomes it to a certain extent, and there is a fight between the disease and the tree all the time. Very likely the disease once on the tree will remain on the tree, as far as we can tell at present, for quite a time, but perhaps not kill the tree outright.

Professor Van Deman: Dr. Van Fleet of the Department of Agriculture is working on what seems to be a very fine prospect for raising chestnuts that will be immune and that will have good quality. Japanese chestnuts are the poorest of all in quality but he has taken the chinquapin, which is of high quality but the very smallest of the whole chestnut family, quite common in many of the central and southern states and as far west as Arkansas, has crossed the Japanese chestnut and the chinquapin, and has obtained seedlings that bear very young—when they are not more than four or five feet high sometimes. They are loaded with nuts, and nuts of large size, larger than our ordinary wild chestnut, usually one in a bur just as the chinquapin is and having the high quality of the chinquapin, and he has grown many of those in New Jersey right in the very worst of the disease area and has found some that are exempt. Perhaps some of you have noticed what was published in regard to this in the *Rural New-Yorker* sometime in the past few months. I have seen the nuts from some of these trees, and while I have never eaten any, I have Dr. Van Fleet's word for it that they are of excellent quality. Now that is something that we might feel quite hopeful about. [Pg 32]

Professor Collins: Dr. Van Fleet is doing a fine work. I have seen some of it and gone over the work with him.

Professor Van Deman: He is one of the government people and he is carrying on his experiments here at the Arlington plantation, right across the river.

Dr. Metcalf: Speaking of breeding material, we have six sorts for breeding purposes in the shape of seeds of this very species of Chinese chestnut on which the disease occurs in China. The nut of that tree is of very high quality and good size, and, so far as I can tell, quite as sweet as the American chestnut. If there is no more disease on the trees in this climate than there is in China it would be a very practical tree to grow, as far as we know.

TOP-WORKING SEEDLING PECAN TREES

W. N. Hutt, North Carolina

According to a census we have just completed there are in North Carolina upwards of 50,000 seedling pecan trees. These trees range in age from one to thirty years. Seventy-five per cent of them are of bearing age, but there is probably not one per cent of that number that are profitable bearing trees. In all parts of the pecan country experience has shown that seedling pecans are notably slow in coming into bearing and some trees never bear at all. Those that do bear have nuts that are almost invariably, small, thick-shelled and of indifferent quality. In this respect, however, the pecan tree differs in no way from any of our other classes of fruits. No one would today be so foolish as to try to get a good peach or apple orchard by planting the seeds of these fruits; but this is just what a great many people have been trying to do with pecans.

This attempt to produce pecan orchards from seed has been the origin of the 50,000 trees noted in the census above. Now that we have these seedling pecan trees, are they of any value at all? Can we make anything out of them whatever or must we cut them down and charge up the expenses to the account of experience, and start over again with standard varieties of budded and grafted trees? Years of time and quantities of money have been spent in producing these beautiful but comparatively valueless seedling trees. However, they are far from being a total loss, for in those deep roots and stalwart trunks and spreading branches, there are latent possibilities in abundance. If by some magic power like that of Aladdin's wonderful lamp told of in the "Tales of the Arabian Nights," we could transform these seedling trees in a single night to standard varieties, we would enrich every owner of pecan trees by hundreds of dollars and the aggregate wealth of the state would be increased by millions. [Pg 33]

For several years I have been in search of Aladdin's wonderful lamp to enlighten me how to effect this felicitous transformation. Like Aladdin's quest of old the search has been long and wearisome and has led me a tedious road through many vexatious disappointments, but at last I have found the lamp! I have in my power the magic by which a worthless seedling pecan tree can be transformed into a productive standard variety. This magic talisman is simply

Patch-Budding.

Every kind of budding is magical. Is it not wonderful to make a crab apple tree produce Stayman or Grimes Golden apples or a quince bush produce luscious Duchess pears? Is it not strange that the sap from the same root can produce red apples on one branch, yellow ones on another, and russets on a third? How does it come that one twig can be made to produce sour apples and the next Paradise Sweets? Strange! Wonderful!! but True!!! It is all owing to the fact that the sap of a tree is a homogeneous substance and that it is the bud through which it passes that stamps the individuality upon it whether it shall be a crab or a Grimes Golden. If we make all the buds of the tree of the Grimes character, the apples will all be Grimes Goldens. In the same way if we make

all the buds on a pecan tree Stuarts or Schleys there will be nuts to be gathered from that tree and they will not be the worthless scrub seedlings.

When I began my experiments in the top-working of seedling pecan trees I soon found that there were many things one could *not* do with pecan trees. I counted myself a successful propagator of apples, peaches, plums, grapes and various other kinds of plants, but apple, peach and general propagation methods failed to give success in the budding and grafting of pecans. I concluded the method must be all right but that I should be more exact about my mechanical manipulations. I started out with the ordinary cleft graft commonly used for top-working most sorts of trees. I experimented in several different orchards and put in hundreds of cleft grafts. I took great pains to make my work as mechanically perfect as possible. All conditions of stock, scions, weather, etc., seemed to promise the highest degree of success. The result of that season's work was a world of disappointment, a lot of experience, and two living grafts. One of these latter, the result of my skill, was so effectively pruned that fall by the pecan girdler that my work for the season [Pg 34] was a minus quantity in all but experience. The other living graft, which was put in by an assistant, is now a bearing Curtis tree, our only monument to the success of cleft grafting the pecan. Other propagators are said to be able to secure fair results with cleft grafting of pecans in certain localities, but from my experience, I am willing to aver that it cannot be done in this latitude.

Next followed a series of trials with shield budding which is so uniformly successful with peach, but peach methods failed entirely with pecans. Then followed a succession of trials with whip grafting, veneer grafting, bark grafting, and chip budding, all with a varyingly large percentage of failure and a uniformly small percentage of success. Some propagators in the South report fairly successful results in the chip budding of pecans, but my results with this method were largely of a negative character.

After persistent trials of all the known methods of budding and grafting, through the varying conditions of four successive seasons, I have narrowed the propagation of the pecan in North Carolina to one single method, namely, patch-budding. This method has year after year given us the highest percentage of successful unions. The operation illustrated by figures 1 to 12, is as follows:

1. *Heading Back.*

During the dormant period which is, roughly speaking, from November 1st to March 1st, the seedling trees are cut back to stubs, the ends of which may be from one to three inches in diameter. Wounds larger than this size take years to heal and endanger the life of the tree. Large trees can be operated on as well as small seedlings, only one has to go higher up so as not to cut too large limbs. Figure 1 shows a seedling pecan tree 18 inches in diameter, which was stubbed back in the winter of 1911-1912 and successfully budded the following summer. The result of this drastic heading-back is a numerous growth of vigorous, rapidly growing shoots near the ends of the stubs, by which Nature endeavors to heal over the wounds. The cambium in these vigorous, sappy shoots is in the most active condition possible; just the condition most suitable for the union of stock and scion. This optimum condition cannot be secured except by the forced growth as the result of the heading back. Our experiments, year after year, have shown that on the ordinary new shoots, even on active young seedling trees, the percentage of living buds was [Pg 35] much less than on the forced shoots of the headed-back trees.

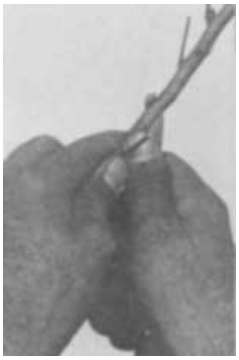
Fig. 1. Seedling pecan tree, 18 inches in diameter, cut back in winter, showing summer's growth of vigorous shoots ready for budding.

Fig. 2. First operation. Making parallel cuts on stock.]

Fig. 3. Second operation. Making vertical cut between parallel cuts on stock.

Fig. 4. Third operation. Loosening bark on stock.

Fig. 5. Fourth operation. Making parallel cuts on bud stick.



6. Fifth operation. Making vertical cut between parallel cuts on bud stick.

Fig. 7. Sixth operation. Taking bud from bud stick.

Fig. 8. Seventh operation. Fitting bud to stick.

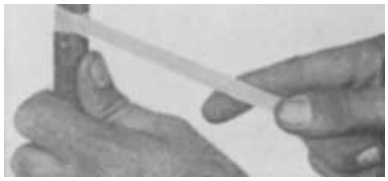


Fig. 9. Eighth operation. Beginning the tie.

Fig. 10. Ninth operation. Finishing the tie.

Fig. 11. The tie complete.

Fig 12. Bud united.

Fig. 13. Bud stick of present season's growth. The three lower, or basal, buds are best.

Fig. 14. Bud sticks of previous season's growth.

The different steps in the operation of patch budding are briefly as follows:

1st operation. Making parallel cuts on stock. See Figure 2.

2d operation. Making vertical cut to remove bark from stock. See Figure 3.

3d operation. Loosening patch on stock. See Figure 4.

4th operation. Making parallel cuts on bud stick. See Figure 5.

5th operation. Making vertical cut to remove bud patch from bud stick. See Figure 6.

6th operation. Taking bud off bud stick. See Figure 7.

7th operation. Inserting bud on stock. See Figure 8.

8th operation. Beginning the tie. See Figure 9.

9th operation. Wrapping the bud. See Figure 10.

10th operation. The completed operation. See Figure 11.

Figure 12. Bud united.

These illustrations should make the method self-explanatory.

Knives for Patch-budding.

Two sorts of knives are used for patch-budding, the double one for making the parallel cuts and the ordinary budding knife for removing the patch.

Cambium.

Professor Bailey, in his "Encyclopedia of Horticulture," says, "The ways and fashions of grafting are legion. There are as many ways as there are ways of whittling. The operator may fashion the union of stock and scion to suit himself if only he apply cambium to cambium, make a close joint and properly protect the work."

The fundamental basis of the whole science of grafting is cambium. What then is this important substance by means of which one plant may be made to live and grow and produce on the roots of another? If we strip off the bark of any actively growing, woody plant we will find just beneath a soft, colorless substance; this substance is cambium. It feels slimy to the touch and if scraped with the finger nail a little doughy mass can be raised. As we examine it it will be seen to quickly darken to cream color, then to yellow and finally to dark brown. A change has taken place in it in a few seconds, right under our eyes. When we first exposed it, it was living, active and capable of building the most complicated of plant structures; now it is dead, inert and impotent. If we examine the smallest portion of this doughy mass under a compound microscope we will find it [Pg 36] not merely slime but a highly organized tissue made up of countless minute cells, each with a delicate wall about it and containing a thickish liquid (protoplasm). The cambium cells are brick-shaped, and are placed end to end, with layer overlapping layer, like bricks in the wall of a building. The microscopic structure of cambium tissue gives us a clearer conception of its extreme delicacy. It is one of the most sensitive and delicate substances in all nature. Exposure to the air will kill it and completely destroy its functions in a few seconds. It is easily crushed by slight pressure and quickly killed by exposure to drying, frost, moisture and sunlight. Nature shows her extreme care of it for in making bark she has formed for the delicate cambium a perfect protective covering. Like the cambium the bark is composed of cells, as in fact are all animal and vegetable structures. But the cells of the bark have thick walls of a tough, corky substance, and each cell contains air instead of protoplasm. The corkiness of the bark makes it an impervious, waterproof covering that does not allow the cambium to be dried out or to be washed by external moisture. The air in the bark cells being in a still condition is a non-conductor of heat, and layer of bark overlapping layer, the cambium is completely covered with a dead-air blanket. This keeps it from being frozen in winter and from being overheated in summer, just as a dead-air space in the walls of a building protects from extremes of heat and cold. From this it is plain that nature takes great pains to cover and protect the delicate cambium from all external influences. This stands in striking contrast to the careless manner in which many propagators and planters handle the delicate parts of trees. It also explains why some budders get such a small percentage of living buds and some planters so few living trees.

Cambium is the building material of plants and without it growth is impossible. It covers every portion of the tree from the topmost terminal bud to the deepest root tip like a living blanket. During the growing season the cambium cells divide lengthwise forming new cells. These divide again and grow, and new cells are formed, until by fall a complete mantle of bark covers the outer surface of the cambium, while within it has built up a solid layer of the woody structure of the tree. A few rows of cambium cells are left in an embryonic condition to carry on growth the following year. The cambium is thus the only tissue of the tree that retains from year to year the power of active growth. The layers of wood and bark, after performing their functions for a few seasons, gradually die and are overlapped by new layers, but the cambium remains living [Pg 37] throughout the entire life of the tree even if it be, as in the giant Redwoods, thousands of years.

Besides forming the regular wood of the tree the cambium also grows out over cut places and builds in woody tissues that heal over the wounds. It is owing to this fact alone that budding and grafting are possible. The callus on cuttings and root grafts is another evidence of the same phenomenon, for the cambium of the roots of a tree is continuous and identical with that of the branches.

The Stock.

The whole practice of successful grafting and budding is the proper handling of active cambium. The cambium is the cementing material that unites stock and scion and unless there is active

cambium there will be no union. It must be said here that no matter how great the future growth of the union, the scion never becomes truly united or fused with the stock. The cambium grows all over and around the cut parts and cements them together, but if the graft union be split open fifty years later, the dead wood of the original scion may be found of the original size and in the original position. Since, then, successful grafting depends on the union of the cambium of the stock with that of the scion, theoretically the best time for grafting and budding would be when the cambium is most active. Actual nursery practice shows that this is practically correct, at least as regards the stock.

The ideal stock for propagation purposes is the young seedling of one or two years growth. In such a stock all the tissues are new and fresh and working to their maximum capacity and the cambium is in its most active condition. In top-working old trees it will be found that though the branches may appear vigorous, they are a long way from having anything like the active circulation found in small seedlings. Buds put in these branches would give a very small "live," while the same care on nursery seedlings could be counted on giving a high percentage of living buds. In top-working, therefore, it is found necessary in order to get the cambium sufficiently active, to stub back the branches to mere pollards. This cutting back should be done in the winter or dormant season. The following growing season will see a dense growth of very vigorous shoots trying to repair the injury. See Figure 1. These shoots are ideal stocks for, on account of their having all the sap from the greater root of the mature tree, the cambium will be even more active than in the nursery seedling. Often when nursery seedlings are in partially dormant condition, [Pg 38] owing to unfavorable weather or other conditions, they may be forced into budding condition by slashing off part of the growth above where the buds are to be inserted. In our top-working experiments this fact was further emphasized by a windstorm which broke off many of the sappy shoots just above where the bud was put on. Every single one of these buds "took," though some others, just as carefully put on, failed. The success of all the buds on the wind-broken shoots was undoubtedly due to the forcing of the cambium growth just at the point where the bud was inserted.

The Scion.

Although it is desirable to have the cambium of the stock in an active growing condition, it is quite the reverse with the scion. The reason of this is evident, for if the scion were active, it would soon exhaust its small supply of food and die before the union could be formed and it could get its permanent supply of nourishment from the root. It is desirable to have scions fresh and firm but in a quiescent condition until pushed into activity by the growth of the stock. If, on the other hand, the scions or buds become too dry the sap will not be able to revive them and no union will be made.

For patch-budding, the buds may be cut from scions or bud sticks of the present or the past season's growth. Figure 13 shows a bud stick of the present season's growth from which the leaves have been cut. Such a bud stick cannot be obtained until July, for before that time the bark is so tender that it is impossible to get the bud patch off the stick without crushing it or peeling off the cuticle of the bark. The basal buds of the present season's growth, Figure 13, make the best buds because they are more mature and dormant than the buds above them and as they have shed the leaf stalk they can be tied in more easily and snugly than those with the thick, fleshy base of the leaf stalk attached. Some budders make a practice of cutting off the leaves ten days or two weeks before they commence budding and leaving the scions on the trees to ripen the buds and shed off the bases of the petioles. There is in this way no danger of the thick fleshy leaf base decaying under the wrap and souring and killing the buds.

Figure 14 shows budwood of the previous season's growth. This budwood can be cut during the winter and kept over in fresh dormant condition by being packed in damp sawdust and carried over in ordinary cold storage or in a refrigerator. It will be ready for use in the spring as soon as the bark will slip on the stocks. By this method the budding season may be greatly extended and [Pg 39] propagation started at least two months before any of the present season's buds will be sufficiently mature for use.

The Kinds of Buds to Select.

As to the buds themselves the most desirable are those at the base of the season's growth. See Figure 13. These, though not large, are plump and fully mature. The bark is smoother and firmer about them than higher up the stem and there is no leaf stalk to interfere with cutting them accurately and making a close fit and tie. These buds are dormant and there is little danger of their pushing into growth in the fall and being cold hurt the following winter. For best success in patch budding it is not desirable to select very large, overdeveloped buds, or those that have grown so rapidly as to stand out on a little pedicel or basal stalk. In removing such a bud from the stick, the central column of the pedicel will often pull out and remain on the stick. Such a bud will almost invariably die. An observation of pecan buds in general will show that they are normally triple in form, the largest above and two smaller ones beneath it. The largest bud will grow first but if anything happens to it, the next one will take its place.

Tying in the Buds.

A good deal of the success in patch-budding depends on the tying in of the buds. The cambium must be thoroughly protected if a union is to result. It is necessary to have some kind of tie that will retain the sap as well as exclude external moisture. After experimenting with different materials and methods I have finally abandoned all except the waxed strip tie. This is made by

dipping sheet cotton in pure, liquid beeswax and pressing out all extra wax. The cloth after dipping is formed into convenient sized rolls. From these rolls the cloth is torn at budding time into strips a quarter of an inch wide and from six to eight inches long.

In tying in a bud hold it firmly so that it will not slip and begin at the top and bind it in very tightly with the waxed strip. Reverse the tie at the rear of the bud like a surgeon's bandage and cover the patch completely, leaving only the tip of the bud sticking out. The wax in the cloth will cause the tie to adhere sufficiently to the wood so that no other ligature is required. In budding in the spring, when the flow of sap is very copious, it is well to tie in a small splinter about the size of a match just below the bud to drain off the excess sap. This will save many buds from being killed by souring of the sap. In two to three weeks time the tie should be loosened so that [Pg 40] the rapid growth of the stock will not cause the tie to cut into the bark.

The Mechanics of Patch-budding.

After all has been said about cambium and stocks and scions and their relation to each other, there is still volumes to be written on the mechanics of pecan propagation. I do not want to scare anyone off from trying, but if there is any plant more difficult to propagate than the pecan, I have not yet found it. Even experienced propagators of general nursery stock have given up pecan budding as a bad job. On the other hand, a novice or "pecan crank" who is handy with tools and has the patience to study out the causes of his failures, may acquire the skill to obtain almost a perfect "live" of buds. This all goes to show that extreme precision is the password in the mechanics of patch-budding. In the first place, the knives should be of the finest quality so that they will hold a clean, fine edge. All cuts should be made with accuracy and precision, so that there are no rough edges and bias corners. The number of living buds will, under ordinary circumstances, be in exact proportion to the accuracy with which the bud patch fits the place made for it on the stock. The experienced pecan budder as he takes the bud off the stick can tell whether or not they will grow. If he tears the bark in cutting the patch, he drops that bud and cuts another; if the bud patch splits, he discards it; if his fingers touch the cambium or the bud patch falls to the ground, he wastes no time with it, but cuts another and another until he gets the conditions perfect. There is little use in tying in any bud that does not fit perfectly. For this reason it is desirable to have the bud stick of the same diameter as the stock. The bud patches from thin or small scions have to be stretched to fit and generally give a poor "live"; likewise, the buds from the more or less ridged portion at the top of the bud stick. The transfer of the bud patch should also be made quickly so that the cambium will have the shortest possible exposure to the air.

After Treatment.

The process of patch-budding is not complete even after a good "live" of buds is secured. It still requires some judicious after-treatment to get them into good normal growth. On account of the drastic heading back the tree has received, practically every dormant bud will be forced into active growth. These will push out so vigorously in spring that if not held in check, they may [Pg 41] completely overgrow and crowd out the buds put in. Attention should be given during the early growing period to see that the buds put in have sufficient room for proper development. If all or too many of the seedling buds are rubbed off, the inserted buds will not be able to carry all of the heavy flow of sap and so may be drowned and killed. On the other hand, the inserted buds may not start unless forced by the extra sap obtained by rubbing off a portion of the seedling buds. A good deal of horticultural judgment is required to adjust the proper balance between the seedling and the inserted buds so as to get the best development of the latter. When the inserted buds are able to carry all the sap of the tree, all seedling shoots should be cut out and attention directed towards forming the new growth into a strong symmetrical top.

If conditions are favorable, there will generally be some nuts the second season. By the third year the transformation from the seedling to the named variety should be complete, and a good crop of high class nuts should be expected.

Mr. Pomeroy: Would it not be an advantage if two persons worked at the budding? After the cuts are made, one could be taking the part from the stock and the other taking the bud from the budding stick.

The Chairman: That is a very good plan. One man could put in the buds and another man could tie —a boy handy with his fingers in making ties.

Professor Smith: Why the superiority of beeswax to grafting wax?

The Chairman: A good many budders object to grafting wax, on account of the oil therein contained being injurious to the trees. A great many people have dead trees as a result. Trees don't like oil, and for that reason we use beeswax and only the purest kind of beeswax. In fact, these pecan cranks who want to do things as they should be, like to examine the wax to see if there is pollen or bee bread or anything foreign in it.

Professor Smith: Is there any particular time that is best for grafting?

President Hutt: Yes; in the early part of the season there is a very vigorous flow of sap and we find we lose more buds then than in the later grafting. In early grafting we put in drainage, just

like the physicians, little tubes or something to drain out the moisture. We put in a little chip and tie over it very carefully so if there is any drainage it may escape. In the fall and late summer drainage is not necessary at all, and we really get better unions then when the trees are slowing down than we do in the spring when they are full of sap. [Pg 42]

Mr. Storrs: In selecting your buds, do you take them from trees that have borne, or from young trees, or indiscriminately?

President Hutt: We take them either from bearing or young trees. It is not important which, just so you get the right kind.

The important thing is to select good fresh active stuff, and particularly good sized scions and not small ones.

In budding we fit one side perfectly, and on the other side we leave a space of one sixteenth of an inch like a door. We didn't do that at first and we lost a good many buds because the active growth began on both sides. We had to leave a place there at the side, an expansion joint, to take care of that.

Mr. Storrs: Then you fit them at the top and bottom and at one side?

The Chairman: Yes, that's it.

The Secretary: This is one of the most important papers ever read before this Association, and that is because the success of nut growing anywhere is absolutely conditioned on our knowledge of propagation. If the propagation of nut trees were as easy as the propagation of apple and peach trees, we would probably now have in the north as many orchards of good nut trees as of apple and peach trees. Any one who has tried this budding of nut trees will, I am sure, appreciate the difficulties that Professor Hutt has described and the pains he has taken in telling us about them. This is the beginning of the demonstrations in propagating. They will be continued tomorrow; we will have then three or four of the most expert grafters and budders in the country, perhaps, who will give further demonstrations.

I would like to ask Professor Hutt a question. I noticed that in putting in some Persian walnut buds this summer, all died except a couple where the tops accidentally broke off.

The Chairman: That is explained by the illustration I gave of the wind blowing off all the shoots. Every one that was blown off lived even though some were badly torn. It was simply forcing the cambium at that point where it was needed. Mr. Roper had an experience of that kind.

W. N. ROPER
Vice-President Northern Nut Growers Association

Mr. Roper: We put buds on stock that was not very active, so the trees were cut back to six inches above the bud, forcing all the growth into the bud, and I suppose 95 per cent of those buds lived; on the trees not cut back the buds did not live. [Pg 43]

The Secretary: You have spoken about soaking the scions in cold water; does not that injure the buds? We have been told heretofore that keeping the scions in water started the cells into activity and rendered them less likely to grow; but perhaps that referred particularly to scions for grafting rather than budding.

The Chairman: I would like to ask Mr. Wiggins that question, he is a specialist.

Mr. Wiggins: One of the dangers in keeping bud wood is that of keeping it in too much moisture. It does not require much to keep the bud plump.

The Secretary: I understand the reason for soaking is simply to allow the bud to be taken off.

THE CHAIRMAN: Yes.

MR. JONES: In our experience the soaking of wood does not injure it for budding, but it does for grafting. You can soak the wood for budding all you want to, we have soaked it until the top bud came out.

THE SECRETARY: I am interested in knowing about this special wax cloth. Can it be used also in grafting?

THE CHAIRMAN: The other is much cheaper for that purpose. To just cover the thing up and exclude the air is all that is necessary in grafting. Liquid wax—four of rosin, four of tallow and two of beeswax—gives excellent results, but for budding purposes it is absolutely essential to have good clean wax, and for our purposes we have never found anything but pure beeswax would answer.

THE SECRETARY: There is a substance called "white wax" which pharmacists use in making toilet preparations—purified beeswax. It is pure white. Is that any advantage?

THE CHAIRMAN: I would not use it. It contains some paraffine.

THE SECRETARY: It should consist of purified and bleached beeswax only. It is more expensive than the ordinary beeswax.

[Read by title.]

UNUSUAL METHODS OF PROPAGATING NUT TREES

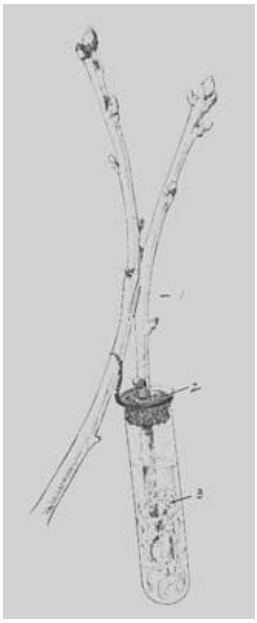
DR. ROBERT T. MORRIS, NEW YORK CITY

With the exception of the chestnut and the almond, much difficulty has been experienced in propagating most of the nut trees of temperate latitudes by budding or by grafting. This appears to be largely due to the slow formation of callus which is to make new cell connection between [Pg 44] the cambium layers of host and of guest. In southern regions of the United States the union occurs much more readily than in the north. My experiments have been made chiefly with reference to developing methods of propagating nut trees in the north. All of the usual methods common among nurserymen have been practically failures, but certain unusual methods seem to promise success.

One unusual method which was suggested at last year's meeting by our member Mr. J. F. Jones, has given a good proportion of catches. This consists in using wood which is more than one year old for scions. Some of the scions of shagbark hickory from wood four, five, and even six years of age have caught. The chief difficulty has consisted in starting the buds of this old wood (latent buds) before vigorous sprouts from the stock diverted all the sap. It has been necessary to give much attention to the removal of these vigorous stock sprouts. I seem to have made the observation that if a small side branch from old wood carries a large terminal bud, this bud will start promptly when old wood constitutes the rest of the scion.

A method which I employed for the first time this year, which appears to have resulted in securing union between stock and scion, has been employed between different species of hickory trees. It belongs among the inarching methods in classification. It seemed probable that if a scion were to be supplied with sufficient water to prevent drying out, in advance of granulation-cell connection, we might meet with success.

The first line of experimentation with this idea in mind was conducted last year. The scion when grafted upon the stock was deprived of its top bud, and a small test tube filled with water and fitted with a rubber cap was adjusted over the site previously occupied by the top bud. This in practical working really did keep the cells of the scion alive and in good condition for a long time, but there was always a tendency for the water to become impure because of the growth of various algae and other microbes. Evidently the water when used in this way helped to furnish a balance between the negative and the positive sap pressures which occur under changing conditions of barometer and temperature, and which are influential in the matter of cellular repair. The introduction of germicides into the water of the test tube prevented the development of adventitious organic life, but at the same time seemed to interfere with normal cell activity at the junction of stock and scion. [Pg 45]



Dr. Morris's march method of grafting with balanced aquarium. 1. Point of union to be covered with grafting wax after binding with raffia. 2. Loose plug of moss to lessen evaporation. 3. A living water plant.

The "aquarium" is made out of an ordinary large test tube. Any small bottle would do as well.

This method served a purpose in advancing our knowledge of the subject, but not enough grafts [Pg 46] caught to encourage me greatly. Following out the same line of thought, I began this year by making union between stock and scion according to inarch principles. The scion instead of remaining attached to its parent plant, according to former inarching method, had been transferred to the stock, leaving two or three inches of scion free below the point of grafting, as illustrated in the drawing. The proximal part of the scion was then inserted into a test tube containing water. In this case, as with placing the test tube at the top of the scion, difficulty was found in preventing the growth of microörganisms in the water. The addition of benzoate of soda, borax, boracic acid, and sulphate of copper, while preventing the development of microörganisms, seemed also to be objectionable to the physiologic processes of the plant. It occurred to me that the principle of the balanced aquarium might be applied, and acting upon this idea specimens of a pond weed (Utricularia) were introduced into the test tubes. This seemed to settle the water question completely, but it was well along in the summer before I made grafts and applied this principle. From one to four leaves, or parts of leaves, were left upon grafts which were applied to stocks according to this new inarching method. All of these leaves remained green until autumn, and fell with other autumn leaves of the stock. Two specimens which I have cut away for examination seemed to show a very good union between stock and scion.

I am presenting a description of the new inarching method promptly, before obtaining more extensive statistics, in order that members of this society may apply it experimentally next spring. Should it succeed according to present promise, it will allow nurserymen at least two months of grafting season, and they will not have to rush their work. In addition it will perhaps open up a method of grafting which may be employed freely with nut trees in the northern states.

Another unusual method for propagating nut trees consists in facilitating the development of adventitious buds from the roots of some particularly desirable tree. I do not know at the present time how many species of nut trees will develop adventitious root buds, as my experiments have been confined to roots of the shagbark hickory, beech, and hazel. Segments of roots of these three species when placed in sand, allowing an inch or so to protrude, will develop adventitious buds if they are kept warm and moist. Various lengths of root segments have been employed, ranging from two or three inches up to two or three feet. The beech and hazel will apparently [Pg 47] start adventitious buds from almost any sort of root segment; but in the shagbark hickory, adventitious buds started best upon root segments which were more than six inches in length and more than half an inch in diameter.

Hazels may be propagated in an unusual way from the cuttings of branches, very much like roses, if these cuttings are placed in sand and kept warm and moist, although they do not strike nearly so readily as rose cuttings. I have not given much attention to this experiment in its practical bearing, but have simply observed that hazel cuttings will strike roots if they are particularly well cared for.

Experiments with hickories and with walnuts from branch cuttings were a failure, but they remained alive so well and formed such good callus, that I believe someone with steam-heated hot-house beds at his disposal may by experimentation succeed in propagating some of these trees by cuttings, particularly from herbaceous growth of the year, in August. As an amateur plant physiologist I foresee what the more scientific plant physiologists may do for this subject.

One unusual method for propagating nut trees may perhaps be described more correctly as a method for propagating unusual nut trees, and it opens a vista of distant horizon in horticulture. The discovery was due to an accident, and I claim no credit beyond recognizing the significance of an odd phenomenon.

Three years ago some pistillate chinkapin flowers which had been covered with paper bags, were left unpollenized because I did not have pollen enough to go round. The bags were left in place because I was busy with other things. When these bags were removed at the end of about three weeks, it was found that the flowers had set a full complement of nuts without having received pollen. These nuts continued to develop and were fertile. Some of them presented a peculiarity in growth of the cotyledons and germ, both of which grew and protruded beyond the involuere before the nuts were ripe, indicating that the germ had not come to a state of rest during its usual period in the nut. This freak appeared in only eight of the nuts, a larger number having normally resting germs.

In all of these nuts it seemed to me we were probably dealing with parthenogenesis. In order to make sure that no pollen had been carried in by any sort of insect, I made check experiments last year, covering pistillate flowers so carefully that there could be no question about their having received no pollen. It was found that the chinkapin would develop nuts freely in this way, and that the bitternut hickory, shagbark hickory, and pignut (Hicoria glabra) would develop nuts sparingly in this way. [Pg 48]

I speak of the matter as parthenogenesis in advance of microscopic examination of the ovules,—which will be made next year; but parthenogenesis seems to be the most likely explanation. If this is the case, the embryo has not been formed by the conjugation of two gametes, as generally occurs in the algae and higher plants. It is possible that the embryo in the unpollenized chinkapins does not originate from the female gamete at all, but that it originates from a formative budding of other cells in the ovule. We can speak of parthenogenesis only when the embryo originates from a female gamete alone, *i. e.*, without fusing of protoplasmic mass of the female gamete with protoplasmic mass of the male gamete.

Some of the nuts which I am calling parthenogens have developed plants this year. The chief peculiarity to be observed is great disparity in size between plants of the same age from the same parent tree. Some of them grow very much more rapidly than the average plant of the species, and others less rapidly when subjected to similar conditions of soil, temperature and moisture.

We assume in biology that one of nature's objects in having two sexes is to prevent early senescence of the allotment of protoplasm for a species, and to avoid undue intensification of characteristics of one parent. This is apparently nature's device for maintaining a mean type. For man's purposes we may now make artificial selection of individual plants which represent intensification of desirable characteristics of one parent. The growing of trees from unfertilized ovules will apparently open an entirely new field in horticulture, and no one can prophesy the result of selection of trees which present intensification of desirable characteristics of a single parent through several successive generations.

THE POSSIBILITIES OF NUT CULTURE IN UTAH

Leon D. Batchelor, Utah

I suppose the majority of you have very little or no idea of agricultural conditions in Utah. Perhaps some think it is a desert. When I went to Utah, three or four years ago, the first thing that struck my mind forcibly in traveling around through the state was the absolute lack of any nuts. Being born and brought up in Massachusetts, I naturally noticed this, as one of the pleasures of my boyhood days consisted in gathering chestnuts, hickory nuts, hazelnuts and beechnuts. We found them all around the fence corners and pastures and in the woods, and I missed this in Utah, and it occurred to me immediately to look up the cause of the lack of nuts in the state and I found no good reason except that nature has not seen fit to plant nuts there. There is no reason in climatic or soil conditions which will make it impossible to grow many of the hardier nuts, and even, in the southern part of the state, to grow almonds and the tenderest walnuts. Climatic conditions are not unlike some of the best fruit sections in New York. Peaches and apples are grown successfully and as soon as you get down to the central and southern part of the state, many of the hardier European grapes are grown. In the extreme southern part you can grow any of the European grapes grown in California, so nothing in the way of climatic conditions exists which would prevent the development of nut growing in this state. The soil conditions vary widely, all the way from the sandy loams to the deep soils and gravels, and it is possible to find thousands of acres of deep, rich loam soil. Some of it is five to twenty-five feet deep. Of course the rainfall in that semi-arid region is insufficient for nuts but that can be supplemented by irrigation water, so that is practically no disadvantage. Since I have been there I have tried to interest some of the fruit growers in the planting of a few different varieties of the hardier nuts, and I have distributed among them some of the walnuts and this year I am bringing in some of the old shagbark hickory nuts from Massachusetts, and I am going to distribute them among my friends and acquaintances there to be used to raise shade trees—trees around the home and pastures—and I find there is considerable interest manifested in the last few years in nut planting. The nut industry has a little mite of a start there in a way—that is, there are a few [Pg 49]

seedling trees distributed from Logan on the north to Arizona on the south. Seedling Persian walnuts fruit from Brigham City on through Salt Lake and Provo, and practically all of the nuts that are produced there in the state are of seedling origin. It is reasonable to expect that some of the best grafted varieties will be very much better. It seems to me that the state has every natural condition for success in the production of nuts. If not in a commercial way we can do a great deal to our advantage in planting nut trees as shade trees. I simply want to let you know that there is a man out there in the mountain section who is interested in nuts and going to help the cause along. [Pg 50]

THE DISEASES OF NUT TREES

M. B. Waite, Washington, D. C.

In taking up the question of nut diseases it is hardly proper, perhaps, to take too narrow a view of it and I will, therefore, mention some of the other work being done here in Washington that is of interest to the Northern Nut Growers Association.

You all know of the pomological work being done on nuts, and I hardly need mention the work now being carried on by Mr. C. A. Reed, a member of this association. It might be well to remind you that the work was started by Mr. Van Deman some twenty-five years ago, and continued by Mr. Corsa, and a report was issued some fifteen years ago. It was taken up later by Mr. William A. Taylor.

The plant introduction work of Mr. D. G. Fairchild should be mentioned. He is scouring the world for new nuts of all kinds for the northern and southern, eastern and western United States, and introducing them into this country. The diseases of those nuts are studied by Mr. Orton in the Cotton Truck Division of our department.

Outside of the Bureau of Plant Industry also there is some work being done on nut trees. The insects attacking cultivated nuts are studied by Professor A. L. Quaintance, of the Bureau of Entomology, along with the deciduous fruit insects. The insects attacking forest nut trees are studied by Dr. Hopkins of the same Bureau in the laboratory that studies the forest insects. Of course the nut trees, as forest trees, are studied in the Forest Service about which you all know.

One thing more that I would like to say, in way of explanation or apology, is in regard to criticism of the Department for not more thoroughly attacking the filbert blight. Only forty-five thousand dollars are appropriated by Congress for the investigation of the entire fruit disease problem of the United States. That includes the great citrus industry; everything, in fact, from cranberries on Cape Cod and the mouth of the Columbia River to grape fruit in Florida or apples in New York. It includes the subject of all the nut diseases, and that means the problem of the diseases of the pecan, of walnut bacteriosis—that is a big problem—in southern California, and more or less in other parts of California, our great apple industry, the peach yellows, the pear blight, etc. When it comes to parceling that out it only leaves about three thousand dollars for nut diseases, and thirty-five hundred dollars for studying diseases of citrus fruits, so you must not be surprised that [Pg 51] we cannot put a group of men on this problem and study it as it should be studied. It is a question of men and means.

Perhaps now some general information might be of interest and set you to thinking.

In the first place in every disease problem, conspicuously so with our fruit and nut diseases, there are two main classes of plants to be considered, our native plants and the foreign plants. The pathologist is always looking to the native origin of a plant in studying its adaptation to the environment in which it is attempted to be grown. A foreign plant may not necessarily be unadapted to another locality. The vinifera grape is thoroughly adapted to California and to much of the Pacific slope beyond the Rocky Mountains, but you know the vinifera grape has a hard struggle in other parts of the United States. This is not only a pathological problem but a physiological one. It cannot stand a soaking rain for two weeks at a time; it cannot stand so much water and humidity but it wants dry, hot sunshine continuously from the time it puts out its leaves in the spring.

Another phase still more interesting is the question of foreign parasites. Many of the worst diseases with which we have to contend are either native diseases attacking introduced plants, or foreign diseases attacking native plants. I will take that up in detail. Nature has fought the battle all out with the native parasites against the native host plants, so we don't have to do it. It's a case of the survival of the fittest. They have won, so when we are dealing with native plants against our native diseases, we have a condition that has been fought out in nature for nobody knows how many thousand years. The result is that unless we disturb the balance too much by cultivating great orchards of a thing that has been grown as scattered individuals, or overforcing it or selecting and breeding towards larger fruit without any regard to foliage and other characters we can go ahead with our breeding and selection and cultivation and trust nature to keep the balance to some extent. We have this natural balance in our favor in dealing with the problem of cultivating native plants. As an example take the pear and apple blight. The pear blight problem is one in which a native parasite on wild crab apples, which occasionally kills a few twigs here and there, attacks the juicy, tender, susceptible, introduced European pear and

makes a very serious disease. It is a fight indeed to grow it in so much of the country that pear culture has been very largely suppressed over the eastern half of the United States and part of [Pg 52] the Pacific coast. All this trouble has been caused by one little native microbe. Apple culture also, with certain varieties, has been seriously interfered with in some sections.

The apple cedar rust is probably the most striking example of a native parasite attacking a foreign host that we know of, and particularly so as the remarkable evolution in which the parasite has adjusted itself to the new host is taking place right now every year. The apple cedar rust is becoming a more difficult problem clear across the eastern United States to Nebraska. It has occurred as a serious disease since 1905 to 1907. As a botanical curiosity we have known it a long time, but as a serious disease, it is very recent, and nobody knows yet how serious it is going to be.

We have a very striking example of this introduction of a foreign plant and the plant being attacked by a native parasite, in the case of the filbert blight, and I am going to take that up later. The trouble is that we have brought into the United States a European filbert and it has been attacked by a parasite of our wild hazelnuts. The disease is very rare and is seldom seen on the wild hazelnut,—so rare that it was hardly known by scientific botanists, and yet it interferes with filbert culture in the eastern United States and is the one thing more than anything else to make filbert culture unprofitable. We have practically the same proposition in the walnut bacteriosis, not only in the northeastern United States, but in the best walnut districts of California. This bacterial disease which is undoubtedly a disease of our native walnuts—probably the native black walnut—occurs rather rarely, and so feebly developed as to be difficult to find at all on its native host yet it becomes the great serious disease of the Old World cultivated walnut.

Now, there again, it is not so much a lack of physiological adaptability, because the walnut is thoroughly adapted to our Pacific coast. I suppose most of you know that east of the Rocky Mountains, east of the Great Plains, we have a humid climate and winters more or less cold which corresponds, not with western Europe, not with Germany, England, Spain, France and Italy, but with China and Japan, with Asia, in its climatic conditions. The result is the Chinese and Japanese trees brought to the eastern United States grow well but may grow indifferently in California. On the other hand, the plants of the Mediterranean, France, Germany, Italy and Spain do not, as a rule, thrive when introduced into the eastern United States. There are a few exceptions, like the apple and perhaps the peach. These are not really natives of western Europe, but have been brought from the interior. They are more like the Japanese and Chinese plants [Pg 53] which came in by way of Persia and which have been slowly adjusted to the conditions of western Europe. That adjustment has gone so far that the Persian type of peach does better on the Pacific coast than in the East. We are breeding a race of these fruits from China, the Chinese cling group, which does well in the eastern part of the United States, and we have from there a peach that is better for the country east of the Rocky Mountains than the ones that have been modified in Europe.

Now take the other side of this question, the foreign parasite—that is very unfortunate thing—over which we do not always have the control that we do with the foreign host. An equal disturbance of nature takes place when we introduce a foreign parasite, whether it is from a similar climatic region or one not so similar. The chestnut blight is a tremendous example of that sort of thing. This has come into prominence within a decade and it is one of the greatest problems in the pathology of the chestnut. That has turned out to be a Chinese parasite. It was found last summer by the agricultural explorer, Mr. Myers, but the fungus was studied out by Dr. Shear.

The three great American parasites of our native grapes are the black rot, the downy mildew and the Phylloxera, an insect pest, and they caused a great amount of study and work and investigation and great expense when they were introduced into France and South Germany and Italian vineyards, and were fought out only by what might be considered a magnificent effort on the part of the European governments, especially France. On our native wild grapes those diseases are almost trivial, and the wild seedlings in the woods are practically immune, but when we cultivate them and select the tenderer varieties, the black rot is pretty bad, especially on the Concord, and particularly when that is hybridized with grapes of European blood. Nevertheless, we have cultivated them in order to get the large juicy fruits. There are many more examples of this sort.

Now about the cultivated nuts. I wish I could tell you how much I think of the native nuts. I grew up in Northern Illinois and could go out on a day like this and gather two or three bushels of hickory nuts. How I enjoyed the black walnut, especially when it was just shriveled so it would leave the shell—it got rather too rich when it was dried and stale in the winter time—but how delicious it was when just wilted! Also there was the butternut and the wild hazelnut. I used to take a one-horse wagon into the woods on a Saturday and gather enough hazelnuts in the shucks to fill it; then we had hazelnuts all winter. So I am in full sympathy with the Northern Nut [Pg 54] Growers Association and I would like to see those nuts grown, if not wild in the woods, at least in cultivation.

There might be a few things of interest to you about the wild hickory nut. According to Farlow's Index of North American fungi of twenty-five years ago, there have been thirty-seven species of fungi collected on that tree. Probably there are twice that number as a matter of fact, but mycologists have collected, described and named thirty-seven species on the *Hickoria ovata*, the plain shagbark, and the other hickories have similar numbers. The pecan has only three named

species in Farlow's Index, but Mr. Rand has got together three times as many I think—I am not sure of the number.

Of the pecan diseases, the pecan scab is probably the most conspicuous fungus trouble. The pecan scab is the most typical fungus parasite of the pecan. It attacks the leaves, fruit, etc. It attacks the vessels or veins of the leaves and frequently enters by means of aphis punctures which break the skin so that there is no doubt but that this particular disease is favored by an aphis. We have investigated this disease quite carefully and carried on a series of spraying experiments for some three years and there is no doubt about our ability to control it. It can be prevented by spraying with Bordeaux mixture. You never can tell how many sprayings will be required. It may take three to ten sprayings to protect the nuts. The leaves are grown mostly within a month—the leaves are pushed out within thirty days and you can spray those leaves and protect them. The weak point in the treatment is that the nut of the pecan grows steadily from the time it starts to way into September. This makes a hard problem in spraying as the nut keeps expanding and forming a new and unprotected surface for an unreasonably long season and they are susceptible to scab attacks all the time, so you have the problem of spraying the nuts all summer. The spray does not stick very well on the nuts. The result is that we advise dodging that parasite by planting the non-susceptible kinds; it is much better and cheaper. It is certainly an encouraging thing that you can plant good varieties, that do not scab badly, and which at the very most require but two or three sprayings to protect them entirely, and in a great majority of cases, no spraying at all. Those already are the great nuts in cultivation, like the Stuart, the Schley and the Frotscher. Most of those good varieties will be occasionally attacked by scab because of a wet season, just as a variety of apple which is very resistant to apple scab is occasionally attacked by that disease.

The pecan has quite a number of leaf-spot fungi and most of those we have tested by spraying. These experiments have been made in the nursery where it is more convenient to spray and [Pg 55] where the necessity is, perhaps, a little more pronounced, and there it is, undoubtedly, a proper practice to spray and fight out the pecan leaf diseases. Bordeaux mixture is the thing to be used on all occasions. The pecan resists copper poisoning almost as well as the grape and can be sprayed with safety.

If a pecan tree has crown gall don't plant it. All nursery trees should be rejected in planting if they show signs of this disease. The pecan has fungus root-rot and various wood rot fungi besides the leaf diseases. It also has several other troubles more or less serious. Occasionally in the pecan groves you will find these remarkably white mildewed nuts. That gives way to spraying. Another disease is an internal spot on the kernel which Mr. Rand has been working on and which seems to be due to a fungus. We don't know how to prevent that yet. The pecan has a fungus attacking it that is very similar to the bitter rot of the apple. The pecan anthracnose looks like the bitter rot, has the same pink spore masses and you will be able to recognize it. That may be prevented by spraying, but it is, fortunately, not a serious disease. The northern nut grower will not have so much trouble with that, as it is a southern disease. Here is a physiological trouble that causes blackening of the young nuts on the inside. It appears to me to be due mainly to wet weather, but I don't know its exact nature. It came primarily on a pecan raised in the semi-arid section of Texas and brought into South Carolina, and by the way you can get as much trouble in adapting trees from the western to the eastern United States as in bringing in trees from other countries. In parts of semi-arid Texas the trees are supplied with moisture by sub-irrigation and when we move those pecans to the humid East we get almost as much non-adjustment as when we bring in foreign things. I would suggest that these pecans from western Texas are the very ones to take to Utah and California rather than those from the eastern part of the United States. They are adjusted to dry seasons with moisture at their roots and you will get the best results from them when grown under irrigation.

I will now take up the walnut, *Juglans nigra*, the common black walnut. There are twenty species of fungi which are known to attack it. Quite a good many of these attack the twigs and cause them to die, and probably half are leaf diseases. One, commonly called white rust, a disease of the leaves, attracts mycologists in collecting, but it has never been of serious economic importance.

Now, as to the butternut, *Juglans cinerea*. It has about nineteen species of fungi known to attack [Pg 56] it, but probably many more will be found when the nut is thoroughly studied.

Juglans regia, the cultivated Persian walnut, has only about twelve species of fungi recorded from it in this country. There are, undoubtedly, more to be found. Of these fungi the walnut bacteriosis, caused by a bacterial germ is more important than all the rest of the parasites put together we can easily say. The California walnut bacteriosis has turned up at various points in the East. The twig blight form of this disease is also prevalent in various states. The walnut blight or bacteriosis is therefore to be figured with in planting the Persian walnut in the East.

Professor Smith: Is it worse or better here than in California?

Professor Waite: There have not been enough walnuts grown here in groves to allow the disease to accumulate—to have a fair test for that, Professor Smith. I don't believe we know; but it is, undoubtedly, a parasite of our native black walnuts. It occurs in Texas and Louisiana, and I think we have it in or near Buffalo, N. Y., and in New Jersey, so if I were planting extensively I should

expect that disease to be serious. That would be my forecast of the matter. The humidity and the cloudy weather in the East ought to be more favorable to the disease than the climate of California.

MR. JONES: For that reason I should think the disease would work fast in the Gulf Coast.

PROFESSOR WAITE: Yes, those specimens of yours seem to show a very serious condition.

We must not pass over the chestnut without noting that there are thirty species of fungi attacking it, and that does not include the new one, the bad one, the chestnut bark disease.

The filbert blight belongs with the diseases of the European grape and sweet cherry. The filbert is an example of a European plant introduced into the eastern United States attacked by a native parasite which almost drives it out of cultivation. In fact, there are so few filberts in cultivation even now that if we were trying to plan a spraying experiment on them we would not know where to find a plantation suitable for carrying on the experiment. If any of you know of any such plantations I would like you to let me know about them.

THE CHAIRMAN: We will have some in two or three years.

PROFESSOR WAITE: Here is a sample of the filbert fungus taken from our pathological collection. It shows the mature fruiting bodies of the fungus and it also shows that the twigs are killed. This [Pg 57] fungus is known as *Cryptosporella anomala*. It was described as *Diatrype anomala* by Peck of Albany, N. Y., but was afterwards found to belong to another genus. There have been two or three articles published on it, the best one probably by Humphrey in Massachusetts. I have an abstract of that which can be copied in the proceedings, if you wish.

(See Appendix.)

The fact that this *Cryptosporella* is related to the black knot of the plum is an interesting feature; and that it attacks the growing canes during the growing season and fruit during the fall and winter. He suggests the treatment of removing all the infected branches during the fall and winter. I would add to that, complete eradication of all diseased branches of the host, and they are rather easily seen, in the fall as soon as the leaves are off—then a thorough spraying with strong Bordeaux mixture, at least 5-5-50, preferably stronger than that, of course burning all the material that you cut out. One is at a disadvantage if there are wild hazelnuts in the neighborhood. How to handle that problem I am hardly prepared to state; perhaps, by eradication of the wild hazelnut in the vicinity.

THE SECRETARY: I think that would be impossible in most regions.

PROFESSOR WAITE: Mr. Kerr had his growing on the eastern shore on an island where there are no wild hazelnuts and they were not attacked by the fungus.

A MEMBER: They are all dead now.

PROFESSOR WAITE: The number of sprayings during a season is an undetermined question. It will be necessary, probably, to spray two or three times. You can certainly protect the two-year wood in that way by making a fall spraying and a spring spraying. This will keep them thoroughly covered with Bordeaux mixture but whether or not three or four sprayings are necessary remains to be tested.

THE CHAIRMAN: Are any varieties of European hazels immune?

PROFESSOR WAITE: I have not studied them enough to answer that question. I don't know. They all seem to go down. Perhaps Dr. Deming can answer.

THE SECRETARY: I don't know.

PROFESSOR WAITE: I think that is all I want to say, except one thing, and that is about the physiological aspect of these, diseases. I touched upon that phase in discussing the matter of environment in the introduction of foreigners to places where they are not adapted. In some particular seasons and circumstances even the native trees suffer. One type of injury which has [Pg 58] caused great trouble with the English walnuts and pecans, and also with apple trees and has also caused trouble with our native red oaks, is freezing when the trees are in a non-resistant condition. There is an example of this within three minutes' walk of this building. Here are the climatic and temperature conditions that bring about disaster, particularly if preceded by a dry season. Let us start with a dry season. The season of 1911 was conspicuously dry in this locality and the adjacent states of Virginia, West Virginia and Maryland, but about the first of September the rains came. Up to that time even the native forest trees such as oaks and chestnuts showed the stress of lack of moisture very seriously and were somewhat yellow and pale looking, mainly from water and nitrogen starvation. When the rains came the wilted trees all greened up, every tree in the parks brightened up, and we had fine growing conditions until October and no cold weather up to New Year's. It was warm that fall and even on New Year's day the warmth was noticeable. On the 12th of January we had the record cold temperature for this locality in the history of the weather bureau, except one year. We had fifteen or seventeen below zero and it was as low as thirty-eight in low spots in the Potomac Valley in West Virginia. Those trees had never been fully shocked into winter conditions. The cambium growth and sap flow had not been stopped and the physiological changes needed to get the trees ready for cold weather had never occurred. They were not ready, not only as to the bark, but in the trunk and wood. The result was

that the trees were seriously injured, the less matured twigs died back, and the trees were frozen on the trunks down to the ground line. In the freeze of 1904 in New York I was surprised to find that the peach trees were not all killed. They were frozen through and through and yet the trees did not die. The question of winter injury hinges not alone on low temperature, but it also depends on the condition which the tree has reached when the cold strikes it. Now, to tell you still further about what that cold wave did, I will ask you to look at that row of red oaks near the Smithsonian which I just alluded to and see the big ribs of dead bark where the cambium layer has been shocked, and checked in other places. You will find these trees ribbed and ridged to about half way down the row. Those trees are subject to special disadvantages; they lack subsoil drainage and they have an excess of manure draining down through the paving stones. They have an excess of nitrogen and lack of drainage. The subsoil is a heavy clay. That brings up another thing that I want you to notice in regard to winter injury. Plant not only hardy varieties, but [Pg 59] select localities with good subsoil drainage. The walnuts and hickories, belonging to the two great families of juglans, and the oaks and chestnuts, want good subsoil drainage. Where the underlying rocks are vertical the conditions are ideal. They do not like a heavy clay subsoil, but do best where water and excess nitrogen can get away.

The general summary I want to make is this: Nut trees have a large number of fungus parasites. In a few cases the native fungus parasites attack European or Old World species and varieties to such an extent as to make very serious problems, so much so that they can not be regarded as solved, the walnut bacteriorosis and filbert blight being examples of these. On the other hand, most of the native fungus parasites of our native trees are not to be feared as enemies of these trees, not only in the northeastern United States where this body is endeavoring to further a good cause, but over the whole eastern United States. These parasites in some cases may be serious enough to justify spraying and other lines of treatment, especially in the nursery. On the other hand, considering the nature of nut trees and considering the results of work on the pecan scab, the object of the nut grower should be to breed and select as far as possible resistant sorts, to work on and select native species and hybrids particularly where the native trees will give the necessary hardiness, immunity and resistance. The outlook, therefore, is promising for the cultivated varieties of hickory nuts and walnuts that I know you are all working for. Foreign parasites are always dangerous. This chestnut blight fungus comes into any such scheme as that like a bombshell. When it comes to an introduced parasite like that we can not tell what will happen. I thank you for your attention.

The Chairman: I think everybody here will agree with me, when you come to look over this list of amounts appropriated for work in nut culture investigation, that there will be no further criticism of the Department of Agriculture from any member of the association for not doing more in the interests of the nut grower.

The Secretary: We are all indebted to Professor Waite for his clear way of stating facts, for resisting the temptation to give a technical talk and for enunciating principles of wide applicability.

This question of the blight on the hazel is a most important one for the northern nut growers. Mr. Reed was telling me yesterday about a man from California who went out near some city there and bought 10 acres of land at six hundred dollars an acre, planted almonds and in a few years [Pg 60] had the place paid for and was making a good income, two or three thousand dollars a year from his ten acres of almonds. We can do almost that in the East, I believe, if we can cultivate the European hazel. If it were not for this blight, we could have splendid crops of the hazel. If the government would grant larger appropriations for nut culture investigations it might enable us to find a way to control this disease. Dr. Morris is breeding hazels, however, and hopes to get one which will be immune.

Professor Smith: It is a great pleasure to listen to a man who knows what he is talking about. I figured out some years ago that I was going to be a teacher and I decided that I would like to have a chestnut farm also. I got along very nicely, planted my trees and then the chestnut blight came along, and I regard the business, at least as to profits, as in abeyance. We are in a period of particular danger from the importation of foreign plants; we are bringing in perfectly innocent-looking things from other countries which are causing us great damage. I want to suggest to any one here who wants to plant an orchard, to plant two kinds of trees. If my nut orchard had been planted with something besides chestnuts, I would now have that something else. I would suggest the possibility of having two things on the same ground—say chestnuts and English walnuts—so if the planter finds he cannot raise one he can still have the other. Then he will not be in the same place I am with my chestnuts.

The Chairman: I understand we have Mr. Fullerton of Long Island here, and we would be pleased to have him give us some of his experiences.

DR. WILLIAM CHAMPION DEMING
Secretary-Treasurer of the Northern Nut Growers Association

Mr. Fullerton: I just came in to see what you folks are doing and I don't think I can pose as a nut expert. I live on an island that has a great many varieties of nuts on it that have become native. We have quite a plantation of hazelnuts; nobody knows who planted them. They are used by nurserymen to fill orders. Also quite a plantation of magnolias which came from the South a couple of hundred years ago. They are thoroughly acclimated. We have also some of the very largest—and I am going to catch it here because I have never used a tape line—we have some of the very largest and oldest of the Persian walnuts in the United States, which produce annually a big crop of the so-called "English" walnuts. The trees produce the largest walnut I have ever seen, with the thinnest shell. They have been there about one hundred and fifty, two hundred and fifty or three hundred years. They are very large, larger than the black walnuts. Whether they [Pg 61] were planted or not I don't know. Their history is probably this: Long Island was a sea-faring community a few hundred years ago. These sailors who went out from the island, some of them, loved nuts and they would bring back from other countries nuts or other plants, and now we have a most remarkable mess of trees. We have planted the Japanese walnut, I don't pretend to know which variety, and it began yielding the third year and has yielded every year since, bearing nuts in bunches like grapes.

The Chairman: Is it a heart-shaped nut?

Mr. Fullerton: Yes. We have some pecans and some almonds. Against the advice of everybody we planted some almond trees; they started to bear in their third year. The trees are one solid mass of glorious big red blossoms every spring. They bear very heavily and have for three distinct seasons. Hard winter or easy winter, nothing has affected their bloom and they have never had a particle of San José scale until this year. The almond grows all over the island. Also the pecan. I planted five varieties of pecans and they are still living and growing very slowly. They have been moved three or four times. Last year we planted seven varieties including the Van Deman and the Stuart and one Indiana variety. One of these trees died and the others were killed back, but they have sent up big shoots.

Two years ago an old fellow came up from the middle of the island to see if our pecan trees were the same kind as his. His story was very remarkable. He didn't know anything about trees. He went into town one day and got interested in pecans and bought all the different kinds he could find, all the different shapes. He didn't care what they were—didn't care whether they came from Canada or Mexico—he was the kind of a man who would plant bananas,—and he planted all those pecans and he told me that every one of them grew. He said they all produced nuts.

Mr. Pomeroy: The first Persian walnut nursery ever established in the United States was at Flushing, Long Island.

The Secretary: I should like to ask how old and how big are the pecan trees that are bearing?

Mr. Fullerton: I think he said seven or eight years.

The Chairman: The insect question is one of great interest. Professor Quaintance can give us a good insight into the insects that attack pecan and other nut trees. [Pg 62]

INSECTS INJURIOUS TO NUT TREES

I have not very much to say because we have not yet accumulated much information on the subject of nut insects. I am glad to appear before you, however, and to assure you that attention is being given to the insect enemies of nuts by the Department. We are not nearly so far advanced in the subject, however, as Professor Waite, since our specific study of nut insects began only, this last spring. At that time we established a laboratory in the South, especially to study pecan insects, as the demand for information concerning these pests has been very strong. The Bureau of Entomology, however, for a number of years, has published more or less on nut insects, as opportunity offered, and I think I should call your attention to a few of the papers treating of nut insects, and which I recommend that you obtain, if possible:

The Nut Feeding Habits of the Codling Moth, Bulletin 80, Part 5, Bureau of Entomology.

The Fall Webworm, Farmers' Bulletin 99, U. S. Department of Agriculture.

The White-Marked Tussock Moth, Farmers' Bulletin 99, U. S. Department of Agriculture.

The Bag Worm, Circular 97, Bureau of Entomology.

The Apple-Tree Tent Caterpillar, Circular 98, Bureau of Entomology.

Nut Weevils, Circular 99, Bureau of Entomology.

The Red Spider, Circular 104, Bureau of Entomology.

The Leopard Moth, Circular 109, Bureau of Entomology.

The Walnut Borer, Fifth Report, U. S. Entomological Commission, page 329.

The Oak Pruner, Circular 130, Bureau of Entomology.

Insects Injurious to Pecans, Bulletin 86, Mississippi Agricultural Experiment Station.

Insects of the Pecan, Bulletin 79, Florida Agricultural Experiment Station.

The Walnut Weevil or Curculio, Twelfth Report, State Entomologist of Connecticut, page 240.

The Walnut Bud-Moth, Twelfth Report, State Entomologist of Connecticut, page 253.

The above list will furnish information on most of the important nut insects thus far known. Inasmuch, however, as the walnut, pecan, etc., are native trees, it is probable that when these [Pg 63] nuts are cultivated they will be attacked by many of the insects which prey upon them in nature. This we have found to be true to a considerable extent in the case of the pecan. Many of the pests of hickory, for instance, are becoming important enemies of the pecan.

We have few requests for information as to the insect enemies of the hazelnut or filbert, practically none as to the almond. I surmise that there is comparatively little injury to the two former crops in the United States, and that in the case of the almond it is largely free from insect pests. The secretary has suggested that I make reference particularly to the insect enemies of the walnut. We have had complaints of severe injury to walnuts in California from the codling moth and walnut aphids. In this state and in the arid sections where walnuts are commercially grown, the codling moth, the well-known apple pest, has turned its attention to the walnut, and under some conditions does serious injury. If walnuts are growing adjacent to pears, the marketing of the crop, which occurs about the time the second brood of larvæ is at its height, deprives these insects of further food and they turn their attention to the walnut. The walnut plant lice in California have just been investigated by an agent of the Bureau of Entomology and we now have a paper in press on these insects. We think it probable that spraying will be a satisfactory remedy where the trees are not too large.

In the East injury is confined largely to certain caterpillars infesting the foliage, as the white-marked tussock moth, the fall webworm, a species of *Datana*, and occasionally reports of severe injury from red spider are received. Rather recently a good deal of interest has been aroused in the so-called walnut curculio by reason of its attacking the shoots and leaf petioles of the Japanese walnut. It attacks also other species of walnut, including the English walnut and the butternut. This pest has been well treated by Doctor Britton in his report as State Entomologist of Connecticut for 1912.

While pecans are perhaps not of particular interest to growers of nuts in the Northern States, yet brief reference will be made to some of the insect enemies of the pecan. There are two excellent publications on this subject, as indicated in the list of titles above. I should urge all interested in nut culture to obtain these papers, since some of the insects treated are quite general feeders and may be expected to occur on most all varieties of nuts.

The secretary also has asked that reference be made to the hickory bark beetle. This is essentially a forest insect and has been treated by Doctor Hopkins in Circular 144 of the Bureau [Pg 64] of Entomology.

Attention should be called to an insect rather recently introduced into the New England States, which will probably attack nut crops, namely, the so-called leopard moth, already indicated in the list of titles on nut insects. This pest will prove a difficult one to control, as it infests the trunk and larger limbs.

The whole question of the control of nut insects is complicated by the often enormous size of the trees, so that operations, effective in the control of insects, say affecting the apple, are not entirely practical. It is a point to be determined whether it will be profitable to spray large nut trees, such as the pecan. In some instances we believe that it will be, and the Bureau of Entomology now has in Florida one of the large power spraying outfits, formerly in use in the gipsy moth spraying, to determine the cost and benefits of such work.

In concluding these brief remarks I wish again to reiterate my pleasure in having the opportunity of appearing before you, and to assure you of the interest of the Department in the insect problems confronting nut growers. Nut culture is bound to increase enormously and insect injuries will probably correspondingly increase. I believe, however, that these injuries will be found controllable, as has been determined to be true in the case of practically all important native or introduced crops.

THE CHAIRMAN: We are glad that Professor Quaintance has told us about the different bulletins. The secretary will have a list of these. I am now going to call for Mr. Rhodes, who is an expert propagator of Persian walnuts, and he is going to give a demonstration on methods of propagating the walnut.

MR. RHODES: I am employed over at Arlington and I have been helping Professor Lake in his work there at the farm. Last year about the 15th of July we put in about seventy-five grafts using the cleft graft, and the side graft, and at the same time we put in some chip buds. Professor Lake has a little instrument which is known as a chip budder. We used an ordinary bandage, such as surgeons have, which we dipped in a mixture of about two parts wax, one part tallow and one part rosin. We put the bandage in when the solution was at a boil—that made it sticky enough to hold to the bud, and then we cut a hole large enough for the bud to come out. We found budding at that season, in August, more successful than grafting. The stocks were about two inches in diameter; we put in grafts anywhere from two to three feet above the ground, sometimes as many as three grafts. In a great many cases we lost all, and in some cases we lost two. I tried also bench or root grafting, and put in about fifty along about December, and when I took them out in the spring, the scion had covered up nicely, but we had a very dry spell, and through lack of attention, as much as anything else, we didn't get a graft to pull through. I am going to try the same thing this year. Along in July I took several cuttings and put in, and out of ten I got one to live. One proved successful in the soft wood and this coming year I hope to get some of the hard wood kinds to pull through. [Pg 65]

In grafting I always try to get the cuts as smooth as possible and to make them in one cut, because if you make a second cut you are bound to make some unevenness in it. These cambium layers have to fit right up flush with the edge of the bark. Then we usually wrap them in raffia. We used also what Professor Lake called a bark graft.

We got about 10 per cent of those to live. We had better success with the cleft graft and the side graft. In cutting the scion for this side graft I usually cut one side a little longer than I do the other which makes the scion lie closer to the stock. We leave the top on. You can put several on each of those stocks.

We were pretty successful with that sort of a graft. For my own personal use, I like this graft for walnuts, and I think we will eventually have better success with that than with any other type.

We put the majority of the grafts in I think about the latter part of June or July.

I have been afraid to cut the top off before the scion has started to grow. There is too great a flow of sap for the small scion to take up and as a consequence it drowns out the scion.

PROFESSOR SMITH: How far toward the center did you make the cut?

MR. RHODES: About two-thirds of the way through.

THE CHAIRMAN: You go past the middle?

MR. RHODES: Yes. The only thing you have to be careful of is not to cut too far, as then there is danger of breaking off.

MR. JONES: Do you have any particular length for the cut on the scion?

MR. RHODES: No. A great deal depends on the cut you make into the stock. I don't like to cut the scion any further up than the depth we go into the stock wood.

MR. JONES: Any other rule? [Pg 66]

MR. RHODES: No, it all depends on the size of the stock. If you get a large stock you can cut it larger.

THE CHAIRMAN: We thank you for these explanations. Mr. Rush is an experienced propagator of walnuts and pecans and I want to give him some time to show his methods. I will ask Mr. Rush to give his demonstration.

MR. RUSH: I am very glad to show you some of my methods. The only difference between mine and

Mr. Hutt's is that he is right-handed and I am left-handed.

The propagation of the Persian walnut may be divided into three divisions, the preparative, the operative and the nursery, and one is as important as the other. Good wood, good weather conditions, good technique and after this you must nurse them.

(Mr. Rush gives demonstration of budding.)

THE CHAIRMAN: This is the method I outlined yesterday, but I think Mr. Rush has it better in his hands than I have in my head.

MR. RUSH: It is practically the same. I have a good knife with two parallel blades that can be taken off, and put on the grindstone, and got as sharp as a razor. For some things I use a surgeon's knife.

THE CHAIRMAN: We have with us another very expert propagator from a little farther south. I am going to ask Mr. Wiggins to give us the benefit of his observations along this line.

MR. WIGGINS: I have not had experience in propagating walnuts, except in an experimental way. I have had some experience in the propagation of pecans. Much depends on the condition of the stocks. If they are in a good healthy, vigorous, growing condition, you will do better.

(Gives demonstration on grafting.)

The best time in South Carolina is in August and early September. I use but one method of budding and grafting. It is the only one I am successful with. What you call chip budding, I call bud grafting. I get 95 per cent of chip buds to take in the spring. I get the wood when it is dormant. I can find dormant wood even in May and June. I usually get it earlier than this, but this year it was in May. Part of these trees were in the shade in the orchard and I got the wood from them. Ninety-nine out of one hundred were dormant, and about that many lived. The wood was thoroughly dormant and plump. I cut it right out of the orchard in May or June and got them to live. Of course if you cut scions from the ends of branches, you haven't a chance at all. [Pg 67]

One thing to remember in the chip graft is not to cut your chip too thin. If you do you will lose a good many. I go right into it. If you do it right it will hurt your finger so you can only work for two or three hours at a time. It won't dry out so quickly if you cut it thick and will stand a better chance to live. I try to get the scion to fit the first time.

THE SECRETARY: What do you tie it with after you put on the waxed cloth?

MR. WIGGINS: I use a strip of common cloth out of the store. Your fingers will be waxed enough in working so that the strip does not need to be waxed. You tie it after wrapping it.

A MEMBER: Would you protect that with a paper bag?

MR. WIGGINS: No.

A MEMBER: Do you place it on the north or south?

MR. WIGGINS: The point that decides the exact place on the stock is the smoothness and greenness and health of it. I pick out the cleanest and best places. The whole top of the tree is above the graft.

A MEMBER: When do you cut off the tree?

MR. WIGGINS: According to the weather. It takes two or three or four weeks for proper healing. I open up a few and if they are all right, I open all of them. Just as soon as it heals, I cut the top off.

PROFESSOR SMITH: What is your ordinary practice in cutting scions?

MR. WIGGINS: Last year I was sick and got behind with my work so I cut them each day as I needed them. I usually cut them earlier and bury them in a shady place to keep the wood dormant. I can get 100 per cent by chip grafting and in no other way. I don't use the cleft graft at all. The better fit you get in this method of propagating the higher the percentage will run. If you make a fit that is not quite a fit, you will be astonished to lose about 95 per cent. If you are just a little more careful, you might get 100 per cent to grow. I can tell by the way it feels when it is right. I use a crude method but succeed with it. I do four hundred in a half day. What is the use of going to another method when I get good results with this?

PROFESSOR SMITH: You say a half-inch scion on a four-inch stock?

MR. WIGGINS: Yes, on a four-inch stock you get a cut an inch or one and a half inch wide. You have a large space that is not covered at all. [Pg 68]

PROFESSOR SMITH: They live?

MR. WIGGINS: Yes, of course.

PROFESSOR SMITH: Only touch in spots?

MR. WIGGINS: On top and bottom and on one side. I get cambium together at top—I am careful about that—and then I get on the left side an exact fit but not on the other sides.

THE CHAIRMAN: Have you had much experience with walnuts?

Mr. Wiggins: No. I should think the best results with walnut as well as with pecans would be by cutting the scion wood the year before.

The Chairman: This is certainly a very interesting discussion, but I have another grafter here yet. A demonstration by Mr. Jones will close this morning's session.

(Mr. Jones gave a demonstration of cleft grafting stating that he used that method practically altogether.) [Pg 69]

APPENDIX

REPORT OF THE SECRETARY-TREASURER

Receipts:		
Dues	$200.00	
Gift	200.00	
Sale of report	10.00	
Advertisement	15.00	
Miscellaneous	7.15	
	———	
		$432.15
Expenses:		
Deficit	$17.54	
Reporting convention	47.13	
Printing	355.74	
Postage	66.34	
Typewriting	19.14	
Advertising	6.79	
Expense of secretary to Albany	10.05	
Expense of secretary to New York	2.75	
Miscellaneous	11.72	
	———	
		$537.20
Deficit	$105.05	

Through the generosity of one of our members the secretary was enabled to issue the annual report, to have other printing done, and to represent the Association at Albany at the conference on the hickory bark borer called by the Commissioner of Agriculture of the State of New York.

It is not likely that this gift will be repeated and it will be a great misfortune if the means for publishing the annual report are not found, as well as for taking up the present deficit of over a hundred dollars.

Of course our membership is increasing rapidly and, in the years to come, we should have members enough to pay our annual expenses, including the publishing of the report. The secretary would like also to have enough to issue reprints or bulletins from time to time.

The secretary asks for instructions in the face of this difficulty and would suggest the appointment of a finance committee, not to include the secretary, and to be composed of persons who will work.

There might be a similar hard-working committee on programme. The secretary is willing to be the clearing house for the Association, but would like to have something to clear besides the cloudy results of his own labors.

The secretary has a list of over six hundred names of persons interested in nut culture, which he thinks should be circularized from time to time with reprints, or bulletins, setting forth the importance of, and the advances in, the art of nut culture.

The secretary would be pleased if each member would send in a new member during the year, would send an advertisement of his own, or some other person's, [Pg 70] business for the annual report, and would pay his own dues promptly on the first intimation from the secretary. Members whose dues for the year are not paid will not receive the annual report and, after a decent interval, their names will automatically drop from the roll of membership and not appear in the next annual report.

Except from a financial standpoint the Association may fairly consider that it has had a prosperous year. Our present membership is 134, an increase of 48 over the number reported at the last meeting. (At date of going to press the membership is

143.)

Three members have resigned and we have lost two by death, Mr. George W. Gachwind of Brooklyn, N. Y., and Mr. W. D. Ellwanger of Rochester, N. Y. (News came during the meeting of the death of Henry Hales of Ridgewood, N. J., the first honorary member of the Association. An account of Mr. Hale's work with nuts appears elsewhere in this report.)

Thirty-one members have failed to pay their dues and have not been sent copies of the report. The secretary asks permission to drop the names of these members from the rolls and that a rule be formulated to guide his action in the future.

That interest in nut growing is increasing is shown by the issuance this year of three catalogues devoted entirely to nuts for northern, or northern and middle, planting. One nurseryman grows nothing else. All are members of this Association and the nuts propagated have all been shown at our meetings.

The work of the secretary during the year, besides the preparation and issuing of the annual report, has been given to answering a large and increasing correspondence, by personal letters and our various bulletins and circulars. The resolutions introduced by the Committee on Resolutions at the last meeting, and ordered by the Association to be printed and distributed as directed in the resolutions, were sent out by the secretary. A number of very complimentary letters in reply to this were received.

Arrangements and announcements were made that all members were to receive a subscription for one year to the *American Fruit and Nut Journal* as a part of their membership, and that new members would receive in addition copies of both the reports that we have issued. This proved very attractive, but unexpected complications have arisen that have kept the secretary busy explaining why he has been unable to fulfil both of these promises.

At the suggestion of Professor Hutt a circular was issued to gather information about the Persian walnut tree in the North. Replies are still coming in and the information obtained has not yet been collated. It shows already, however, that there is a great number of trees in the North; that there are two large centers so far shown, one about Rochester, N. Y., and the other in Ontario, Canada, on the strip of land between. Lakes Erie and Ontario, known as the Niagara Peninsula. In both localities reporters speak of hundreds of trees. One grower near Rochester has 225 seedling trees about 27 years old from which he is marketing nuts.

The original trees in these locations are often spoken of as grown from seed brought from Philadelphia at the time of the Centennial Exposition. Another center seems to be about Lancaster, Pa. There it appears that the original trees were brought in by the Germans. Perhaps the Philadelphia trees above referred to had the same origin. This would be a good subject for investigation by some of our Pennsylvania members.

There is a tree, said to bear good crops of good nuts, at Newburyport in the extreme northeastern corner of Massachusetts. (Specimens were shown at the meeting.) [Pg 71]

If not already undertaken by the Government agents, I would suggest the making of a map on which all known bearing trees of the Persian walnut in the East should be located. If not in the Government plan the secretary would under-take to make such a map. In any case he is very anxious to learn as much as possible about these trees and he urges the members to furnish him any knowledge about them that they may have. Circulars to be filled out will be sent on application.

A member has offered to give $25 as a prize to be offered by the Association for the best shagbark hickory nut sent in. This offer came too late to make suitable announcement this year, but it is too valuable not to be accepted and encouraged, and I would suggest that either a special committee be appointed to devise means of offering prizes, with the above mentioned sum of $25 as a foundation, or that the matter be referred to the committee on promising seedlings.

THE CHAIRMAN: I think we should take some action on the secretary's report. It is before the association. What shall we do about it?

PROFESSOR SMITH: I move that the situation of the finances be referred to the executive committee.

A MEMBER: I second the motion.

THE CHAIRMAN: It is moved and seconded that the matter of the financial standing of the association be placed in the hands of the executive committee.

(Motion was carried.)

THE SECRETARY: The next is the election of the Nominating Committee.

THE CHAIRMAN: Are there any nominations for Nominating Committee?

MR. JONES: I place in nomination Professor Smith, Mr. C. A. Reed, Mr. Rush, Mr. Ridgway and Mr. Albert Stabler.

MR. POMEROY: I second that nomination.

THE CHAIRMAN: It has been moved and seconded that these gentlemen be appointed as a nominating committee to nominate the officers for the ensuing year.

(The motion was carried.)

RESOLUTION ADOPTED AT THE ANNUAL MEETING OF THE ASSOCIATION NOVEMBER 18 AND 19, 1913

Resolved, That the Secretary of the Northern Nut Growers Association be instructed to keep "an accredited list of northern nut nurserymen," such list to be made up by the Executive Committee of this Association of such nurserymen as the Executive Committee may feel satisfied make no misrepresentations as to whether the trees they sell are budded and grafted varieties or as to the [Pg 72] specific varieties which they sell, or any other statement calculated to mislead the purchaser to his detriment. The said Executive Committee is to have full authority to make any necessary inquiries into the reputation or practices of any nurseryman, and shall take steps as soon as practicable to make up such an "accredited list," and such list shall consist not only of nurserymen who belong to this Association, but of any nurserymen engaged in the sale of northern nut trees. Such accredited list of nurserymen shall be furnished anyone upon inquiry. The Executive Committee shall have full power in making up this list of accredited nurserymen and shall add to the list from time to time such names as in their judgment shall be entitled to be entered on this list and shall drop from such list any names of such persons as in their judgment at any time violate the standard required for admission to such accredited list. Any nurseryman whose name is to be dropped shall first be notified and permitted to appear before the Executive Committee and be heard and shall, if he chooses, have the right to appeal from the action of said Committee to the Association at any annual meeting, and the majority vote of said Association shall be binding.

PRESENT AT THE FOURTH ANNUAL MEETING OF THE NORTHERN NUT GROWERS ASSOCIATION

AT WASHINGTON, D. C, NOVEMBER 18 AND 19, 1913

Members:

Batchelor, Leon D., Logan, Utah
Close, C. P., Washington, D. C.
Coleman, H. H., Newark, N. J.
Crockett, E. B., Lynchburg, Va.
Deming, Dr. W. C, Georgetown, Ct.
Druckemiller, W. C, Sunbury, Pa.
Fullerton, H. B., Medford, L. I.
Hume, H. H., Glen St. Mary, Fla.
Hutt, W. H., Raleigh, N. C.
Jones, J. F., Willow St., Lancaster, Pa.
Kinsell, Mrs. Ida J., Rock Mills, Pa.
Lake, E. R., Washington, D. C.
Mayo, E. S., Rochester, N. Y.
Pomeroy, A. C, Lockport, N. Y.
Prange, Mrs. N. M. G., Jacksonville, Fla.
Reed, C. A., Washington, D. C.
Ridgeway, C. S., Lumberton, N. J.
Roper, W. N., Petersburg, Va.
Rush, J. G., West Willow, Pa.
Smith, J. R., Roundhill, Va.
Stabler, Albert, Washington, D. C.
Storrs, A. P., Oswego, N. Y.
Wile, Th. E., Rochester, N. Y.
Van Deman, H. E., Washington, D. C. [Pg 73]

Others:

Editor *Life and Health*, Washington, D. C.
McHatton, Prof., Georgia
Frost, Mr., Boston, Mass.
Stabler, Mr., Jr., Washington, D. G.
Evans, Mr.

Lee, Mr.
Collins, J. F., Washington
Wiggins, J. B., S. Carolina
Waite, M. B., Washington
Quaintance, A. L., Washington
Sober, C. K., Pennsylvania
Davis, Mr.
Rhodes, Mr., Washington, D. C.
Mittlepage, Mrs. T. P., and friends
Pomeroy, Mrs. A. C.
Reed, Mrs. C. A.
Metcalf, Dr. J. B., Washington
Roberts, Horace, Moorestown, N. J.

EXHIBITS

By George W. Endicott, Villa Ridge, Ill.

The Boone chestnut and unnamed Boone seedlings, Nos. 4, 6, 7, 8, 22 and 24. Staminate parent of Boone. Chinquapin x Boone; Boone x Rochester; Boone x Ridgeley; Boone x McFarland. Blair, Burrill, best native, Champ Clark, McFarland, President, Ridgeley, Reliance, Rochester, William P. Stark.

C. K. Sober, Lewisburg, Pa.

Paragon chestnuts.

Mrs. Annie E. K. Bidwell, Rancho Chico, Chico, Cal.

American sweet chestnut, Italian chestnut, butternuts, black walnuts, I. X. L. almonds, seedling filbert, Bidwell pecan.

D. H. Hulseman, Lakeside, Wash.

Chelan and Hulseman walnuts.

Fancher Creek Nurseries, Fresno, Cal.

Eureka, Placentia Perfection, Neff's Prolific walnuts.

A. C. Pomeroy, Lockport, N. Y.

Pomeroy walnuts.

C. S. Ridgeway, Lumberton, N. J.

Ridgeway walnut.

E. S. Mayo, Rochester, N. Y.

"Thompson-Avon" walnut. Unnamed seedling.

W. S. Devoe, San Luis Obispo, Cal.

Santa Barbara walnut.

Frank P. Andrus, Almont, Mich.

Unnamed seedling walnut. Butternut.

E. R. Lake, Washington, D. C.

Gingko nut. Pili nuts. [Pg 74]

Arlington Farm.

Juglans sieboldiana. Juglans australis, probably from South America. Twenty-three exhibits of almonds from different California growers.

J. G. Rush, West Willow, Pa.

Lancaster, Nebo, Hall, Rush and Kaghazi walnuts, Barcelona filberts, Weiker and La Fevre shellbark hickories.

Prof. V. R. Gardner, Experiment Station, Corvallis, Oregon.

Eleven varieties of filberts.

W. C. Reed & Son, Vincennes, Ind.

Beard, Indiana, Kentucky, Letcher, Luce, Major, Niblack, Posey, and Warrick pecans.

T. P. Littlepage, Boonville, Ind.

Kentucky pecans.

J. F. Jones, Lancaster, Pa.

Lancaster and Holden walnuts, Weiker shellbark and Kirtland shagbark hickories, Barcelona filberts and photographs of the Lancaster tree. Ninety-six exhibits of southern grown pecans by various exhibitors.

WILDER MEDAL FOR EXHIBITION OF NUTS

The American Pomological Society awarded the Northern Nut Growers Association a bronze Wilder Medal for the exhibition of nuts at the fourth annual meeting of the Association at Washington, D. C, November 18 and 19, 1913.

GEORGE W. ENDICOTT—THE BOONE CHESTNUT

E. A. Riehl, Alton, Illinois

George W. Endicott was born in Belmont County, Ohio, July 25, 1837. He joined the Forty-eighth Illinois Infantry in 1861, serving nearly three years, when he was discharged owing to wounds received. Then he went to farming in Wayne County. In 1867 he settled at Villa Ridge, Ill., devoting himself to fruit and vegetable growing, in which he was eminently successful. Mr. Endicott was a man of strong character and a leader in his community. Energetic and up to date in all his operations, he procured and tested all kinds of new fruits as fast as introduced. He died at his home November 14, 1913.

Of the greatest interest to the nut growers of this country was his work of creating the Boone chestnut. About 1888 Mr. Endicott conceived the idea of producing a cross between the American and Japan chestnuts and getting one combining the sweetness of the native with the large size, early ripening and young bearing habits of the Japan. He encountered an obstacle in the fact that the Japan blossomed before the native and it was not until seven years later that he found a native blossoming early enough to make the cross. In the spring of 1895 he carefully hand pollinated some Japan Giant with the pollen of this early flowering native, sacking the same to prevent other pollen reaching them. The seed so produced was planted in the spring of 1896 in rich soil that had been used as a vegetable garden. One of the seeds so planted bore six burs in 1897, eighteen months after planting the seed and has produced crops every year since as follows: 1898, 1 pound of nuts; 1899, 3 pounds of nuts; 1900, 5 pounds of nuts; 1901, 6 pounds of nuts; 1902, 8 pounds of nuts; 1903, 12 pounds of nuts; 1904, 17 pounds of nuts; 1905, 25 pounds of nuts; 1906, 31 pounds of nuts; 1907, 43 pounds of nuts; 1908, 50 pounds of nuts; 1909, 56 [Pg 75] pounds of nuts; 1910, 5 pounds of nuts (early bloom killed by late freeze); 1911, 80 pounds of nuts; 1912, 76 pounds of nuts; 1913, 140 pounds of nuts—a grand total of 568 pounds from the time of planting the seed seventeen years ago.

This nut is of very good quality, has large size, ripens early and comes into bearing very early. Has been well tested and proven to be one of the best chestnuts we have. It has but one fault, it is very hard to propagate by either budding or grafting. Mr. Endicott and others have grown many seedlings of Boone, but none are in all respects as good as the parent.

Mr. Endicott did a good work in producing the Boone chestnut and deserves the thanks of the nut growers of this country.

LETTER FROM G. H. CORSAN, TORONTO, CANADA

My place of 15½ acres just west of Toronto, is in a small valley containing sandy, gravelly and clay soils, while the creek bottom land is rich black humus. My efforts are purely experimental and the losses do not worry me as I simply wish to know what will succeed in this district. Peaches and grapes grow on my place.

Last winter I bought twelve Paragon chestnut trees from Colonel Sober. All twelve are alive and looking well and this fourth day of November are just turning color and dropping their leaves. You will probably remember that of the three samples that Colonel Sober displayed at the convention last year I took the walking stick. I had to go to Columbia and other South Carolina points for three weeks afterwards, so that it was well into January before I finally got the "walking stick" planted. Well, it is also alive and has that well-known Paragon form, five fan-shaped shoots above the graft.

I planted seeds from all over the world, in rows, and of ten bushels of black walnuts only five nuts sprouted. On the other hand, every pecan came up. Hickories and English cob nuts behaved a little better than the black walnuts. I slip a little collar of tar paper over each little tree to protect it against field mice, rabbits and ground hogs. Red squirrels trouble me the least of all the pests as I cannot keep them out of my double section wire rat trap, and the pet stock men give my boys 30 cents apiece for them.

I also bought a dozen Pomeroy walnuts last winter for experiment. They are all alive but the extraordinary late and early frosts were hard on them and nipped them down three inches from the top where they again sprouted out. This occurred to all but one tree which positively refused to take any notice of either the late or the early frost. I consider this one tree worth *many* times

the money I paid for the dozen.

My experiments are only two years old but I will mention that my English filberts or Kentish cob nuts are doing well, also my Battle Creek persimmon seedlings that I planted in an exposed position two years ago.

Seeds from those Battle Creek persimmon trees can be procured from Dr. J. H. Kellogg by writing him. They are the two most northern persimmon trees which I have discovered so far. The fruit is good to the taste and the trees have lived through terribly cold winters. I mention this as many of you are fruit growers also and want to get persimmon stock in order to graft the Japanese persimmon on. The female tree every second year is loaded to the point of breakage and should do well for stock. [Pg 76]

Speaking about procuring seeds from dealers, I can get here and there for one cent as much as I have to pay the dealer a dollar for. For instance, while passing through Phoebus, Va., I asked a lady what she wanted for Juglans sieboldiana and she said 5 cents a quart or 35 cents a peck. She only got 16 bushels from a 20 year-old tree! They were bigger and better specimens than I got from Japan at about five nuts for one dollar, postage extra.

Then I wrote to a gentleman who had a small tree of Juglans cordiformis in Ontario and he said that he only had a bushel which he was expressing to me and to send him a dollar! Think, and the Japs sent me three nuts for one dollar!! A lady at Niagara Falls, Ontario, told me that she had a little tree of J. sieboldiana so I asked her the price and she sent me half a bushel and said to pay the express charges which were a quarter!

And it is the same way with these forest seed merchants, they send me for dollars the seeds of pinus edulis and pinus Koriensis that it would take a powerful microscope to discern, and I afterwards bought of a fruit merchant in Milwaukee a big glassful for a nickel!

Roadside planting is a failure, for, besides rodents little and big, there are all kinds of animals from sheep to horses to destroy them, so that I have to plant all my trees at least four feet within my fence line.

Juglans Mandshurica seed I find impossible to procure so far. There are two magnificent trees in Toronto planted by an old man who is dead now. These trees show no sign of ever having been winter killed and are 13 and 19 feet high but have not fruited yet. The leaves are very long and the trees resemble the stag horn sumach, except that they are distinctly Juglans in appearance; but the growth of the year's shoots is thick and long like a coppice growth.

LETTER FROM W. C. REED, VINCENNES, INDIANA

The Indiana pecan tree bore a splendid crop of about 3½ bushels. The Busseron also had a good crop on all the old wood and some on the new wood. The Busseron is just recovering from a severe cutting back by the owner and should be in shape to give a good crop next year. Other pecans in the vicinity bore a very light crop.

The Niblack bore only a few nuts this year. Butterick had a very good crop for an off year, some five bushels as reported to me, and they were well filled. This tree is very large, 4½ feet in diameter, 90 foot spread, located near Grayville, Ill.

The writer and my son, M. P. Reed, have top worked quite a number of large black walnuts, ranging from 3 to 9 inches in diameter. They were cut back last spring and budded in the new growth this summer, setting from 20 to 40 buds in some of the trees. Buds of the Hall, Pomeroy and Rush have taken well and look very promising. Of other varieties only a limited number have taken. We will top work several large trees this coming summer and should get results soon from these.

Pecans in the nursery have made a very satisfactory growth. The stand of buds was only fair, in some cases poor. We still have a limited number of Indiana and Busseron trees but the supply of other kinds is exhausted for this year.

We have planted 600 pounds of pecans and 50 bushels of walnuts and with the seedlings we have on hand in nursery hope to have plenty of stock to work in the future. [Pg 77]

We had a splendid stand of grafts of the Major pecan the past spring and some of these made 4 feet of growth and calipered ¾inch, for grafts set May 1st.

THE LATE HENRY HALES AS A NUT CULTURIST

H. W. Hales, New Jersey

About 1876 he and the celebrated writer and agriculturist, Andrew S. Puller, made extensive experiments with the large English filbert,—mostly of the Kentish cob varieties. These proved unadapted to the climate as the trees seemed to run all to growth and bore very few nuts. About this time, also, very extensive plans were laid to propagate by grafting the Hales Paper Shell Hickory. There is probably no more difficult tree in existence to graft than the hickory as, owing

to the extreme hardness and close grain of the wood there is always an uncertainty about their uniting permanently, consequently the percentage of perfect trees was always small. Mr. Hales tried all kinds and methods of grafting, some were done on stocks that stood naturally in the fields, others were grafted in greenhouses, then again, others were tried in frames or sashes, and large numbers were grown in pots, and success was only attained after years of time and thousands of dollars were spent. Mr. Hales was also an enthusiastic grower of the English or European walnut and one tree which grew on his farm at Ridgewood was grown from seed given him by ex-Mayor Daniel F. Tieman of New York City many years ago.

Japanese walnuts were also grown on the farm at Ridgewood and some of these are now bearing. A large number of Japanese chestnuts were planted some years ago, and while these bore heavily for a short time they nearly all succumbed to the chestnut blight. There is some difference of opinion among nut growers on the subject, but Mr. Hales was always of the opinion that the chestnut blight was introduced into this country with the Japanese trees, and that when the Japanese trees were gone the disease then spread to the native trees. The Hales Paper Shell Hickory, it may be remarked, still holds the palm as being the largest and thinnest shell nut, and it was only by the most persistent and painstaking efforts that Mr. Hales succeeded in propagating them at all. A large number of chestnuts were grown by Mr. Hales, such as the Numbo and other varieties. Some of these were said to be purely American varieties and others hybrids, or crosses. All of the hybrid varieties seemed to lack the hardy constitution of the American and although some of the nuts were very large he did not succeed with them in the long run as well as with the native varieties. Pecans of all kinds were tried by him and choice [Pg 78] specimens were obtained from all parts of the country. Like the hickories these were grown and grafted in different ways and the percentage of good results was always much larger than the hickories. Grafting the hickory on the pecan was of course tried, and this proved one of the best ways of propagating the hickory. Everything that he could possibly think of or do was brought to bear in his efforts at nut culture and it is some satisfaction to know that many nut lovers will have the benefit of his work and efforts, long years after he has passed away, the hickory especially being a very slow growing and long lived tree.

ABSTRACT OF PAPER BY HUMPHREY

Filbert. Black knot, *Cryptosporella anomala*

HUMPHREY, JAMES ELLIS. Mass. Agr. Exp. Sta., 10th an. rept., 1892, p. 242-243.

The author describes this fungus as killing the canes of the European hazel, *Corylus avellana*, at Palmer, Mass. The fungus appears in the form of protuberances with elliptical bases that burst the bark and rise rather thickly from the affected portions of the branch. The diseased portion is sunk below the surface of the healthy part. The interior of the protuberance, which is the fruiting part of the fungus, contains numerous black, flask-like structures whose tips reached the surface. Within the cavities of these flasks are formed the very numerous spindle-shaped spore cells, each containing, when ripe, eight colorless elliptical spores. The author noticed that the inner bark on the part of the branch occupied by the fungus is reduced to a narrow black line between the wood and the outer bark. This reduction in the thickness of the inner bark explains why the surface of the affected parts is sunken. If the entire circumference of a cane becomes involved, the result is that it is girdled, and the part beyond necessarily dies. The attacks of this fungus on the host-plant are essentially similar in their results to those of the black knot of the plum, though the immediate effect on the inner bark is here one of atrophy, while in the latter case it is one of hypertrophy. The fungus is also related to the black-knot fungus on the plum, but its life-history is not yet known. There may be other spore forms in its life cycle, and therefore it is impossible to give any more definite suggestions for avoiding it than to recommend that infected branches be cut away well below the point of infection and burned as soon as they are seen to be infected. [Pg 79]

THE TRUTH ABOUT TREE PLANTING WITH DYNAMITE.

> [Note by the Secretary.—As planting with dynamite has been especially recommended for nut trees, on account of their long tap roots which have the habit of growing down until they reach permanent water; as there has been some difference of opinion among horticulturists as to the merits of tree planting, in general, with dynamite; and in order that nut growers may know how to use this method as advised by the dynamite makers, in case they may wish to try it in setting their trees, the following description of the method advised, from the pen of Mr. George Frank Lord of the E. I. du Pont de Nemours Powder Company, is here printed.]

During the past two years there has been considerable discussion in the agricultural press on the merits of dynamite in tree planting. The majority of orchardists who have tried the new method

are enthusiastic over the results, but now and then we hear someone condemning the practice, and stating that they have tried it with poor results. It would appear from investigation that the theory of the use of dynamite in tree planting is a good one, but that the practice is sometimes incorrect, and hence fails to produce the desired results.

Purpose of Dynamiting for Tree Planting:

In the first place, to secure successful results it is necessary to understand clearly what the dynamiting is to accomplish. Some orchardists and farmers have the idea that the purpose of the dynamite is to excavate the hole for the tree and save them the trouble of shoveling out the soil. This is a wrong theory.

The object of dynamiting for tree planting is to break up the subsoil at a depth of from three to five feet so as to create a soil sponge or water-absorbing area twelve or twenty feet in diameter around and underneath the spot where the tree is to stand, so that the heavy rainfalls and melting snow of spring may be conserved in the subsoil to take care of the tree during the long dry summer.

If the force of the dynamite is used merely to blow out the soil and make digging unnecessary, it is unreasonable to expect the dynamite to do this underground work. On the other hand, when the charge is properly placed at a depth of about three feet and tamped in just enough to confine most of the force of the explosion in the subsoil, the blast will not only crack and pulverize the subsoil, but will also break up the ground around the bore hole clear to the surface, and throw it into the air, possibly a foot. It is then a very easy matter to excavate the hole for planting. [Pg 80]

Necessary Soil Conditions:

There is no economy nor advantage in using dynamite in a soil that is loose and sandy to a depth of three or four feet. The weakness of this soil is that it allows water to percolate through it too rapidly, hence dynamite would be harmful rather than helpful under such conditions, but no matter how loose the top soil or plowed soil may be, if it is underlaid by more or less impervious clay, or even a heavy loam, dynamiting under proper conditions will certainly increase its water-storing capacity, and also make it easier for the roots to grow downward and deep.

The proper conditions referred to are that the blasting must be done when the subsoil is relatively dry, otherwise it will not crack or pulverize. Every farmer knows the disadvantage of plowing wet top soil. It is equally disadvantageous to blast a wet subsoil. Of course, some subsoils are always in a more or less damp condition and never get thoroughly dried out, but they may be safely and advantageously blasted when they are in their dryest condition.

Water-logged soil should never be blasted except for the purpose of ditching it or tiling it so as to get it into a proper condition for blasting. The ditching may be done economically and quickly with dynamite, and in many cases this will answer just as well as the more expensive tiling. When the ditching or tiling has drained this subsoil, it may then be safely blasted.

Filling the Pot-Holes:

In any heavy soil the explosion of the dynamite tends to form a cavity in the immediate vicinity of the cartridge, varying from one to two feet in diameter. The heavier or the wetter the subsoil, the larger this cavity is likely to be. After the blast the top soil should be shoveled out and laid to one side; next shovel out the subsoil and lay it on the other side of the hole; continue this excavation until the pot-hole is reached, then be careful to fill this hole reasonably tight with subsoil, the object being to prevent the possibility of soil falling away from the roots of a tree after planting, and leaving it suspended in the air. This is the cause of the death of trees planted in dynamited holes which some unsuccessful experimenters report. It takes a little time to fill this pot-hole, but the many advantages of planting trees properly in dynamited holes more than offset this extra time and trouble required to properly prepare the hole. [Pg 81]

Planting the Trees:

After the pot-hole has been filled, continue to shovel in subsoil until the proper height is reached for planting the tree, then throw in half the top soil and spread the roots on that in their natural positions, then throw in the remainder of the top soil, next get in the hole and walk around the tree several times, tramping the top soil down tight around the roots so as to remove all large air spaces that surround the roots, then fill the hole to the surface with subsoil. Planting a tree in this way costs a few cents more per tree than the old way, but since the tree can only be planted once and the comparative records as to loss of trees the first year after planting, show an average advantage of 30 per cent. in favor of dynamited trees, namely, the loss is cut down from three to five trees per hundred, a dynamited tree grows so much more vigorously and produces fruit from one to two years earlier, therefore it pays to take the extra trouble and do the job right.

The editor of *Successful Farming* was at one time skeptical as to the use of dynamite in tree planting, but has been convinced from personal observation of its use in large commercial orchards, and from letters from various subscribers, that it is an important and valuable innovation in horticulture, provided it is used with proper care and discretion.

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The following list is made up of the names of authorities or correspondents whose special knowledge of local conditions enables them to give information or advice of special value. With some of them arrangements have been made to take charge of inquiries and other local nut matters. Some of them are connected with state or government experiment or educational institutions and will answer any inquiries.

The United States Department of Agriculture at Washington, D. C., will always respond to requests for information, referring them to the best authority available, many of whom are to be found in the various bureaus.

The secretary of this Association is always glad to do his best when no better authority is to be found. He intends in the future to refer many inquiries to those who have a better knowledge of local conditions.

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WYOMING

United States Department of Agriculture, Washington, D. C.

THE CHESTNUT BLIGHT AND IMMUNE HYBRIDS.

To persons who are interested in growing chestnuts, the following papers are of importance. They are published in the *Journal of Heredity* for January, 1914, Paul B. Popenoe, Editor, 511 Eleventh St., N. W., Washington, D. C.

"The Chestnut Bark Disease," by Haven Metcalf, United States Department of Agriculture.

"Chestnut Breeding Experience," by Walter Van Fleet, United States Department of Agriculture.

"Chestnut Blight Resistance," by Dr. Robert T. Morris, New York City.

The following important publications are not listed in Circular No. 3:

Walnut Culture in California. Walnut Blight. Bulletin 231, Agricultural Experiment Station Berkeley, California, August, 1912.

The Persian Walnut Industry in the United States. By E. R. Lake. Bulletin 254, Bureau Plant Industry United States Department of Agriculture, February, 1913.

Bulletin No. 1. Yamhill Walnut Experiment Station, McMinnville, Oregon, January 2, 1914.

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