Northern Nut Growers Association, Report Of The Proceedings At The Tenth Annual Meeting. Battle Creek, Michigan, December 9 and 10, 1919

Northern Nut Growers Association

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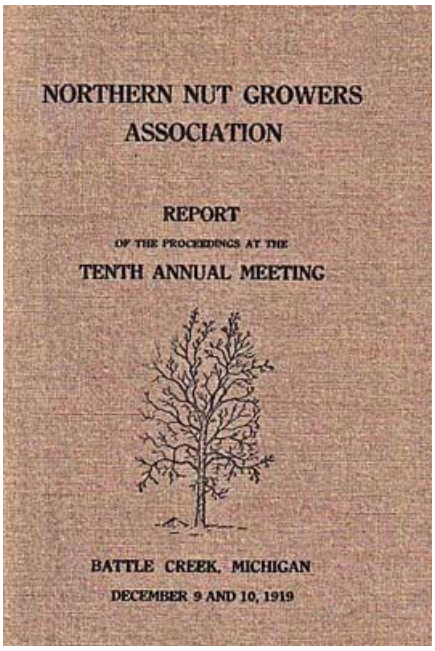

NORTHERN

NUT GROWERS ASSOCIATION

REPORT

OF THE PROCEEDINGS AT THE

TENTH ANNUAL MEETING

BATTLE CREEK, MICHIGAN

DECEMBER 9 AND 10,

1919

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W. O. Potter, W. C. Deming, J. Russell Smith
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Press and Publication—Ralph T. Olcott, J. Russell Smith, W. C. Deming
Programme—W. C. Deming, J. Russell Smith, C. A. Reed, R. T. Morris
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Illinois	E. A. Riehl	Godfrey
Indiana	M. P. Reed	Vincennes
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New Jersey	C. S. Ridgway	Lumberton
New York	M. E. Wile	37 Calumet St., Rochester
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Tucker, T. C, Manager California Almond Growers Exchange, 311 California St., San Francisco

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Filley, W. O., State Forester, Drawer 1, New Haven

Glover, James L., Shelton, R. F. D. 7

Hungerford, Newman, Torrington, R. F. D. 2, Box 76

Ives, Ernest M., Sterling Orchards, Meriden

Lewis, Henry Leroy, Stratford

McGlashan, Archibald, Kent

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Pomeroy, Eleazer, 120 Bloomfield Ave., Windsor

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Littlepage, T. P., Union Trust Building, Washington

Reed, C. A., Nut Culturist, Department of Agriculture, Washington

Taylor, Dr. Lewis H., The Cecil, Washington

* Van Fleet, Walter, U. S. Department of Agriculture, Washington

England

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Michigan

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Ward, Miss Daisy, 2019 Allen Ave., St. Louis

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Marston, Edwin S., Florham Park, Box 72

Price, John R., 36 Ridgedale Ave., Madison

Ridgeway, C. S., Floralia, Lumberton

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Ashworth, Fred L., Heuvelton

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Brown, Ronald J., 320 Broadway, New York City

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Goeltz, Mrs. M. H., 2524 Creston Ave., New York City

Harper, G. W., Jr., 115 Broadway, New York City

Hicks, Henry, Westbury, Long Island

Hodgson, Casper W., World Book Co., Yonkers

Huntington, A. M., 15 West 81st St., New York City

McGlennon, James S., 528 Cutler Building, Rochester

Olcott, Ralph T., Editor American Nut Journal, Ellwanger and Barry Building, Rochester

Pomeroy, A. C., Lockport

Stephen, John W., New York State College of Forestry, Syracuse

Tallinger, J. F., Barnard

Teele, A. W., 120 Broadway, New York City

Ulman, Dr. Ira, 213 W. 147th St., New York City
Vollertsen, Conrad, 375 Gregory St., Rochester
Wile, M. E., 955 Harvard St., Rochester
Williams, Dr. Charles Mallory, 48 E. 49th St., New York City
Wissman, Mrs. F. deR., Westchester, New York City

North Carolina

Barrett, Dr. Harvey P., 211 Vail Ave., Charlotte
Hutchings, Miss Lida G., Pine Bluff
North Carolina Dept. of Agriculture, Raleigh
Van Lindley, J., J. Van Lindley Nursery Co., Pomona

Ohio

Burton, J. Howard, Casstown
Dayton, J. H., Storrs & Harrison Co., Painesville
Ketchum, C. S., Middlefield
Truman, G. G., Perrysville, Box 167
Weber, Harry R., 123 East 6th St., Cincinnati
Yunck, E. G., 706 Central Ave., Sandusky

Oregon

Pearcy, Knight, Salem, R. F. D. 3, Box 187

Pennsylvania

Druckemiller, W. H., Sunbury
Fagan, Prof. F. N., Department of Horticulture, State College
Heffner, H., Highland Chestnut Grove, Leeper
Hile, Anthony, Curwensville National Bank, Curwensville
Jenkins, Charles Francis, Farm Journal, Philadelphia
Jones, J. F., Lancaster, Box 527
Kaufman, M. M., Clarion
Leas, F. C., Merion Station
Murphy, P. J., Vice President L. & W. R. R. Co., Scranton
O'Neill, William C., 328 Walnut St., Philadelphia
Patterson, J. E., 77 N. Franklin St., Wilkes-Barre
Rick, John, 438 Pennsylvania Square, Reading
Rife, Jacob A., Camp Hill
Rush, J. G., West Willow
Smedley, Samuel L., Newtown Square, R. F. D. 1
Sober, Col. C. K., Lewisburg
Weaver, William S., McCungie
Wilhelm, Dr. Edward A., Clarion
Wister, John C., Wister St. & Clarkson Ave., Germantown

South Carolina

Shanklin, Prof. A. G., Clemson College

Texas

Burkett, J. H., Nut Specialist, State Department of Agriculture, Clyde.
Trumbull, R. S., Agricultural Agent, El Paso & S. W., System Morenci Southern R. R. Co., El Paso

Virginia

Parish, John S., University
Smith, Dr. J. Russell, Roundhill

West Virginia

Brooks, Fred E., French Creek
Cannaday, Dr. John Egerton, Charleston, Box 693
Hartzell, B. F., Shepherdstown
Jenkins, Miss, The Green Bottom Homestead, Glenwood P. O.

Life member.

*** Honorary member.**

CONSTITUTION

Article I

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

Article II

Object. Its object shall be the promotion of interest in nut-bearing plants, their products and their culture.

Article III

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 rules and regulations of the committee on membership.

Article IV

Officers. There shall be a president, a vice-president and a secretary-treasurer, who shall be elected by ballot at the annual meeting; and an executive committee of five persons, of which the president, two last retiring presidents, vice-president and secretary-treasurer shall be members. There shall be a state vice-president from each state, dependency or country represented in the membership of the association, who shall be appointed by the president.

Article V

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

Article VI

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.

Article VII

Quorum. Ten members of the association shall constitute a quorum, but must include a majority of the executive committee or two of the three elected officers.

Article VIII

Amendments. This constitution may be amended by a two-thirds vote of the members present at any annual meeting, notice of such amendment having been read at the previous annual meeting, or a copy of the proposed amendment having been mailed by any member to each member thirty days before the date of the annual meeting.

BY-LAWS

Article I

Committees. The association shall appoint standing committees as follows: On membership, on finance, on programme, on press and publication, on nomenclature, on promising seedlings, on hybrids, and an auditing committee. The committee on membership may make recommendations to the association as to the discipline or expulsion of any member.

Article II

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

Article III

Membership. All annual memberships shall begin with the first day of the calendar quarter following the date of joining the association.

Article IV

Amendments. By-laws may be amended by a two-thirds vote of members present at any annual meeting.

Northern Nut Growers Association

TENTH ANNUAL MEETING

December 9 and 10, 1919
Battle Creek, Michigan

The tenth annual meeting of the Northern Nut Growers' Association was called to order at 11:00 A. M., Tuesday, December 9, 1919, in the Annex Parlor of the Battle Creek Sanitarium, Battle Creek, Michigan, with the President, W. C. Reed, presiding.

The meeting was opened with a short business session beginning with the President's report as follows:

PRESIDENT'S ADDRESS

W. C. Reed, Vincennes, Ind.

Fellow Members, Northern Nut Growers Association,

Ladies and Gentlemen:

Our Association meets today under the most favorable surroundings. We have this splendid building in which to hold our meetings, furnished gratuitously also have with us in this wonderful Institution several thousand guests, men and women of ability and prominence in their respective communities, from all parts of the United States.

Dr. Kellogg has been very kind and generous in extending an invitation several times to this association, and your speaker has thought there was no place quite so well suited for a winter meeting. It gives me great pleasure to be able to be with you and preside over a meeting as the guests of Dr. Kellogg. There is probably no man in America who has done so much to further the use of nuts, to show their benefits, and to explain their uses, as a food for mankind.

Conditions have changed greatly since our last meeting, September 1917, at Stamford, Connecticut. At that time the greater part of the world was at war, and owing to conditions prevailing during 1918, it was impossible for this association to hold its annual meeting. Your speaker is still holding the office of President because you have had no meeting at which new officers could be elected. It is to be regretted that the past three years have been crowded so full of events, that it was impossible to give the association matters the attention they deserved, and devote the time to them I would have liked to have done.

With the armistice came a cessation of war, and we are all happy that the terrible struggle is over, but with it have come conditions that are almost as terrible as war. Famine and want stare millions of people in the face on the continent of Europe. Our own country is at present in the grip of strikes for higher wages, the like of which has never been known. Yet we are prosperous beyond the greatest dreams of any nation on earth, but with this prosperity comes many duties. Our yields of food crops have been great, but to us has fallen the lot of feeding the world, and this will continue until industrial and agricultural conditions of Europe, have been reestablished on a pre-war condition.

There never was a time when meats of all kinds were so expensive, and to many almost prohibitive. Many have learned the use of nut meats in varied ways until all kinds of edible nuts are quoted on the markets today at prices undreamed of in former years. These conditions will not always last; crop failures will come; and production will be curtailed. Land values are advancing so rapidly that the production of cheap meats will be impossible. To help supply this deficiency, there will be an increased demand for nuts of all kinds.

To help meet this demand, much can be done by road side planting. On our main market highways, such trees as the grafted black walnuts could be planted profitably, in many sections of the country; the English walnut in some parts where they succeed the best; and the pecan and chestnut in other parts of the country where they are specially adapted.

While commercial planting of nut trees may not be attractive to the average man, home planting of a few nut trees can be recommended for every where space is available. They will make beautiful shade trees, and produce crops that will eventually be of great value. To land owners who are planting private parks, avenues and pastures, we would recommend nut trees.

The production of nut trees is very difficult, and the development and testing of new varieties, a slow and expensive process. We need the Government's helping hand, and are very glad that there has been set aside by Congress an appropriation to help develop this industry. We have with us, the Nut Culturist from the Department of Agriculture, who is devoting his entire time along these lines.

On the programme that is to be presented here, today and tomorrow, are men of national reputation in their respective lines, who stand at the head of their profession. To our friends and visitors here, we extend an urgent invitation, that you attend all the meetings possible, and we trust that you may learn much that will be of interest, and that this information may be taken home to your different communities.

Our sincere thanks should be extended to the Programme Committee and our very efficient Secretary who have given so much time to this work.

For an association to stand still, is usually to go backward. Owing to war conditions, and missing one meeting, we have had little chance to increase our membership. I sincerely trust that the Membership Committee will be active while here, and extend an invitation to all to become members, and to help advance an industry that will be for the good of posterity, and should give us much pleasure during our own lifetime.

We are told, the good we do unto others lives after us. May the Nut Trees planted and fostered by the members of this association, live long to wave their leafy branches under Heaven's purple dome, and may weary pilgrims of future generations rest beneath their shade, and enjoy their fruits, thanking us with a silent prayer that these trees were planted for their benefit.

President Reed: I believe the next thing in order will be the reading of the secretary's and treasurer's reports. Does any one have anything to present while we are waiting for the secretary, who is busy?

Dr. Morris: How many members have we, Mr. President?

President Reed: I don't know. Several have written me asking about members, and Mr. Olcott probably knows something about it.

Mr. Olcott: I don't know how many there are now; but I think there were 150 or 200 at the time of the Stamford meeting. I think there were that many enrolled. I presume that two-thirds of those renewed—probably something over 100 members.

President Reed: There were 138 paid members.

Dr. Morris: Dr. Kellogg says there may be a thousand men in the audience this evening, and if there are we ought to do some propaganda work.

President Reed: I don't remember who the membership committee was. Mr. Weber was chairman, I believe, and he is not here. Olcott is next on the committee.

Mr. Olcott: I didn't know I was on that committee.

President Reed: Fagan was on that committee, Potter, Deming, Williams, J. Russell Smith. I guess you are the only member of the committee who is here. We are ready for the report of the secretary and treasurer, Mr. Bixby.

REPORT OF THE SECRETARY-TREASURER
Sept. 1, 1917-Nov. 30, 1919

RECEIPTS

	Sep. 1. '17 to	Jan. 1, '18 to	May 21, '18 to	Jan. 1, '19 to	Total	Balance

	Dec. 31, '17	May 20, '18	Dec. 31, '18	Nov. 30, '19		
Balance on hand date of last report, August 31, 1917.					$ 15.93	
Received from annual members including joint subscriptions to American Nut Journal	$69.50	$123.54	$ 73.75	$247.35	$514.14	
Received in payment of life membership	20.00			25.00	45.00	
Sale of reports, brochures and leaflets	2.25	4.00	9.95	4.85	21.05	
Advertising in report of Stamford meetings 8th, 1917	21.00				21.00	
Sales of sundry material.		1.58			1.58	
Contributions for 1917 Contest			25.00	125.00	150.00	
Contribution for special hickory prizes				25.00	25.00	
	$112.75	$145.12	$108.70	$427.20	$793.77	$793.77
						$809.70
EXPENDITURES						
American Nut Journal, their portion of joint subscriptions	$ 6.75		$ 14.00	$ 59.00	$ 79.75	
Stationary, printing and Supplies	.69		44.05	49.50	94.24	
Postage, Express, *etc.*	4.82	13.95	9.66	9.24	37.67	
Prizes 1917 Nut Contest				15.00	15.00	
Prize 1918 Nut Contest				107.00	107.00	
Advertising 1917 Nut Contest $10.21; expenses 1917 contest $2.90		13.11			13.11	
Advertising 1918 Nut Contest				51.50	51.50	
Stamford Meeting 1917 expenses	65.55				65.55	
Printing Report of Stamford Meeting			162.00		162.00	
Errors in remittance corrected		3.85		3.50	7.35	
Litchfield Savings Bank. Life membership of John Rick Balance on hand Dec. 1, 1919.	20.00				20.00	
	$97.81	$30.91	$244.71	$279.74	$653.17	
						$653.17
Balance on hand Dec. 1, 1919.						
Special hickory prize						25.00
Life membership Lee W. Jaques						25.00
For regular expenses.						106.53
						$809.70

I have carefully been over the above statement and found it to be correct. C. A. REED, for Auditing Committee.

The above are records of receipts and expenditures for two years and three months and are approximately double those noted in the report of of the Stamford meeting. The activities of the Association were necessarily at a low ebb in war time, and, although a joint meeting with the National Association was planned for the fall of 1918, it was never held.

The list of members printed in this report numbers 128 while that in the last one shows 166, apparently a very large decrease. The last report showed 138 paid up members. Following the methods of Secretary Deming, members who have not responded to notices and letters have been dropped. In no case has a member been dropped until a letter with return postage has been sent. In a number of instances members thus written to have resigned giving various reasons, the most common of which are change of occupation or residence, which prevented their doing anything in the line of nut growing or lack of success in their attempts to grow nuts. Two members have died since the last meeting, Mr. Wendell P. Williams and Mr. Mahlon Hutchinson; the former was in the U. S. Service at the time of his death. 57 new members have been added to our rolls since 1917 making a total of 410 joining since organization of whom we now have 128, 282 having dropped out. Of the 52 who have joined since last meeting, 21 joined before Oct. 1, 1919 the date of the proposed meeting in Albany, Ga., which was never held, and 31 since that date.

The holding of members is a difficult problem and one that has not been worked out at all satisfactorily. Most members join in the hope of thereby learning how to successfully grow nut trees. They find out that so much is still experimental that most do not remain. This is bound to continue till we can show grafted or budded nut trees bearing satisfactory crops, and, until that time, there seems nothing to do but to keep on going after new members and by means of bulletins, reports, letters and otherwise making the membership more valuable than ever. There has been a greater interest in nut growing during the past fall than at any time since your Secretary-Treasurer has held office.

Respectfully submitted,

WILLARD G. BIXBY,

Secretary-Treasurer.

President Reed: You have heard the report. What is your pleasure? I believe that is usually referred to an auditing committee. C. A. Reed was chairman of that committee.

Mr. Bixby: Mr. Reed spoke to me about this yesterday. He said he would be glad to audit it, but there has not been time to give it to him. It was ready for him this morning, but he was busy on other things.

President Reed: What is the next thing on the program, Mr. Secretary?

Mr. Bixby: The reports of committees. I do not know how much report the standing committees have.

President Reed: There is the executive committee, the finance committee, the hybrids committee—maybe Dr. Morris has something on that.

Dr. Morris: No, I have no report to make on that. I shall talk on the subject this afternoon or in the course of my paper incidentally. I didn't see any occasion for action in that direction since the last meeting, so I have not acted except incidentally in the course of my work.

President Reed: The committee on nomenclature—of course they wouldn't have any report until after this meeting.

Mr. Bixby: Who is on that committee?—C. A. Reed, Dr. Morris, and J. F. Jones. Two members of the committee are here. There is one matter which perhaps I better bring up to the committee first,—one matter I think they should take some action on.

President Reed: I think it would be best to have that come up at a later time.

Dr. Morris: I would like to bring in something incidentally in relation to nomenclature in my paper. Perhaps we could have the question discussed after I have brought up that point.

President Reed: There is a committee on promising seedlings C. A. Reed, and J. F. Jones. I think that covers all the standing committees. Wasn't there a committee on nominations for officers to be elected, this morning?

Mr. Bixby: That nominating committee has to be elected.

President Reed: How many members?

Mr. Bixby: There were four or five last time, I think.

President Reed: (Reading by-laws calling for five members).

Mr. Bixby: I move Mr. Olcott be on the committee.

Voice: I second the motion.

President Reed: It has been moved and seconded that Mr. Olcott be elected as a member of the nominating committee. All in favor say, Aye. It is so ordered. Who else shall we have, for a second member?

Mr. Linton: I move Mr. Bixby be a member of the committee.

Mr. Bixby: There is a precedent that the secretary has never been a member of the nominating committee. He has sometimes given them information. I move Dr. Morris, Mr. Jones, and Mr. Linton be members of the nominating committee, and Mr. McGlennon.

Mr. McGlennon: I second the motion.

Mr. Olcott: The committee as you suggested it is Dr. Morris, Mr. J. F. Jones, Mr. Linton, Mr. McGlennon and myself?

President Reed: You have heard the motion. All in favor say Aye. The committee stands elected as named. They report at tomorrow morning's meeting. I think there is one matter it would be well to bring up, and that is the membership committee.

Mr. Olcott: I was going to suggest that is an important matter, and I think that committee should be filled out with those who are present, inasmuch as the regular members are not here. It looks as though a comparatively small membership would have to double up on membership committee.

President Reed: Have you any suggestions as to whom you want on that committee?

Mr. Bixby: Those committees, with the exception of the nominating committee, are appointed by the president. I think myself that the new president appoints them.

President Reed: My idea was to appoint for this meeting and help Mr. Olcott out.

Mr. Olcott: I suggest Mr. McGlennon and Mr. Jones as two of the members.

President Reed: Let it stand as it is with the three and give the chairman power to appoint two more later.

Mr. McGlennon: Can the secretary tell us how many members there are?

Mr. Bixby: One hundred sixty-four notices of this meeting were sent out. There are 128 paid up members.

Mr. Olcott: On the matter of membership, I wonder if the association could suggest some inducement for membership, or summarize the inducements. As you know, the American Association of Nurserymen has been desirous of more members, and they found it very advisable to outline definitely the benefits of membership in that association. I am wondering if that has been done recently and could not be emphasized in some way to the advantage of larger membership. You have got to do something more than say that there is in existence an association devoted to these purposes and everybody is invited to come in. Maybe the secretary has something on that line.

Mr. Bixby: I have no suggestion. It is very evident that there is a greatly increased interest in nut growing over what there was when I first took up the office. That is very clearly brought out by the amount of mail received. You may know that Capt. Deming, when in the service, took the position of editing the nut department of the American Fruit Grower. I saw him recently and it looks to me as if, as editor of that department, he is answering about as many correspondents on nuts and trying to boost the association in that way as he did when he was secretary before. And that would appear to be in addition to the communications that are coming to me now.

Mr. Olcott: There is interest. We get at the Journal office a great quantity of inquiries but only a small per cent of them result in memberships and subscriptions, and while this interest is so strong, ought not this association to study that which is something of a problem—perhaps something that ought to be taken up in view of the interests and the benefits of the association shown.

President Reed: I think that is a good suggestion. I think they need something along that line. Is there anything else we want to bring up at this morning session?

Mr. McGlennon: Is this not a very good field to open up operations along that line, right here at Battle Creek? A large number of people who come here are people who eat nuts, and I believe that condition would resolve itself into a material advance of membership. I think we ought to get busy right here and see if we can not enlist the membership of a great number of the patrons of this institution.

Mr. Olcott: That was the principal object of the membership committee I suppose. My idea was to get the ideas of the individual members, put them together and present a broadside of benefits in this organization rather than have one man attempt to outline them.

Dr. Morris: There is an immense amount of interest. The question is how to get it together and formulate it in such a way that men will join. There is an enormous, large loose majority, and we must have a small compact minority to swing it as the Senators do down at Washington, you know. Prof. Murrill of the New York Botanical Garden told me that wherever he went (he is interested in mushrooms, that is his special subject) he had had no idea in the world there was so much interest of the public in mushrooms; yet when it comes to getting together members to form the base of an association to study the subject, he finds very few members. It is simply because men haven't got the habit, and we have got in some way to give direction to that in such a way that it will be focused and concentrated on some one objective point. How to do it, I don't know.

Mr. Bixby: Dr. Kellogg suggested that at the meeting this evening there will be the largest number of people, not members, that there has been at any meeting; and he said he had had requests from people that they wanted to hear Dr. Morris, and they wanted to hear Prof. Cajori who used to be here, and he asked me to change those from this afternoon to this evening in order to accomplish that, and I said we would switch the program. That was for that very purpose.

Mr. Olcott: Mr. President, it just occurred to me that in view of the number of inquiries we get, and I am sure the secretary gets, and I am also sure Dr. Deming gets from his articles, there is no doubt of the interest, yet the joining of this Northern Association, and the attendance of its single annual meeting, does not appeal to many. They do not find it convenient to attend the convention; they do not see any great amount of benefit in the membership. It occurs to me that

if we had a list of state vice-presidents and each of those could provide for some local gathering of people interested in nut culture in the various communities; rather, I would say that if our members, as fast as we can increase our membership, wherever they are located, would form a nucleus of a little circle in their neighborhood, and have them affiliated with the Northern Association; it would accomplish this result. And afterward it occurred to me that perhaps that could be done through state vice-presidents. But what is really needed is to get them together in meetings. They won't come yet. They will when you get a larger membership, but they won't come to the annual meeting of this association where I think they would go to a community affair and talk over matters and refer difficult problems to the Northern Association of which they were affiliated members. In some way, a wheel within a wheel could work at it that way, and we could increase membership in that way.

Dr. Morris: It is a rule in psychology that you have got to have personal interest first. If Mr. Olcott's idea of having a local vice-president offer prizes, no matter how small, for nuts in the vicinity, and would also state that any one finding some remarkable nut would have that nut named after him to go down to all time, you would have two points there in self-interest. First, a five dollar prize to the best nut; next the name going rattling down through time in association with it. There are two points of personal interest. We may as well take it back to the basic principles and begin with the psychology of the situation.

Mr. Ketchum: Mr. President, in regard to these vice-presidents, that point looks to me very good for this reason. I saw it work out in the Minnesota State Horticultural Society. They had a vice-president in each congressional district. I was vice-president in the third district one year myself From them reports were sent from their district by people who were interested. They were asked to fill out blanks about conditions as they found them in their neighborhood and we got great good from it. Then this vice-president was to make a general district report from the reports sent him, and hand it in at the annual meeting. It was quite a success.

Dr. Morris: There you have civic pride brought into your psychology.

Mr. Ketchum: That was in the third district which included the northeast part of the state. It was quite a large district geographically, and I sent out something like seventy of these blank reports, and while the interest was very slight, I think I got 23 field reports in return, and out of those 23 were some nine or ten that were of some considerable importance; but it was a great big help to me in making out my report together with what I knew in my own location. The percentage of reports that came back showed that there was great interest taken by those persons.

Dr. Morris: You can arouse local pride in any locality.

President Reed: I have tried that in our own state in the last two or three years, at county fairs and local district horticultural meetings. Several times I have offered prizes out of my own pocket individually; then I have gotten other parties to help in some cases, and some exhibits even at county farmers' institutes, even very creditable exhibits and they seemed to attract as much interest even as the school exhibits. I know of one case at Martinsville two years ago this winter where the nut exhibit was almost as large as the fruit exhibit, and I think it attracted more attention; and I think there was only something like ten dollars spent in order to get it out. I think that work along that line, missionary work of that kind, is going to do us more good than almost any other endeavor.

Mr. Olcott: I do not think that the industry is old enough or strong enough yet, perhaps, to operate that state vice-president plan as it would be perhaps later on, for this reason, that if you have a state vice-president, you narrow the activity in that state to that immediate locality. But it would probably be much better, instead of that, to endeavor to get each member to form the nucleus of a local circle, and so have ten or a dozen in a state, instead of one.

President Reed: I think that suggestion is better.

Mr. Olcott: That was my original idea, and the state vice-president idea came in afterwards.

Mr. McGlennon: How many states are included in the northern association territory?

Mr. Bixby: There is no limit.

Dr. Morris: Northern is a relative term.

President Reed: I don't think there is any clearly defined line where the Northern Association is.

Mr. Olcott: For the reason that men live in the North are interested in lands in the South, and *vice versa*.

President Reed: There are twenty-three vice-presidents on the list here, in the last published report. Is there anything else that should come up at the morning session? Mr. Secretary, do you know of anything else?

Mr. Bixby: I would really like to see something definite on this line of increasing the membership. I can think of several

things that will help; but to get something that is going to have action right away is not so clear. Recently I have had a good many people come down to my place to look at the small orchard I have there. I aim to have varieties of every nut tree that is being propagated, and I think if I keep at it a few years longer I will pretty nearly have them; and in most cases, when people have come down that way, they have become members afterwards. Two or three of them have. I am only twenty miles from New York City, and it is not difficult, if I find someone interested, to invite them down to look over the trees growing there, and usually when they come they join afterwards.

Mr. Olcott: Pardon me for speaking again, but I am on the membership committee and I am anxious to draw out anything that may be of use. Why could not some plan be devised by the secretary or by this committee and sent out tentatively in the way of suggestion and perhaps some other suggestions will be made to add to it. Perhaps also in addition to this local community plan that I suggested, there might be formed, all of it within the Northern Association, a subsidiary thereto—the walnut society—people particularly interested in the walnut, but do not care for the hickory, pecan or any other nut. You will find people particularly interested in the black walnut, some in the Persian walnut, some in the filbert—form a filbert society as the American Nut Journal has suggested, and let all the enthusiasts of the filbert get together, and if they are scattered, let them keep together by correspondence and increased activity in that way. The same for the butternut. Get at it from that way.

Mr. Ketchum: Another thing to further our society here today, we can make those small organizations auxiliary thereto.

Dr. Morris: Any one who is interested in one nut becomes interested in all eventually.

Mr. Bixby: I received more inquiries regarding the Persian walnut and the pecan than any other nuts—probably more regarding the Persian walnut. Nearly everybody who writes wants to grow Persian walnuts; and in the great majority of instances, I have to try to switch them onto black walnuts with the suggestion that they plant a few Persian walnuts because we have no experimental data of the Persian walnut succeeding in their section. In some instances they will turn to the black walnuts; in other instances I hear nothing further from them. The Persian walnut is the most popular with people who have not tried to grow any nuts. Mr. Jones perhaps can tell us how his inquiries run. Don't they run very largely for Persian walnuts?

Mr. Jones: Yes, they do. I was thinking possibly you could make a combination—take, for instance, the membership, the nut journal, and some nut trees. The nurserymen could make considerable concession.

Dr. Morris: That combination is right well.

Mr. Jones: You could give a coupon good for so much on an order for trees or something of that sort.

Mr. Bixby: That suggestion was made and I referred it to the executive committee. I have not had any reply.

President Reed: I didn't have time to answer the communication and get it back to you before I came here; so I thought we would decide on that here. If there is nothing further to come up this morning, a motion to adjourn will be in order until the afternoon session.

Mr. Bixby: I might repeat that at the request of Dr. Kellogg, in order to get the papers which he had been particularly requested to have given so that people could hear them, Dr. Morris and Prof. Cajori who were scheduled this afternoon, will come this evening, and Mr. Hoover's and Mr. Graves' papers, which were scheduled for this evening, will have to come this afternoon. Neither of the writers are present, but the papers are here. Mr. Graves expected to be here but I had a telegram yesterday that he could not get away. I have the paper, though and the photographs.

Mr. McGlennon: Has there been provision made for a paper on filberts by Mr. Vollertsen? If not, I should like to have it.

Mr. Bixby: Certainly, there can be. It ought to come in this afternoon. I wrote Mr. Vollertsen asking if he could deliver it.

Mr. McGlennon: He has the paper prepared, and I want to hear it. I have been closely associated with Mr. Vollertsen for some ten years, and I know that his whole heart and soul are in the development of the filbert; and I know what he has done and that he is a rare character in the nut world today, that he possesses a fund of information. I am sure you will find intensely interesting; and furthermore I would suggest, and I believe I speak for him when I say I hope you will feel free to ask him questions. As I said before, he has a fund of information that I think we nut people ought to have, and the general public as well. We have a very good exhibit of the nuts. Mr. Vollertsen is the practical man in the enterprise we are interested in. I look after the business end of it. We are equally interested in it and feel that we have made some progress.

Dr. Morris: Put Mr. McGlennon on too.

Mr. McGlennon: I have said all I can say.

Mr. Vollertsen: You have said too much.

President Reed: If there is nothing else, we will stand adjourned until 2:30 p. m.

Tuesday Afternoon, December 9, 1919, 2:30 P. M.
President W. C. Reed, in the Chair

President Reed: The first paper is by Mr. Hoover, Matthew Henry Hoover, of Lockport, N. Y., president of the New York State Conservation Association. Mr. Hoover is not here, and the Secretary will read his paper.

THE FARMS BY THE SIDE OF THE ROAD

By Matthew Henry Hoover, Lockport, N. Y.
Formerly New York Conservation Commissioner
President New York State Conservation Association

Horace Greeley is best known for his contribution to the abolition of human slavery in the United States. Yet his service to mankind is not fully appraised by the average American, because many of the younger generation are unaware of his aid to agriculture. His maxim about farmers' failing to till the most valuable part of their farms underneath, opening the eyes of agriculturists to the efficacy of sub-soil plowing, was the preamble to freeing American husbandry from the slavery of antiquated and unscientific methods.

Following the application of science to the cultivation of the soil, came the students of Conservation. They were teaching the farmer the relation of conservation of natural resources to agriculture, the effects of forests on rainfall, moisture, erosion of soil, minimization of floods that annually bury thousands of acres of arable lands in the valleys, under rocky debris and so on.

Greeley discovered the Farm Below. The Conservationists are saving the Farm Above.

Now, in these days of reclamation and reconstruction, it is high time to pay more attention to the Farm by the Side of the Road.

The Northern Nut Growers' Association is to be congratulated upon the fact that it is blazing the trail through the forest of popular ignorance on this vitally important conservation question; leading public thought in the right direction; and providing both the seed and the stock for practical efforts in behalf of the Farm by the Side of the Road. I am going to claim a bond of brotherhood with you in this great work, basing my claim not upon my small activities in nut cultivation, but rather upon the fact that I was one of the conservation pioneers in New York State in the advocacy of planting profitable trees—nut trees and fruit trees—along the public highways.

That eminent conservationist, Gifford Pinchot, addressing the National Council of Farmers' Co-operative Associations in 1915, defined "Conservation" as "the wise use of the earth for the benefit of the people who live on it." That would be a perfect definition, if it did not invite the query: Should it not be enjoined upon the people who live upon the earth today, while enjoying its benefits, to keep faithful stewardship of the interests of the inhabitants of tomorrow?

About the time Mr. Pinchot enunciated this famous definition, the New York State Conservation Department summed up the purposes of practical Conservation as: "The correction of past indiscretion, the perfection of present utilization, and the formation of future accumulation with respect to natural resources."

Conservation activities must repair errors of the past which have left denuded forest lands and empty game covers and waters; they must afford and direct the present use of the forests and the streams; they must safeguard the future supply, if they would meet the requirements of a conservation which shall raise the standards of life and lower the cost of living. That is a conservation embracing both the aesthetic and the economic, the only kind worth while. It is a conservation wherein the arable areas and the so-called waste lands and waters have a very intimate interrelation of interests. And, I submit, Gentlemen, that the American people too long have failed to recognize and to account as in the class of waste lands, "The Farms by the Side of the Road."

The reclamation of waste lands is a compromise between the activities of the Conservationists, who claim that in the more thickly inhabited portions of the United States the cultivated or semi-cultivated areas are out of sane and safe proportion to the wild forest sections, and the advocates of intensive and extensive agriculture. It is not the purpose of this article to take sides in that controversy, but rather to invite attention of both sides to a safe and practical field for their endeavors, namely, the reclamation of the "wasted lands" along the roadsides, the farms along the highways.

During the War Garden campaigns of the past two years, these heretofore largely unused strips of tillable land, forming in the aggregate thousands of along-the-road acres in every state, received considerable attention from the thrifty plow and hoe. But in the main, the results were not encouraging. The public will trespass, unintentionally or otherwise, upon the land cropped along the highway. Then, if the farms by the side of the road are to be conserved—used by present as well as future generations—there remains but one practical recourse: productive trees.

The American people love beautiful trees, possibly the expression of a reaction from the sentiment of the pioneers who regarded trees as their enemies, handicaps to agriculture to be removed as thoroughly and expeditiously as possible. But with virgin soil producing enormous crops, they naturally centered their interest on ornamental trees without reference to their fruits. Hence the horse-chestnut, buck-eye, maple, locust, oak, poplar, along the highways and byways of America, instead of the native nut trees and the Persian or English walnut.

And, speaking of highways, this is the age of concrete. Taking the hint, I am selecting one concrete example of which I have intimate and personal knowledge, well aware that there are numerous others that I might cite were my acquaintance with practical nut culture more extensive than it is. The one that I know about of my own personal knowledge is, a very good example of the plain common sense of productive trees which combine the useful with the ornamental.

It Reads Like a Fairy Tale

In 1876 two Niagara County farmers, Norman Pomeroy and Matthew O'Connor, neighbors, decided to go to the Centennial. They packed one carpet-bag in common for their baggage and boarded the train for Philadelphia. Although well to do farmers, their economic instincts warned them to beware the profiteering hotel keepers. So they sought a humble boarding house in the suburbs of the city. Returning one evening from sight-seeing at the exposition, the travelers were so weary that they retired immediately after supper. During the night Pomeroy was awakened by a tapping on the window. Assuring himself that the wallet under his pillow was still there, he investigated the cause of the disturbance of his slumbers. The noise had ceased and he decided that the overstrain of the day had worked an hallucination. Pomeroy dropped off to sleep, but presently was aroused by sounds which were unmistakably caused by a gentle tapping on the window pane. Exasperated, the man arose, picked up a boot, slipped to the window and raised it gently ready to give the joker or would-be burglar a rousing whack on the head if within reach. He stuck his head out of the window for a better view of the exterior world, and his curiosity was rewarded with a stinging blow on the cheek. The pain aroused all the Pomeroy French Huguenot fighting blood in his veins. Viciously he swung the boot at the unseen foe, only to hear it crash through tree branches. Laughing softly, in his enlightenment, he reached out into the night, grasped a branch, broke it off and turned on the gas and lit it. On the twig were two curious nuts.

Pomeroy was a lover of nature, as I learned by many an interesting talk with him. He found time in his regular farming pursuits to study native trees and shrubs, and had forbidden his hired men to cut down any of the native nut trees on his 500 acre farm. But the nuts on the branch retrieved from darkness were specimens new to him and he could hardly wait for daylight to come to enable him to get acquainted with the tree which had invited his attention so rudely. Next morning Pomeroy learned that his new found arboreal friend was a Persian walnut. It was loaded and the wind storm of the night had covered the ground with shucked and unshucked nuts. By permission of the landlord, he gathered a peck of the Persian walnuts, wrapped O'Connor's and his own belongings in a newspaper and filled the carpet-bag with the nut treasures. Arriving home, the tourists stopped first at O'Connor's house. There they had to relate the experience of their great trip to an assemblage of the two families. The recounting of the Centennial wonders took until midnight. When Pomeroy picked up his carpet-bag to go home, it was empty! The children had made a discrete retirement after having consumed the entire peck of English walnuts, as the shells in the kitchen disclosed. Luckily for the youngsters, they were safe in bed and asleep.

The next day, according to the elder Pomeroy, little Albert who had not been at the O'Connor home the night before, heard the dolorous tale of the wonderful tree in Philadelphia, the gift of nuts and their weird disappearance. To confirm the sad story he picked up the carpet-bag, turned it inside out. Within a torn lining, he triumphantly extracted ten nuts. Child-like, he proceeded to sample them and had eaten three when his father rescued the remainder. Seven Philadelphia walnuts were planted in the yard, and, in due time there were seven slender, silver-grayish seedling trees. These were carefully staked, guarded and cultivated by Norman Pomeroy. Despite the caviling of the neighbors, who declared that a Persian walnut tree would not thrive and bear so far north, twelve years after planting the "lucky seven" reproduced their kind—from a dozen to two dozen large, handsome Persian or English walnuts. Today the seven Centennial trees are about two feet in diameter and about 60 feet high. And as to the value of the crop, one tree alone produced nuts which sold four years ago for $142.50.

Now as to the application of this romance in real life. I must return to the more prosaic generalizations of conservation and its relation to the products of cultivation with which this article began.

In 1913 Governor Martin H. Glynn invited me to outline for him a program of "Practical and Progressive Conservation",

applicable to the needs of New York State. In the effort to meet the request, I drew a little from my personal experience and observations as a sportsman, a farmer and a newspaper man, and a great deal from what I had learned from others among the organized sportsmen, agricultural societies, hydro-electric engineers, forest products men, foresters, and nature lovers in general. We then set forth the following as necessary to the realization of the purposes of a Conservation which should meet all conditions imposed by the past, the present and the future, as hereinbefore stated:

"Practical and Progressive Conservation"

1. Protect the birds and save the crops.

2. Develop the unutilized water powers, now going to waste with destructive effects in freshet periods to arable lands and thickly populated communities, through public ownership and distribution; thereby use "The People's White Coal," save coal and cussin' the ash-sifter, giving the public cheaper light and power for the homes, the farms, the factories, and public highways.

3. Amend the constitution to permit the use of dead and down timber in the state forest preserves, worth at least $10,000,000 annually.

4. Provide free forest trees furnished by the state for all who will plant them. (Note—The present N. Y. Conservation Commission in a special report to be made to the Legislature of 1920 has at last adopted that progressive policy).

5. Plant productive trees along the highways—nut and fruit trees.

6. Restock waters and covers more extensively and intelligently.

7. Stop pollution of private and public waters.

8. Harmonize the interrelated interests of farmers and sportsmen.

9. Establish game and bird refuges in every county in the state.

10. Sane and practical game laws, eliminating prosecutions on petty technicalities, educate the public to co-operate in fish and game protection, enact legislation to encourage rather than handicap the propagation of fish and game by private enterprise.

It will be noted that plank 5 in our progressive conservation platform is urging the planting of producing trees along the highways. By that we meant not only the native nut trees, all of which are beautiful and ornamental, but also fruit trees, according to the wishes of the abutting owners.

In the State of New York, taking into account only improved roads coming under the head of State or County Improved Highways, disregarding the mileage of the rural roads several times as large, there are about 8,000 miles of "Good Roads". There are many stretches of the highways which nature has generously adorned with trees. Some portions of the roads have witnessed the spoliation of the contractor's indiscriminating ax, but in the main the workmen were as careful as possible to retain natural shade trees along the routes. A few miles comparatively, were planted by state agencies. Farmers, especially in the Lake Ontario Fruit Belt of New York State, have worked wonders in ornamentation and economy by planting cherry, apple, plum and other beautiful and productive trees on the strip of land, "The Farms by the Side of the Road."

At a very small additional expense, the State could have planted every rod of improved highway with productive trees, putting that forethoughtful specification into the contracts.

Get out your pencil for a moment. Suppose the state had English walnuts on the 8,000 miles, placing the trees 40 feet apart. We should have growing then over one million productive trees and some of them would be old enough to be bearing today. Within ten years from now, their product would be worth at a conservative estimate $25 per tree, representing a sum sufficient to carry one-third of the State's entire cost of government.

The war just won for the cause of World Democracy has opened the eyes of the American people to many things they had not before apprehended or realized. One is the value of productive land space. Another is the importance of our forests, and especially the value of the native nut-bearing trees. It was discovered, when Uncle Sam scurried around to procure a supply of black walnut for gun stocks, that the German agents had been ahead of him. Although thickly settled, Germany finds it profitable to employ one-fourth of its entire area in growing forest trees. Yet it seems the Kaiser's forests were short on this valuable timber, so they picked up all the procurable black walnut in the United States.

This set the New York State Conservation Commissioner thinking and last year he advised farmers to propagate and

cultivate the black walnut—a little late for the emergency; but better late than never, especially in this case.

On my little farm near Lockport, N. Y., there is a large black walnut tree, perhaps 90 to 100 years old. It bears a nut of unusual size, of excellent taste and good keeping qualities. This tree has produced as high as ten bushels of shucked nuts in a season. Twenty-two years ago, when the importance of growing native nut trees had impressed but few people, I did have the good sense to plant several dozen nuts from the "Niagara King Walnut." I must confess I gave the trees little attention, and a farm hand zealously cut down all but one of the black walnuts, mistaking them for sumac. The survivor last year bore about three bushels of nuts. Most interesting of all is the result of observations as to the product, and its bearing on the question of whether or not nut trees will reproduce "true to variety." The walnuts from the young tree differ in shape, being almost round, while the fruit of the parent tree is almost chestnut in form. But the flavor, thickness of shell and the keeping qualities seem identical.

Six years ago I started a small black walnut and butternut tree nursery for home use and from it have set out about four hundred trees along the ditches and fences on the farm. The early plantings have attained a height of from 12 to 15 feet. If every farmer would do likewise, he would make a considerable addition to the country's food supply, to say nothing of the value of the timber for coming generations when the frees approach maturity. It has afforded me pleasure to send nut trees to friends in various counties of the state and we shall watch with interest, the reports on their growth and development under the many variations of soil and climate. The butternut in many parts of the country is rapidly disappearing. To save this beautiful tree with its delicately flavored nuts, it will undoubtedly be necessary to take it into extensive cultivation.

Although apart from the subject perhaps, it may be interesting to refer to the application of forestry to a woodlot containing native nut trees. Like many farmers who regard every tree as just a tree, useful for timber or fire wood, I found several years ago that indiscriminate cutting on my woodlot was destroying walnuts, along with the commoner species of the stand. My first step was to halt the cutting of all black walnuts, hickories, butternuts, oaks and beeches on the seven-acre woodlot. I took an inventory of these trees and found there were 160 shagbark hickories from 10 to 25 years old, five butternuts about 20 years old, and four black walnuts about 25 years old. These, of course, were not "tolerant trees" like the evergreens, and most of them were rapidly deteriorating from being overcrowded by more rapidly growing and less desirable neighbors. All *of* them had been retarded in growth by the crowded condition of the stand. Inaugurating a process of judicious thinning with a view to giving the nut trees the advantage, the result in a single season was surprising. Under the beneficent influence of ample sun, air and root sustenance, the butternuts and black walnuts bore fine crops for the first time, in the season following the winter thinning process. The young hickories contented themselves with making their first annual growth in years. And, Oh joy of realized hopes, in this the third season since letting the sun into the native nut grove, nearly all of the older shagbark hickories bore their first crops! And now I have a nut plantation, that might have been ere this, burned up as fire-wood, at no expense whatever, since the thinning out process produced a very welcome supply of fire wood in these days of high-priced coal.

In a recent bulletin of the United States Department of Agriculture, "Value to Farm Families of Food, Fuel and use of House," there are some illuminating statistics on "The Farmer's Income" and "The Farmer's Living." It is stated that "the total average of the three items of food, fuel and use of the house for the 950 families (selected from all parts of the United States) is $642, and 66% of $424 of this is furnished by the farm." The Seven Pomeroy Centennial. Trees in one year produced a food product worth and actually sold for about $800 in one year! The average annual production of those seven trees has been over $600 for the last ten years. And what about the labor involved in raising and harvesting the English walnut crop in question? Picking the nuts from the ground, children gladly doing it and earning five cents per basket.

Horace Greeley's undiscovered farm under the first twelve inches was a gold mine when turned up finally; Mr. Pinchot's farm on top rescued from flood and other devastations is worth more money than before. But how about the strip of land along the roadside, an aggregate waste of at least one per cent of the acreages of eastern farms? Well worth reclaiming, and no expensive ditching, irrigation and lumbering involved in the process either. In addition, credit must be given also to this enterprise for the value of ornamentation of the highways and their protection from the elements all seasons of the year.

And strange to relate, in the long list of items under the head of "Classes of Food," given in the Federal Bulletin referred to, no mention is made of nut foods, either native or imported nut trees. Fruits, vegetables, meats, store groceries, everything is there but nuts.

"Nutty," do we hear someone suggest? Probably not in this audience of enlightened nut growers, but speaking to the general public we shall say, "Well, mebbe," like Uncle Lige of Niagara. Two bad years on the farm, four acres of tomatoes that didn't pay for the plants, nothing but soft corn and no potatoes compelled Uncle and Aunt Tompkins to open an account at the corner grocery. The first month the bill came in, Aunt Sally was all in a flutter when she audited the items: Sugar, 60; coffee, 40; oatmeal, 50; sugar, 75; ditto, 80. "Lige, you go right back to the store and tell that cunnin' clerk that he's charged us fer what we never got. We ain't had no 'ditto' in this house." Lige went to the store and

returned, apparently a sadder but a wiser man. "Well, Lige," inquired the thrifty spouse, "Did you find out 'bout that 'ditto' we didn't get? What did you find?" Lige picked up his pipe, remarking, "Well Sally, I found I was a durned fool, and you *ditto*."

We are all waking up to the fact that we did not become "nutty" soon enough. We have found that our public agencies of conservation have been "durn fools" and farmers and other land owners "ditto", for not having inaugurated the systematic planting of productive trees along the highways and farm hedgerows and ditches, many years ago.

Norman Pomeroy used to say with becoming modesty that he took no credit for planting the trees that have made such a substantial income for his family, because "I had to be slapped in the face in the dark before I became wise, and then the natural improvidence of mankind came near spoiling Nature's tip when the children gratified their little stomachs in preference to planting for the future. Men are but children of an older growth, a wise man said. That is a true but sad doctrine. We all live too much in the present and for the present, forgetting that the future will soon be the present, if not for ourselves, for our children and our children's children. It takes time to realize on trees, for the stomach or the pocketbook. It requires sacrifice to get anything worth while and, waiting is the hardest kind of sacrifice, especially for people of small means. But it pays in the end."

The Northern Nut Growers' Association, is doing valuable work not only in the study and planting of nut trees, but in its propaganda. But I have discovered that the results of practical work and the worth of propaganda, are hard to bring home to public agencies, like Governors and Legislatures. The construction and maintenance *of* public highways are a state function. But that duty must be incomplete in our opinion until the state finishes its job by planting productive trees along the highways and public roads. How shall we bring this about? Adopt resolutions? Very good.

But did the Anti-Saloon League, for example, content itself with resolutions when it wanted real results in the halls of legislation? Not much. Our prohibition friends were very practical. They employed trained agents to present their cause everywhere and in every way calculated to do the most good.

Let me repeat to you tree planters the late Norman Pomeroy's favorite lines, as I recall them:

"*The dead are eternized in stone,*
The living, by living shafts are known.
Plant thou a tree and each recurring spring
The stirring leaves thy lasting praise shall sing."

President Reed: Prof. Chittenden, of Michigan Agricultural College will address you on "Native Nut Tree Plantations for Michigan."

NATIVE NUT TREE PLANTATIONS IN MICHIGAN

Professor A. K. Chittenden, Michigan Agricultural College East Lansing, Michigan

I am very glad of this opportunity to tell you what the Michigan Agricultural College is doing, and what it thinks, about nut tree plantations in this State. I want to say first, that there is a very general interest in nut trees among the farmers and land owners of the State. A considerable number of the letters that the Forestry Department of the College receives from farmers are about nut culture. They seem to be particularly interested in pecans, English walnuts, and chestnuts. A few years ago the State was flooded with literature urging people to plant these trees and we are still feeling the aftermath of this campaign. Much of this state is too far north for the successful growth of these particular trees and we therefore have advised waiting before investing heavily in young trees, until experiments have shown where they would succeed and what kinds it would be safe to plant. At the same time, we suggested the planting of one or two trees of certain varieties as an experiment. We have for the most part recommended only our native nut trees for planting on a large scale.

We have tried many varieties of nut trees, grafted on hardy stock, at the College, and only a few of them are alive today. All of the pecan trees have been lost and nearly all of the English walnuts. About two years ago, we got some of Burbank's Royal walnuts from California. All of these trees except one, were killed back of the graft the first winter. One of them, however, is doing well although growing very slowly. It will doubtless succeed now, as it has pulled through two winters, one an exceptionally cold one.

About three years ago, we bought some Sober Paragon chestnuts from an eastern nursery which had been advertising them widely in this State. They were all infected with the Chestnut Blight disease. Now this disease has at the present time not appeared in Michigan, except on imported nursery stock. We have a considerable number of chestnut plantations in the State, and if the disease can be kept out, there is no reason why chestnuts cannot be raised more

profitably. But our experience has shown that the trees must be raised in this State and not brought in from outside. We have some very nice chestnut trees in our nursery at the College which are now thirteen years old and which have been bearing nuts for four years. This fall we are planting them all along the drives so as to open up the crowns and induce a greater production of nuts.

We also have some Japanese walnuts that are doing well indeed. One of these trees on the campus is 35 years old and produces a large quantity of nuts.

There are a number of English walnuts at various places along Lake Michigan in the fruit belt. Individual trees will often succeed, but the chances for success are not great enough to warrant a man putting very much money into a plantation. There are two Sober Paragon chestnuts near Niles which are now 12 years old and are growing and bearing well. At the College farm, near Grand Rapids, there are some pecan trees, but their history shows that they have been repeatedly frosted back.

I could mention a great many cases of success with individual imported trees, but I do not know of any extensive plantations that have so far succeeded.

There is, however, a different story to tell of our native nut trees of which there are many successful plantations. Our native edible nuts are black walnut, hickories and chestnut. They will grow anywhere in the southern part of the State and along Lake Michigan. Using these trees as a basis, I believe we can develop, if it has not already been done, a tree that will bear an improved quality of nuts and that will be perfectly hardy.

The black walnut is the tree that did perhaps more than any other tree to help win the war, and, while timber raising and nut culture do not perhaps go hand in hand, probably more black walnuts are being planted as individual trees than any other tree in the State. The black walnut was an invaluable tree for gun stocks and airplane propellers. The War Department scoured the country to find trees for these purposes and every black walnut that is now planted, may be of service to the country in the future. The College raises thousands of black walnuts and Japanese walnuts each year, and the demand for them is very great. When we have in planting, a choice between two trees, one choice being a tree suitable for shade only and the other a nut producing tree, I would say plant the nut tree. Our trees will have a double appeal if they furnish not only shade, but edible nuts as well. At the last session of the State Legislature, an act was passed providing for the planting of nut and shade trees along our highways. As a result of this act, we hope sometime to see the highways in the southern part of the State lined with walnut and other nut bearing trees. A tree that will serve a double purpose should be planted wherever possible.

Tree planting is a thing in which we are all interested. Those of you who have been abroad remember the long rows of trees, often fruit trees, that lined the roads. In this country we cannot plant fruit trees along our roads as there is nobody to care for them and disease would quickly start and spread to our orchards. But nut trees can be safely planted.

We have, on certain soils in the southern part of the State, recommended planting black walnuts for fence posts. The heart wood is very durable and the tree grows quite rapidly under favorable conditions. Then, perhaps when the trees are large enough for posts, the owner will decide to keep them for the nuts and for timber production.

During the past summer the College made a study of native nut tree plantations in the State with a view to determining the profitableness of such plantations.

Among the older plantations studied was one in Berrien County. It was planted 45 years ago and covers four acres. The soil is clay and loam with a clay sub-soil. Three year old seedlings were used with an average spacing of about 28 by 32 feet. The grove was cultivated for about 8 years after planting. The trees are now in fairly good condition but many are affected with heart-rot. They are quite spreading and bushy in form and are not suitable for lumber. There is now about 30 cords of wood per acre. The average diameter is 20 inches with an average height of 60 feet. The ground is sodded over and the grove is used for grazing sheep. The owner says that about half the trees bear and that the June bugs are the principal source of trouble, eating the blossoms. The yield in nuts varies from practically nothing to 25 or 30 bushels for the entire plantation. About six years ago, the owner reports a crop of 36 bushels, and two years ago a crop of 27 bushels. From these figures I should say the plantation is a success.

A chestnut plantation in Van Buren County was set 37 years ago and covers one acre of sandy soil. The plantation was cultivated for about ten years and corn was grown between the trees. The average tree is 14 inches in diameter and 65 feet tall. The returns have been small because the trees were planted too close together, but some years the plantation has yielded 15 bushels of nuts. There are 67 trees on the acre, which is too many for good nut production. The grove will produce about 20 cords of wood or about 550 split fence posts per acre.

One of the oldest plantations in the State is 56 years old and covers 1½ acres in Montcalm County. It consists of black walnuts and chestnuts mixed together. The average black walnut is 14 inches in diameter and 67 feet tall. The average chestnut is 20 inches in diameter and 60 feet tall. The spacing is about 40 by 30 feet and the soil is a gravelly sand. The

yield in nuts has been quite small, six to eight bushels a year.

There are a number of such mixed plantations in the State and it would seem that the two trees do not do very well together. In this case, I should say that the soil is not well suited for either tree.

There is a plantation of Japanese walnuts in Oakland County. It is five years old and on sandy soil. About 500 trees were planted at the cost of 60 cents per tree. The stock came from Pennsylvania and was budded to English walnut. The scions died back, however, and the plantation stock came along so it is now a Japanese walnut grove. The average tree is about 2 inches in diameter and 10 feet tall. The trees are very healthy and vigorous and are beginning to bear a few nuts.

A chestnut plantation in Van Buren County is 12 years old. Two foot transplants were used and the trees were planted at the rate of 100 to the acre. They were cultivated for two years. The average tree is 4 inches in diameter and 20 feet high. The trees are healthy and in good condition. The grove is yielding from one to two bushels of nuts a year and should be thinned so as to open it up and encourage nut production.

A black walnut plantation in Ingham County, planted about 20 years ago for timber purposes and underplanted with white cedar to force the trees to grow straight and tall, is in excellent condition. The average tree is 5 inches in diameter and 34 feet tall. The plantation has not yet borne nuts but if it were opened up, would doubtless produce a large number in a few years.

I could give more instances of nut tree plantations in the State, but I think I have mentioned enough to show that our native nut trees can be profitably raised. During the last few years, a great many black walnut plantations have been established but most of them are yet too young to be in a bearing condition. If it were not for the difficulty of getting healthy chestnut stock, I believe Michigan would be a large producer of these nuts.

A study has been made of the volume of the wood that could be obtained from these chestnut plantations. Owing to the open nature of the groves, the trees are mostly not suitable for lumber and the yield of cordwood and posts is less than in a forest plantation where the trees are closer together and force each other to grow straight and tall. It was found, however, that a chestnut grove planted for nuts, would yield on the average 13 standard cords of wood per acre at 20 years of age, 20 cords at 30 years, and 25 cords at 40 years of age. Placing the value of this wood at present prices of $7 per cord, would give a value of $91 per acre at 20 years and $140 per acre at 30 years for the wood alone.

Probably most of the chestnut plantations have been planted for the nut and the black walnuts for timber with the nuts as a side issue.

Black walnuts should be planted on fairly fertile, moist soil. We do not recommend planting the nuts as squirrels are liable to dig them out. It is better to use small trees.

The cost of establishing black walnut plantations is quite small. Native trees can be bought for $15 per thousand one year old seedlings. We prefer to plant these small trees as the black walnut develops a strong tap root early in life, making it difficult to transplant large trees.

Only a comparatively small number of hickories have been planted in this state. This is a tree that, while it grows slowly, is very valuable for its wood and it is becoming very scarce. It should be planted more extensively. It may well be planted in openings in the woodlot. Every farmer knows the value of hickory and the trees can be utilized when quite small.

It is needless to say anything about the value of black walnut wood. High prices have been paid for standing trees and for saw logs. Many individual trees have sold for $500 apiece and even more. Prices as high as $120 per M board feet have been paid for standing timber.

At the present rate of cutting, it is only a question of a few years before all of the merchantable black walnut will have been removed, and, unless trees are planted, the black walnut will be a thing of the past. It cannot be depended upon to reproduce itself in our forests as do the maples, the ash, and many other trees with nonedible seed. For every black walnut tree in our woods and along the roads, there are innumerable small boys and squirrels who are after the nuts and the seed have little chance of germinating even if they do get into the soil. If there are to be black walnuts in our future forests, the trees must be planted or the nuts planted and properly safeguarded. From a forestry viewpoint, the black walnut is a good tree to plant. It has a high value and the demand for the wood is very great. And, for planting, trees should be chosen that will give a good quality nut as far as possible.

For ornamental planting, too, nut trees may often be chosen to advantage. For the farm yard they are often the best choice. Hickories or black walnut are long lived trees and the hickory is very ornamental. A great many trees have been planted by the school children of the State; and right here is a good field for planting, around our school houses. The average country school ground is a forlorn place, usually barren of both grass and shade. While we perhaps cannot

have a lawn, we can certainly have shade trees, and the children will take care of them and watch their development with interest, particularly if they have a part in planting them. A few years ago the College distributed about 6000 trees to the schools of the state for Arbor Day and many of these trees were black walnuts. During the last few years, the Collage has not raised enough of these trees to meet the demand.

As memorial trees, also, nut trees are being quite extensively planted. A great many black walnuts have been planted in the honor of our soldiers who gave their lives in the war and it is a very suitable tree to plant for this purpose.

Now that our forests are becoming more scarce, we are beginning to appreciate more fully the value of their products. Nuts, extracts, maple syrup and many minor products are obtained from our native trees. If man could be surrounded with the right assortment of trees, he would need little else. He would have food in the nuts and fruit; fire wood and building material in the stems, as well as paper and clothing from the wood pulp. He would have sugar from the sap, medicine from the bark, and he would have wood distillates, turpentine and resin. He could live long and well on the products of our forests.

Our forests are, however, disappearing. Our native nut trees are being cut off. Our sugar maple orchards are being put into farm land, and forest products are increasing rapidly in price. We have got to keep a certain part of the country in forests in order to have the country prosperous, and to do this we must either plant trees or so manage the existing forests that they will renew themselves naturally. In planting trees, we should not overlook the by-products of the trees, nuts and syrup and bark. These products are often the main crop in themselves and in any case, they will increase the receipts and make our forestry work more profitable.

There are many acres in southern Michigan and along the Lake, that will give larger returns from nut tree plantations than from any other source. We want first to be sure that the trees are hardy to the locality before we recommend them. I believe there is a very big future for such plantations. The history of southern plantations has been one of remarkable success.

We must be particularly careful in advising the establishment of nut tree plantations. We ought to be particularly careful in not encouraging people to buy trees that we are not sure will succeed. For every plantation that fails means a loss of money and an obstacle to future progress. But every tree that succeeds means an advertisement for years to come.

I do not see any reason why southern Michigan cannot raise many improved varieties of black walnut and perhaps some other nut trees as well. Our study of native nut tree plantations this summer, shows that with proper care they may be very profitable and we hope to see a great extension of such plantations in this State.

Prof. Chittenden: I would like to say that the College has been very favorably impressed with the work that this Association has been doing and the care that is used in recommending nut trees. It is a thing the people need a lot of advice about. I thank you. (Applause).

Mr. J. F. Jones: I would like to ask if the pecans that were tender were northern or southern pecans.

Prof. Chittenden: We got them from a nursery in New York State and I could not say as to the source of the stock beyond that.

Mr. Jones: Naturally the southern source is the cheapest tree.

Prof. Chittenden: We got the trees from a nursery that had been advertising them very extensively in Michigan. It was about five years ago, at a time when this State had been flooded with literature from this nursery and other nurseries about particularly pecans and chestnuts. We were doubtful about the trees they were recommending, and we got a considerable number and planted them out, but we took pretty good care of them; but they all died in winter.

Dr. Morris: It is a pity that people who do the most advertising have to. Certain firms are not allowed to advertise in nut journals at all. I think the public ought to be made aware of that fact. It is a pity too, because the ones who spend the largest amount of money in advertising are the ones of whom we ask the most questions.

In regard to Prof. Chittenden's paper, it is a very important matter to impress upon children and others who are setting out trees the idea that a tree is not able to care for itself as a rule. It is quite the exception for a tree set out by itself to thrive and enter into competition with other trees and bushes and shade, in the early years, and insects later. I suppose the number of ordinary trees including maples that make their way to a successful old age would not represent one in many hundred thousands that make a start in the sprouting seed. That fact ought to be impressed on every school child who is setting out a tree—he really should adopt that tree and make that its own child. And if you can inculcate the maternal and the paternal instinct along with the setting out of from one to six children of these other children, you will then get trees on your roadsides and your waste lands, and without a great amount of difficulty. But you have got to go back to first principles there and realize that very few trees are able to succeed after they have been set out unless they

receive a great deal of care subsequently. Those of us who give a great deal of attention to trees, who pretend to care for our trees, will lose a percentage so large that I would hardly dare state what it probably is. Among the hundreds and thousands of trees I have set out, all from reputable nurserymen or raised by myself; I doubt if 25% are alive today, and I have pretty good success too. This is not to discourage anyone; it is to encourage people, and they are to be encouraged by knowing the facts; and when all the final facts are known about the values of trees that are given proper attention, then people will be willing to give them that degree of attention. Not until then are we to have success in filling our waste lands with nut trees.

Prof. Chittenden brought up one point of a great deal of consequence. In any locality plant the species which belong to that locality. The species which, by natural selection and adaptation have fitted themselves to the environment are, as a rule, the trees which will do best in that locality. That is a principle I think which ought to be thoroughly well fixed in mind. One may experiment with any number of trees from a distance, but the trees which naturally have adapted themselves to a locality, the species which have done that are the species upon which we can expend our efforts to the best advantage.

In the matter of chestnut blight, we assume that the chestnut blight will act like measles blight, scarlet fever blight, or any other epidemic. In other words, it is due to a microbe, it is due to a peculiar microbic group, a peculiar family group which happened to start out in northern China on its invasion and got to this country where it found trees which were not resistant. The American and European trees are not resistant. Wherever it has gone from northern China, from the place where blight, the tree host and enemy grew up side by side, and represented the survival of the fittest; wherever it has gone away from the place where we have the survival of the fittest, at any rate as a result of struggle, there it has found susceptible individuals that it has destroyed. When a blight of any sort sets out, chestnut blight, measles, scarlet fever—any blight you please, you are talking natural history, you are taking biology, about an animal or a plant, about a microbe, a living thing. All of these living things run out of their vital energy in time. Each microbe runs out of its energy just as a breed of horses or of strawberries runs out of its energy. All varieties, varietal types, run out of their natural energy, so that it is simply a question of length of time before this family microbe or family group of this microbe will lose its energy. We do not know how many years that will be. It may be a great many years, and by that time, our chestnuts may practically have disappeared. We can find here and there a tree which resists better than others do, and we may find some with enough resistance to be worthy of propagation as of that resistant kind. We know that several species resist the blight very well. I found four species that resist the blight very well among six kinds I have tried out on my place. But some chestnuts bear so early and heavily that we may afford to set them out, even in the presence of blight, trimming them back and looking after them carefully: For instance, a number of Sober Paragon chestnuts that I planted all died but one that is near the house. It bears so heavily that it is well worth while, and it simply means that one must give a great deal of attention to it. Some people can afford even to set out the Paragon because of its high bearing power. I have a number of hybrids which resist the blight very well. The cross between the American chestnut and the Japanese, or between the common American chestnut and the chinquapins showed the resistance very largely of the resistant parent. But curiously enough, the ones which look most like the American chestnut also carry that parent's weakness in regard to blight, so that all of my hybrids between the American chestnut and the resistant kinds which look like the American chestnut and act like it also catch the same microbe for the most part. But one of the hybrids does not. No. 2 which I have given Mr. Jones, is very much like the American chestnut. It grows vigorously, acts like it, and looks like it, and it has not blighted up to the ninth year of age, beginning to bear about the fourth year. Most of those that are like the chinquapin or like the Chinese chestnut resist blight very well.

About Japanese walnuts. If Prof. Chittenden has a large number of Japanese walnuts about the state, he may very well select one or two of the very best and advise the owners to top work the others with the one or two which happen to be particularly good. Most of the Japanese walnuts are small. Most of them are Siebold type instead of the heart nut variety, but a few very large ones will be found here and there and of high quality, and they graft almost as easily as peaches.

In regard to Persian walnuts. If there are a few trees here and there about the state, we need not fear the question of introducing others because it is too far north. If you simply have one tree that is a good one, that is enough, because you can graft over all sorts of black walnuts, Japanese walnut and Persian walnut stocks with the one or two trees which are known to be good in Michigan. One good tree in the state which is bearing good nuts of desirable qualities is enough. Graft all of your other walnuts back from it. And in setting out the native black walnuts, chestnuts and the hickories of different species, it is important always to distinguish in regard to intention—whether they are to be for forest purposes or for nut purposes. That is not always clear in the minds of a number of people whom I have seen setting out groves of these trees. They talk about getting timber and nuts. You can not get both profitably. I think people ought to be impressed with the fact that if they are setting out apple trees for timber they would set them five or six feet apart. If they are setting them out for apples, they would set them sixty feet apart. Precisely the same thing is true of nut trees. (Applause).

Mr. Jones: I would like to ask Dr. Morris how he protects grafts the first year. Grafts growing the first year are very tender, put in late, and they will often winter kill in the tree that is perfectly hardy otherwise.

Dr. Morris: Mr. Jones is quite right about that, and that is a matter requiring more experience than I have at the present time. What I have done in the way of protection fairly well is this: For instance, if I graft Persian walnut on black walnut and it makes a late start and then in September has a very sappy growth, or in October has a sappy growth of three or four or five feet (they grow tremendously fast, like weeds) if the bark at the base of the graft is brown or has two or three buds that are brown or partially ripened, I cut off four or five of the first leaves and let them harden. Then in the fall I cut off all but those four or five buds and put wax over the end. That is the way I avoid the winter killing of the sappy growth. As soon as the part nearest the grafted place begins to turn brown, looks like hardening up and two or three buds are pretty hard, I cut off four or five of those leaves right there and let the buds ripen, and those buds will ripen very well. I will sacrifice five or six buds for the sake of saving three or four buds. The next year they grow all right. That is not a nice way, but when you see you are going to lose a thing on account of sappiness, that will sometimes work.

Mr. Jones: I generally wrap the base of the limb in burlap.

Dr. Morris: If the sappy tip dies, it poisons the rest. There are poisonous enzymes that poison the rest of it.

Mr. Bixby: I was going to ask Prof. Chittenden if he could give any experience with the named varieties of black walnuts.

Prof. Chittenden: I don't think I could distinguish between the varieties of black walnut that have been planted in this state. That is not a thing that I feel able to discuss. I know that a number of different varieties of black walnut have been planted. At the College we have done a good deal of grafting on the black walnuts, and we have not had very good success.

Mr. Bixby: I had in mind improved varieties of black walnut grafted on the black walnut stock.

Prof. Chittenden: I don't think we have had any experience of that. We always get a good deal of wood from Pennsylvania in the spring and do the grafting in class. We can not expect a very high grade of work when the students do it as a part of their work of instruction. There are some black walnuts in the state that have very good nuts, and some that have not. I have tried to get for our nursery good nuts from trees that had a good native nut. We have had so much difficulty getting black walnuts at all the last few years that we have taken just what we could get. We get nuts from all over the central part of the state and plant in the nursery to get our seedling trees.

Mr. Bixby: I have found some of the named varieties of black walnuts bearing in quite a number of sections of this state and other states. They seem to bear quite young.

President Reed: Mr. Jones has partly prepared a paper on "Pecans other than those of the well known sections," but as it has been impossible to complete it, it will be handed to the secretary later, and inserted in the proceedings.

PECANS OTHER THAN THOSE OF THE WELL KNOWN SECTIONS

J. F. Jones, Lancaster, Pennsylvania

Pecans have been grown in the South for a good many years, and, with the advent of budded and grafted trees of superior varieties in more recent years, the industry made great strides and now that the product of some of these grafted orchards is coming on the market and selling readily at high prices, the economic value and importance of the pecan is becoming to be more fully appreciated.

The success of the pecan in the South, led some planters in the northern states to make experimental plantings of these southern varieties but they have proven disappointing, as might be expected, since our seasons are too short for the nuts to mature, even where the trees are hardy. I have seen the Stuart, one of the largest southern pecans, when grown in Lancaster and Adams Counties, Pa., not half as large as the Indiana sorts and with little or no kernel. The Schley, one of the finest southern pecans, when grown in Adams Co., Pa., is so small that no one would recognize it and it has no kernel at all.

In very recent years, largely through the efforts of a few progressive men in Indiana, fine varieties of the pecan have been discovered in Indiana and Kentucky, and these varieties are being propagated and planted over the northern states generally. While the discovery of these varieties and their propagation marked a big step forward in extending the cultural range of the pecan and making it possible to grow this nut several hundred miles north of the southern pecan belt, not unlike the southern varieties, the Indiana and Kentucky varieties are necessarily limited in their range of adaptability, and it is perhaps not safe to recommend them for planting, except possibly in the more favored localities, north of the 40th parallel and south thereof and possibly in the elevated or mountain sections they should not be recommended for planting north of latitude 38 degrees. The advantages of securing varieties for propagation therefore from as far north as possible is obvious.

I have examined a good many sample pecans from Missouri and Kansas, some of which are excellent, but, aside from possibly being a little hardier in tree, they have no advantage over the fine Indiana and Kentucky varieties that we already have, unless of course, they should be better adapted to planting in the western states.

In its natural range, the pecan is found growing farther north along the Mississippi River, in Iowa and Illinois, than anywhere else in the country, and naturally we turned to these pecan forests hoping to find a variety bearing nuts of a size and quality to merit propagation and dissemination north of the belt where it is safe to recommend the planting of the Indiana varieties. As a result of correspondence with an Iowa nurseryman in the fall of 1914, I engaged the services of a competent man to gather pecans for me at Muscatine, Iowa. Following my instructions, this man searched the woods in that locality to find what I wanted for propagation and as a result, nuts were sent me from several trees which were carefully marked so that in case scions were wanted from any of the trees, they would be readily identified. This man seemed to be very enthusiastic about the nuts he sent me, and, as he had made a business of gathering pecans, and he knew the pecans in that section well, I felt that he had sent me the best that he had there. None of the pecans sent had sufficient size and merit to propagate however, and I gave the matter up. Fortunately, Mr. G. H. Corsan, Toronto, Canada, was endeavoring the same fall or winter to get pecans to grow trees that would succeed in Canada and he bought pecans from a dealer in Burlington, Iowa. Upon receiving this lot of nuts, Mr. Corsan was astonished at their large size, as he expected that pecans from the northern limit of the pecan to be of small size. Thinking that this party had sent him southern pecans, Mr. Corsan wrote him at once that he did not want southern pecans, explaining that he wanted them for planting. This party replied that the nuts sent him were genuine Iowa pecans. Knowing my interest in the matter, Mr. Corsan wrote me during the spring of 1915, giving me the facts in the case and urged that I go to Burlington the next fall and look up a variety for propagation. Fall came on, but with it, so much to do and with short help, due to war conditions, that I had to give up the trip, but, at Mr. Corsan's suggestion, I took the matter up with Mr. Ed. G. Marquardt, Burlington, Iowa, with the result that the matter was placed in his hands, with the assurance from Mr. Marquardt that he would do the very best he could for us. Mr. Marquardt employed a man who had made a business of gathering pecans there and who knew the trees bearing the largest nuts, and with the help of this man, finally located a tree 20 miles north of Burlington bearing very large pecans of thin shell and splendid quality. Although most of the nuts had been gathered, the husks on the ground indicated it had been bearing good crops. This tree was marked and some of the nuts sent to me. These pecans I considered remarkably fine for so far north. They were fully as large as the Indiana, with even a thinner shell and a full kernel of excellent quality. With the help of Mr. Marquardt, scions were secured from this tree the following spring, and grafting proved very successful, which we consider very fortunate, as this land was cleared during the war and this tree met the fate of others, being turned into lumber and it is no more.

This variety has been given Mr. Marquardt's name. Coming from 20 miles north of Burlington, Iowa, in north latitude 41 degrees, I shall expect the Marquardt to succeed any where south of the Great Lakes. The Indiana and Busseron pecans originated farther north than any others of the Indiana group, the original trees of which are growing in the Wabash River bottom, west of Oaktown, Ind., about 10 miles south of latitude 39. Most of the Indiana and Kentucky

varieties are from latitude 38 degrees, or approximately 200 miles south of where the Marquardt originated. The climate of Iowa is also considerably colder than is the same latitude farther east, due to the more open character of the country west and to the influence of the Great Lakes farther east. The pecans there are not only necessarily hardier, but have to mature their fruit in a shorter season, which is all important in a variety for northern planting, as it has been shown that the pecan is hardy in tree considerably north of where it will mature its fruit properly. Realizing the importance of the Iowa pecans for northern planting and realizing the building of the big power dam on the Mississippi River at Keokuk, Iowa, and the consequent raising of the water level for considerable distance up the river together with building of levees and clearing of the forests, threatened the destruction of many of the pecan trees and pecan forests, Mr. Bixby spent nearly a week during the past fall in the pecan forests and groves along the Mississippi River around Clinton, Ia., and Burlington, Ia. The facts of the following paragraphs (except the last two) I have taken from his notes:

These pecan trees at Clinton, Iowa, are the most northerly growing of the native pecans so far discovered. They are on the islands in the river and on the bottom lands, where the land at low water is only a few feet above the water level, and at high water, several feet under water. The trees certainly are not suffering from lack of moisture. The soil is alluvial, seemingly of unknown depths and must be very fertile, enriched as it is by the deposits left by the high waters each year, or sometimes, several times a year. No pecan trees under six inches in diameter were seen here, and they ranged from that size up to 24 inches in trunk diameter 85 feet tall. No trees bearing large pecan nuts were seen, although the flavor of the kernels of practically all of the trees was good. Crops of nuts were irregular and seemingly not so good as they were some years. None of the trees near Clinton were deemed worthy of propagation.

The pecans at Burlington are growing under similar conditions to those at Clinton, but they are much more numerous, there being thousands of them, some being larger than any seen at Clinton. Four trees, including the Marquardt, have been discovered and brought to the attention of the association by Mr. Ed. G. Marquardt and Mr. John H. Witte of Burlington. Cuts of these nuts, natural size, are shown opposite page 48. The Marquardt is being propagated by me and the other three varieties by Snyder Bros., Center Point, Iowa.

From the appearance of the leaves, buds and habit of growth of the Marquardt pecan, it seemed to me that the tree had hickory blood in it, although the nut did not suggest it; and I intended to look into this matter fully, on a trip to Iowa the past fall, but finding I could not go, I gave Mr. Bixby samples of the nuts, leaves and twigs and told him what I expected, and he had this in mind during his trip. He never found young pecan trees growing in the woods but did find them growing in large numbers on the levees and on the edges of cultivated fields. A careful examination showed a very considerable variation in leaf, bud and habit of growth and there seemed little question but that there were among them many hybrids between the pecan and the big bottom shellbark, *Carya laciniosa*, which is found growing on the bottom lands and the islands along with the pecan. As a matter of fact, two of the four Iowa pecans selected for propagation, the Burlington and the Greenbay, show unmistakable evidence of hybrid parentage in the nut, in the leaves and buds. The Marquardt gives no hint of such parentage in the nut, but the leaves and buds do suggest that it has hickory blood in its make up, and it is believed that this is so. The Witte is seemingly a pure pecan.

There has recently been much done near Burlington in reclaiming valuable, cultivatable lands from the river which formerly overflowed them each year so that people were afraid to plant crops and they were therefore abandoned to the forests. Levees have recently been built to keep the water off these lands in time of high water. Drainage ditches have been made behind them and pumping plants put in to pump the water out of them. The cost of these improvements, which has given to cultivation much very fertile land, has been assessed on the owners of the lands benefited, as is also the upkeep expense. Many owners had not the money to pay the assessments and have sold the land to those who are clearing off the timber. This means the clearing of thousands of acres of bottom land and the pecan is one of the principle trees on these bottom lands. This condition makes it necessary to locate and propagate at once, the best and most promising of these Iowa pecans and hybrids and observe their behavior afterwards in the young trees, instead of depending on the watching of the behavior of the original trees as has been the case in Indiana.

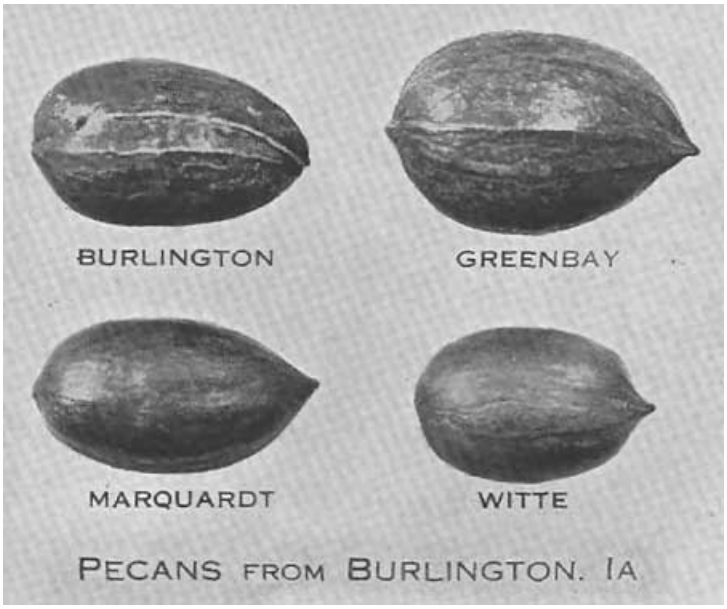
I feel reluctant to close this address without mentioning the good work done by Secretaries Deming and Bixby and other members of this Association in searching for varieties of nuts that may be superior to what we already have. Those of us who are propagating these trees, while we may feel the inspiration that comes from doing a work that benefits mankind, nevertheless, we hope and expect to make dollars and cents out of growing these trees, while this is not the case with some of the members of this Association who are not nurserymen and who do not expect to enter this field.

Dr. Deming, former Secretary of this Association, did much good work and secured some fine nuts worthy of propagation, through advertising and the offering of premiums, and Mr. Bixby, who very kindly took up this work when Dr. Deming was called to the colors, has been active and is doing a great work for northern nut culture.

President Reed: We will now have a grafting demonstration by Mr. Jones.

Mr. Jones had brought with him specimens of stock, scions and all the materials and tools needed for the demonstration, and performed the various operations of grafting and budding before the audience.

Mr. Jones: We often use scions half or three-fourths of an inch in diameter, for grafting, but they are rather hard to get. In top working, we generally take limbs two to four inches in diameter, cut them off, and split the bark. The nut grafting must all be done late when the sap is up in the trees. Cut the scions all on one side. Split the bark, slip in the scion, tie up and wax the whole scion over with grafting wax, put it on hot and seal it up tight. Sometimes for winter protection of the English walnut as far north as Michigan your tip might kill back because it grows so very fast and is sappy. I have never



Pecans from Burlington, Ia

had trees kill in that way, but I do have many people write me that they have trees killed in that way. In nursery grafting, we usually use just the cleft method. You should cut the cleft on one side and don't split it, but keep it smooth all the way through.

President Reed: You get better results, Mr. Jones, from waxing the entire scion?

Mr. Jones: Yes, we get better results that way. In the South we have no success at all that way; we have to cover them with sacks.

Voice: About what degree of heat is best for the wax?

Mr. Jones: Don't have it too hot and it can't burn. You can tell that by the wax smoking.

President Reed: As long as the wax does not smoke, it is pretty safe.

Mr. Jones: This illustrates what we call a side graft. Put the scion in the side and leave the top on. You can also do it in bark grafting. Cut your bark, split it, and stick your scion straight down as it is here.

Voice: How do you apply the hot wax?

Mr. Jones: With a swab or brush. We use a carbon heater and that makes it about the right temperature.

Voice: How large black walnut trees could be top worked to English walnuts?

Mr. Jones: You can work almost any sized tree, but it is quite a job in the large tree. Take a tree larger than six inches in diameter, or eight, and it would not be very satisfactory. In cutting the scions be careful to make a straight surface on the cut bevel. To do that the knife should be held at an angle lengthwise to the scion. In our grafting in the South we leave the scion dry and cover it with a bag. That was in Florida.

Dr. Morris: That is a very interesting question about the limits of our using the method of covering the scion and all with the wax. I shall speak of that in my own grafting demonstration which is short. I got the point from Mr. Jones, and Mr. Jones tells me he got it from Mr. Riehl. They use black wax and hard, strong wax.

Mr. Jones: Mr. Riehl uses a liquid wax, resin and beeswax without the coloring matter. We use the coloring matter to toughen the wax.

Dr. Morris: Still, that is amber. Amber will cut out light, and it seems to me that it is a matter of a good deal of

consequence, the black or amber wax covering the graft completely, buds and all, wound, scion, stock. It succeeds in the North, succeeds better than any other method in grafting, and yet in the South it does not succeed. It is possible that as you get further south the longer sun, the hotter sun scalds the cambium layer of bark beneath when it would not do so in the North. That is at least worth thinking about. In my own work during the past year I have used transparent paraffin alone, nothing else. I have tried different kinds of paraffin, the Parowax, the common one that the women put up preserves with is the one that will stay on best, will not crack and is perfectly transparent, allowing the light of the sun to act upon the chlorophyl, in the bark and the bud and intensify the activity of that part of the plant that depends upon light transformation by means of chlorophyl. I am very much interested to know if this will not succeed in the South. Paraffin would not attract the heat of the sun, and it is possible that this will allow us to carry the method of Mr. Jones, the best method to date, still farther south.

Mr. Jones: I think, Doctor, it is a matter of heat, because in the shade you can graft them almost any way. Do you cover the scion with paraffin or only the union?

Dr. Morris: I cover the entire thing with paraffin, scions, buds and all including the wrapping. I don't leave anything exposed to the air. There are several principles involved there. In the first place you have the effect of light upon chlorophyl which is important; in the second place, the melted paraffin fills all interstices in which sap would collect and ferment. If those interstices are filled with melted paraffin, sap will not collect there and ferment. The microbes of bacterial and fungus origin, that prevent union and break down the products of repair that are thrown out for the purpose of repair, can not do it if they can not collect in quantity, and the paraffin fills the space in which they would collect in quantity; so that does away with another one of the dangers. In the third place, you have the same sap tension maintained in the scion as in the stock. The difference between the negative and positive pressures, day and night, is very great in spring time, and as the sap responds between day and night in the stock, it puts a strain upon the scion. The scion can not follow the stock with its sap movement ordinarily. But if scion and stock are covered completely with paraffin, the tension remains the same, so that you do away with the shock of varying negative and positive pressures. That is an important point, it seems to me, in principle in the matter of using the paraffin. Another point is this. You prevent evaporation from scion that goes on ordinarily through the little breathing lenticels, the little apertures between the cells of the bark which allow moisture to escape as well as to enter. One would naturally believe the paraffin would fill these and smother the scion, and I presume it is that fear which has prevented the world from trying this for the past ten thousand years, because they were skilful grafters in Egypt, both in the tree world and the financial world, in the days of Hammurabi there were skilful grafters in both worlds two or three thousand years before Christ. I suppose that fear of closing the breathing apertures in the stock has prevented people from adopting this method; but it is not justified, because those bold, brave nurserymen who are not afraid to smother a scion find that all the scions live. It is a venture into the unknown, that dramatic book, in the way of dramatically constructive progress. Another point: When you protect your graft in the ordinary way with ordinary wrapping, ordinary wax, the scion becomes timid, the stock becomes timid. It is not quite sure of itself in many cases, and when it is not sure of itself, when it has a fear, what does it do? It resorts to the protection method. What is the first? Suberization, cork layer formation. So the frightened stock throws cork cells over its cut surface between that and the graft, and the suberization goes on as a result of fear on the part of the timid stock. When you have taken away the fear by covering the whole area with melted paraffin and it feels safe, then suberization does not go on in this way, your stock is not frightened, you have not a scared tree at all, and it will go on kindly and gently as a Jersey heifer to do its work.

President Reed: I would like to ask Dr. Morris about that myself. I am very much interested in the line of grafting, as we graft 50,000 to 100,000 every spring, using this same method. I feel as Mr. Jones does, that the losses from grafting are largely due to heat and the fermentation of sap. We find perhaps, that the first week of grafting in cherry, we can almost invariably secure a fairly good stand. Following that it tapers as the warmth and air increase, although the scions are kept in cold storage, perfectly dormant, the sap is coming up, and the increased rays of the sun—we get a very small percentage, and it seems to become less every day, and we have always used the dark wax. While I have been using paraffin wax a good deal of the time, I put lampblack in it for coloring.

Dr. Morris: I have until this year. In order to get Mr. Jones' points, I tried to work out the philosophy of the subject and see what values there are, what meanings in the methods which led to his success. Then following that line of investigation, I stopped into another line of observation, and arrived at the transparent paraffin method, so that this is the first year in which I have tried it, but the results are perfectly remarkable. I have only done it for a year, but you will see 100% of catches on almost everything, hickories, walnuts, hazels. I must tell you of one very remarkable incident. Mrs. Morris had some dwarf trees set out on the slope of the lawn, dwarf pear trees. One of my men cut one of them off with a lawn mower the latter part of August. The top kicked around under foot for three or four days, wilted in the sun. We were walking past it along in August. I think Mr. Bixby said, "Why don't you try grafting on that kind of material?" I said, "I will, blessed if I don't." So I cut three pear scions from this wilted top that had been cut by the lawnmower in August, and I put them on a scrub pear tree under the fence near the house. And I tried this paraffin method, and in about six days one of them started out a shoot, and I said to one of my men, "We will transplant this. This is no place for it." I meant in the spring, or in a year or so. He transplanted it the next day. And it grew I think about half an inch after that, made good wood to last through the winter. So I don't know what the limitations of this paraffin method are. But that is a thing I would

hardly dare tell about unless there were men here in this room who had seen it. That little pear top, cut off by mistake, kicked about under foot a few days in August, no sort of scion that any one would ever think of using as a graft, put it in as a joke, and with the further abuse of being transplanted; but it started growth, and now it is going to be a good pear tree.

Mr. Jones: The kicking around only made it good for grafting.

President Reed: Perhaps it ripened up to a certain extent by that drying out, like it would in the fall.

Dr. Morris: Maybe, but I have never heard of horticulturists propagating trees in that way and transplanting them in the same year, and having the new wood from the graft harden for the winter.

Mr. Jones: Mr. Reed spoke of grafting a cherry. You cut the top off didn't you?

President Reed: Yes.

Mr. Jones: We graft filberts by leaving the top on and cut the graft in on the side and wax it over. We leave it there two weeks, maybe, and cut it off, and we get perfect stands that way, and you would on the cherry.

President Reed: We use the side grafting, but we cut the top off.

Mr. Vollertsen: I would like to ask Dr. Morris with regard to the stock. Don't you think the fact that that tree was moved at the time it was, so soon after grafting, had something to do with the retarding of the sap and causing the tree to mature the wood it did in place of making more growth?

Dr. Morris: That might be. All of the expert horticultural opinions brought to bear on this are valuable. Every suggestion that has been made has had a meaning. It requires explanation.

President Reed: If there is nothing further along that line, we have with us Mr. Conrad Vollertsen, of Rochester, who has been asked to prepare a paper; and we would like to hear from him. He is an expert in the filbert, and I believe can give us some valuable information. (Applause).

HAZEL NUTS AND FILBERTS

Conrad Vollertsen, Rochester, N. Y.

Mr. President, Ladies and Gentlemen of this Convention: I have been approached by a member of the Northern Nut Growers' Association to prepare a paper to be read at this convention on the growing, cultivating, and propagating of the European hazel, together with such other topics on the subject, as would be of interest to the members of this association, particularly my experience and observations during the last three or four seasons in my hazel orchard and nursery.

Now, Ladies and Gentlemen, I am not a public speaker nor a public writer; my business is nursery and garden work; I can use spade and pick more freely than pen and ink, and, therefore, fear that I am not the right party called upon, knowing as I do, that we have members in this association far more capable and experienced, and who possess more knowledge about the European hazel than ever I had. Nevertheless as the growing and planting of the European hazel in the eastern and middle states of our country so far, both for ornamental or commercial purposes, has been more or less experimental, I think all practical information on the subject should be welcomed, and therefore I have consented to prepare this paper and hope it will be accepted for what it stands.

A number of years ago, after leaving school, I entered a large nursery and garden establishment in Germany, as an apprentice boy, to learn the garden business, to become a gardener and horticulturist, to learn how to raise trees and other plants, to learn how to graft, to prune and cultivate, and, in general, to take care of all kinds of growing plants. One of the first duties bestowed upon me in my new place was the charge of a large plot of young hazel or filbert plants. To prune or graft them? Not at all. At that time I did not know anything about such skilled labor. I was merely told to weed and hoe them and to keep them clean. It was not just very elegant work, but, ladies and gentlemen, I enjoyed very much indeed, every minute so employed among those young filbert bushes. I became really attached to them and knew practically every plant in the plot, and almost believe they knew me, too.

Now what was the reason for this immense pleasure I found in working among those plants? Was it perhaps from the commercial or financial point of view, the future income from them for fruit or when the plants reached a saleable age? Not at all. I was then too much of a boy and did not comprehend such a thing as that. It was merely the fond and pleasant

recollection of my childhood, of my boyhood, when, together with other children, in the proper season, we went hunting for the common hazel nuts, the *Corylus avellana*, as the gathering of these nuts is one of the greatest pleasures of the German country child, and to roam through fields and woods in late summer in those beautiful September days, when the foliage of trees and bushes begin to color, when the birds of the garden, field and forest begin to assemble for future migration, when goldenrod, asters and other field flowers are reaching their greatest beauty, then, ladies and gentlemen, the hazelnut has reached maturity. The nut itself is a very beautiful brown color, the outer bark a golden yellow, the leaves of the plants slightly colored with bronze, pink or yellow, a most beautiful combination, a pleasure to look upon, and a sight never to be forgotten. Whoever has had an opportunity to see and admire a well fruited hazel plant, at the time of maturity, will agree with me that it is a thing of beauty, not only during the fruit bearing season, but in fact throughout the whole winter, with the handsome staminate flowers or catkins appearing very abundantly in early fall, and remaining throughout the winter, until late spring. Of all these pleasures, these beautiful sights, etc., of which a vivid and fond recollection caused all the pleasures in cultivating the above mentioned hazel lot, we need not be deprived in our otherwise so richly blest country. It is true that, at the present time, we have no American native hazel, that can fully compete with the better European varieties, but we hope that in time not far off, through scientific hybridization, such will be produced. For the time being, we have some very fine European varieties as a substitute, which for years have stood the test very well, and should be planted wherever a place can be spared for a few of them, and great pleasure and enjoyment will be the result. So much for the pleasure of raising hazel nuts. I have related the foregoing merely to show the lasting pleasure and enjoyments derived from the planting, cultivating and gathering of a few European hazel nuts.

But to raise hazel nuts for the pleasure of it only, would be a very poor business proposition, and certainly not a paying one. What we should do is to raise them in large quantities, for commercial purposes, but here it seems to me the question should be asked: Have we had experience enough as to recommend the planting of them in the middle and eastern states for commercial purposes? In other words, is it worth while to plant them with that point in view? Now, gentlemen, I do not suppose that any one of us, at the present time, would be fully capable or prepared to answer this question intelligently or positively, as the planting of the hazel, for commercial purposes, has not been tried long enough, at least not in the eastern or middle states, to warrant a positive opinion on the subject. A great deal depends upon the variety planted, also the location where the planting is done. Much observation and experimenting is still required.

I have growing on my ground in western New York, near Rochester, several hundred trees or bushes, 6 to 8 years old, about 20 varieties, most of them German varieties, a few from France, and a few from England. They have been bearing nuts the last four seasons, and all have reached maturity perfectly. The smaller and medium sized nuts appeared to bear a little better than the larger varieties. The varieties received from France have, so far, not done well with me, as the German varieties. They are poor bearers. In the fall of 1917, I gathered from each 5 to 6 year old tree, of the German variety, about a pound and a quarter of the medium sized nuts, while hardly a pound from the larger fruited varieties (same sized plants) ripened well. I was then under the impression that the hazel not only could but should be planted in large numbers for commercial purpose. In the fall of 1918 my crop of nuts was very much less, and I had expected even a better harvest than in 1917, which certainly was discouraging to me. The plants themselves were growing beautifully, but most of the staminate blossoms or catkins were frozen, and, consequently, very little pollenizing was accomplished, and very little fruit the result. Such and possibly other occurrences, from time to time we may expect and look for, and should be ready to investigate thoroughly, before we can advocate or recommend the planting of the hazel extensively.

It really seems strange that while the hazel generally is at home in the northern latitudes, it should partly freeze when the thermometer reaches say about 12 to 18 degrees below zero, and, as I had never noticed that before, it then occurred to me that possibly another reason could be found, why so many of the catkins were frozen.

Through my investigation in the spring of 1918, I have come to the conclusion that the unusually wet season in our vicinity of western New York throughout 1917 caused the hazel plants to grow until the real cold weather was upon them, which gave the wood a very poor chance to ripen, particularly the terminal buds, where a great many of the catkins had formed, and caused not only them to freeze but also a certain part of the wood. Only the lower and more protected catkins came through the winter alright and caused what little pollenizing was done, hence the very light harvest in the fall of 1918.

Should the results of my investigation prove true, and the continuance of the wet weather prove the main cause of freezing so many catkins, then it seems to me there is nothing to be alarmed about, and the planting of the European hazel, at least in this vicinity, for commercial purposes could be conscientiously recommended, and should be done, the sooner the better. We do not expect our apple or pear orchards to bear an abundant crop every year, and we should not expect it of our hazel orchards. Something will occasionally happen to them as well as to other crops, otherwise we run no risk whatever.

My trees or bushes, several hundred in number, planted in 1912 and later, have stood all kinds of weather, extreme cold, very hot, continuous wet, and still are growing most beautifully at the present time. They gave a very satisfactory crop of nuts this last fall, 1919, in spite of severe freezing weather on April 25th and 26th when the mercury dropped to 12 to 15 degrees, and all hazel bushes in full bloom. At the present time the prospect for a good crop of nuts next season is

certainly very bright.

Neither fungus, blight, or other diseases of any kind, or troublesome insects have so far been detected. In planting the hazel for commercial purposes, I should recommend 12 feet distance between the plants each way, as they require abundant sun and air. At the same time, there is an opportunity to use the land between the rows for several years to come, as low growing crops like potatoes, strawberries, beans, beets, carrots, etc., could be grown there to great advantage, and the cultivation of these crops would be amply sufficient for the hazel plants.

Now the selection of varieties to be planted for the commercial hazel orchard is a very important part of the undertaking, and should be well considered. To plant several varieties is absolutely necessary on account of pollenizing, as staminate and pistillate flowers, though on the same plant, do not always appear together in proper condition on all plants; in fact it has been proven in my orchard that sometimes plants bring forth a great many pistillate blossoms and not a single staminate one on them, and still a good crop of nuts were grown on them. Here the pollination must have taken place with the pollen from other nearby plants conveyed to them by wind or insects. One particular plant of the zellernut type grown in one of my city lots during the last season was very well filled with pistillate blossoms and not one catkin on it, and still it ripened a fairly good crop of perfect nuts, where the nearest plants filled with staminate blossoms was at least 30 feet from it. Here it is shown and proven that a number of varieties is a necessity.

But what varieties we shall choose, will undoubtedly be an open question for some time to come, and, no doubt, a great deal of experimental work will have to be done to finally select the right varieties for the different localities, the variation of temperature and location has very much to do with the proper selection of varieties. I have among my varieties some I could recommend and again others that are not at all satisfactory, at least not so far, and it requires more close observation before the very best of them can be picked out or selected.

Our next operation in the hazel will be the pruning. Here I should say above all things: "*Keep the suckers away.*" Hazel bushes are naturally inclined to produce a great many suckers, which should be thoroughly removed as soon as they appear; it will stop when the plants grow older. Besides the suckers, all weak and unnecessary wood should be removed entirely, not cut back. Our aim should be to try and get as near as possible low standard trees, with trunk say 10 to 15 inches high and the tree itself not to exceed 15 to 18 feet in height with the center kept open all the time. To accomplish this, I should suggest the removing of all crowding limbs from the center, regardless of their being fruit-bearing limbs, which to determine is mostly guess-work at the best. In order to keep the plants within 15 to 18 feet in height, the terminal shoots also should be removed or reduced as the case may be, beginning at the time of planting until the desired height is reached. After that, one or more of the old limbs may from time to time be removed, as there always will be enough young branches to take their places. Such pruning in my orchard, so far, has proved sufficient, as blight has never made its appearance in my nursery.

I will not be able to say much about blight. I have known trees in our city, 4 or 5 varieties, for more than 30 years, bearing more or less fruit year after year, and have never noticed any blight or anything wrong with them. Should blight appear, I should remove all affected limbs to the sound and healthy wood, as we would do to our pear and quince trees when blight appears among them. I do not believe that properly treated hazel bushes will ever suffer much from blight, at least not in our vicinity. Neither do I believe that any more pruning than I have outlined is required or necessary to our hazel plants.

The next subject about which I wish to say a few words is the propagation of hazel plants. There seems to be quite a difference of opinion as to the mode of propagating them; some advocate grafting, others layering, again others from suckers only. Grafting I believe myself, will produce a finer plant and the operation of doing so seems quite successful, but a great many varieties produce so many suckers that the graft is liable to be choked or crowded out if not constantly watched, and it should not be expected of the average person to know the difference between the graft and the wild shoot, and consequently, in a comparative short time, he would have a wild or common hazel. For that reason grafted plants should not be used for the trade until our people get better acquainted with hazel plants. I, therefore, should recommend layering, thereby having the plants on their own roots, which would prove more satisfactory everywhere. That grafted plants bear fruit sooner than layers, does not always hold good; it may be so with some varieties, but not with all of them. I have some three year old grafted plants and no fruit as yet, where I had plenty of layers in the nursery rows two years old well fruited.

It is true that plants grafted on seedlings of the *Corylus avellana* will not produce as many suckers, as plants grafted on layers of the avellana type, but they will produce enough to confuse the average person, as the foliage of some varieties are so nearly alike, that it actually requires an expert to tell the difference. I, therefore, under the existing circumstances, should advise the propagating of hazel plants by layers only, until our people get better acquainted with the hazel proposition in general. Why propagation by suckers only should be preferred by some people, I fail to see, as they are practically the same as layers, plants on their own roots from a parent plant, only that layers are produced a little more scientifically and suckers more naturally; otherwise they are identically the same thing.

When I referred to propagating, I should perhaps have mentioned the growing of hazel plants from seeds, that is from the

nut, but I did not think it necessary. I will, however, say that plants raised from seed should never be planted for fruit bearing unless they are grafted or budded, as it has been fully and positively proven that plants raised from seed, even if the very finest nuts of our European hybrids are planted, will not produce nuts as good as those planted, but will almost invariably go back to the original type, the *Corylus avellana*. It is alright to raise plants from seeds for the sake of getting stock to graft or bud on, but, as to variety, the seedlings are unreliable.

Before coming to a close, I would like to say a few words about the fertilizing of the ground for hazel orchards and what experience I have had in this matter, as I believe this would be of interest to all. It is a well-known fact that hazel plants grow well and will thrive in almost any kind of soil, as long as it is not too wet or too heavy, but from time to time a little manure worked in is very beneficial both to old and young plants, but care and judgment should be exercised, so as not to overdo it. I have growing in one of my city lots with very fertile soil, several bearing hazel plants, 7 to 8 years old, different varieties. These plants grow so immensely that it plainly shows, they are growing at the expense of the fruit, not only that the quantity of nuts gathered from a plant there is considerably less than of same sized plants grown on ordinary farmland, but the quality also is very much below. My best nuts are all grown on ordinary farmland and the greatest quantity has always been obtained from the farm where only very little fertilizing or manuring had been done. For the growing of young plants for commercial purposes, for the trade, I should recommend liberal manuring at all times. (Applause.)

Question: Is the hazel a long lived tree?

Mr. Vollertsen: I have known trees for almost forty years that are bearing good fruit year after year, although not always a good crop. They don't seem to grow so rapidly at that age as when younger.

Dr. Morris: Hazels seem to graft pretty well on each other. I think the tree hazel is going to be our most successful stock for grafting. However, I have grafted on the *Corylus avellana*. The tree hazel does not put out any suckers.

Question: Does the hazel find its way into the market commercially?

Mr. Vollertsen: I would almost think so. I have had lots of inquiries for them from storekeepers. It seems to me there are a great many imported around here. Our American hazels are not so very good. There may be here and there a fairly good one, but I have not found any really good ones worth propagating. I think if we would do more scientific work we could get very good nuts. There is no question that they are perfectly hardy and will stand almost any climate.

Mr. Jones: Some of your varieties are hybrids aren't they?

Mr. Vollertsen: They are all hybrids. I have a few of the real, original *avellana* type I think got there by accident.

President Reed: I believe the next paper is one the secretary has from Mr. A. H. Graves.

DISEASE RESISTANCE IN THE AMERICAN CHESTNUT[1]

Arthur H. Graves

(Read by the Secretary)

Your secretary, Mr. Bixby, has asked me to tell you about the native chestnut trees in the vicinity of New York City which I have found to be resistant to the destructive bark disease. I commenced the search for such trees in the summer of 1918, at the suggestion of Dr. Haven Metcalf, of the laboratory of Forest Pathology, Bureau of Plant Industry. During the campaign in Pennsylvania against the bark disease, scouts had been on the lookout for immune or resistant trees, but without result. As far as I am aware, no systematic organized search had been made for such individuals.

It was our plan to commence the search in the region of New York City, because this area is probably the oldest center of infection in the United States. Apparently this is the port of entry where the undesirable immigrants (Japanese or Chinese chestnuts) passed through quarantine and were allowed to disembark carrying their terrible scourge with them unnoticed. According to Metcalf and Collins,[2] this was probably as early as 1893. This was why we selected this area to begin on, for here the disease has had a longer opportunity to run its course than anywhere else, and, consequently, has had ample time (more than a quarter of a century) to call out the non-resistant trees. Those remaining, if any could be found, might be suspected, *a priori*, of being resistant.

As the work progressed, I soon realized that it would be most difficult, or perhaps impossible, to locate resistant or immune trees in a region not so long exposed to infection; for, in such a region, one would have to inoculate all individuals suspected of possessing resistant qualities, in order to ascertain whether their healthy condition was actually

due to resistant qualities or simply the result of a chance escape of infection. We therefore decided to restrict the work, for the present at least, entirely to a definite area about New York City. This area includes all of the territory within a radius of about 16 miles from New York City Hall, and therefore comprised in a general way, Greater New York and the adjacent parts of New Jersey.

Results of the Survey

First I made a thorough canvas of Staten Island, doing the work on foot, aided by the trolley and the Staten Island R. R., and often guided by that genial naturalist and lover of Staten Island, Dr. Arthur Hollick of the Staten Island Institute of Arts and Sciences, I made a careful survey of the whole 64 square miles of which the island is composed. After two weeks of this kind of work, I began to get fairly well discouraged, not so much because of lack of results which, it is true, were entirely negative, but more on account of the appearance of the dead chestnuts. For where it was not entirely cut out, the bare, weathered poles showed that they had been dead for many years. The only encouraging feature was the finding of large quantities of healthy seedlings, from 7 years of age upward, to which I will refer later.

The Palisade region along the Hudson has been notable in the past for its chestnut forests. I next attacked this, making as thorough a search as possible from Hoboken to a little north of Alpine, N. J., which is a small place on the Hudson opposite Yonkers. Here also the vast forests of dead poles weathered gray with time, bore silent witness to the completeness of the destruction.

About the middle of July while ferrying across the Hudson, I noticed north of the landing at Dyckman St., what appeared to be chestnut trees in bloom. On investigation, I found these to be living native chestnuts, of the peculiar strip type I shall describe later, and proceeding further north from this, where the Harlem enters the Hudson. I was led into a forest where I found at least 40 living chestnuts, some of which were in good condition, and one particularly was leafy nearly to the top. (Fig. 1) Naturally, one would immediately suspect that somehow these trees had escaped infection, but this could not possibly be the case, for mixed in with them on all sides were bare, weathered trunks showing signs of old worn cankers, proving incontestibly that the fungus had been present here also for a long period. Shortly afterward, Dr. Olive, of the Brooklyn Botanic Garden, informed me that he had seen living chestnuts near Hollis, L. I., and at Valley Stream, L. I., and at each of these places I found a group similar to that near the Harlem.

These, in brief, are the high spots of the survey from the point of view of the scientist. In addition, I covered adjacent region of New Jersey to the west, including the Watchung Mt. range about Plainfield and the Oranges; the Bronx and Van Cortland Park and the country to Yonkers and the north, and to the northeast of New Rochelle. Long Island, as far as Hempstead, was also included. Altogether I travelled about 1200 miles on foot, not counting the distance traversed on trolleys and railroads. Always armed with opera glasses, I was careful not to use them when anyone was looking, for on the second day of the survey I had been arrested on the charge of being a German spy! I was also arrested on board a train in New Jersey for looking earnestly at a topographic map, then sharply out of the car window and noting what I had seen (dead chestnut trees) on said map. The carrying of a botanist's tin can (containing fungi, not bombs) was also an additional implicating circumstance on the latter occasion.

What then were the results of the survey? They may be stated briefly as follows:

1. No immune trees were found.

2. For the most part the older trees (from 20 years upward) were entirely dead, and had been so for a long period, as attested by the bare trunks, weathered a characteristic gray color which only time can produce.

3. However, large numbers of seedlings and young saplings were located, both healthy and diseased.

4. *The most important result was the finding of three well defined colonies of living mature trees; all of which, by virtue of characters to be presently described, are offering more or less resistance to the disease.*

Seedling Trees

It is well known that seedlings and young saplings are naturally immune for a certain period, which varies in extent from 8 to 15 years beyond germination of the seed beginning, of course with the first formation of the seedling. Such immunity depends, however, not on any inherent characteristic, but on the fact that at this period the bark is usually smooth, sound, and free from wounds of any sort where Endothia spores and mycelium might enter. Of course, when wounded from any cause whatever during this period of youth, this immunity ends, so that the condition might perhaps be termed physical, in contrast to physiological immunity.

As I have already said, large numbers of seedlings, for the most part still unattacked, were found in many places in the area surveyed. There are of course no grounds for believing that such seedlings, descended as they are from non-

resistant trees, are physiologically immune. Where they are free from disease, this exemption is due merely to the physical immunity I have just mentioned. Since they therefore represent non-resistant stock, they were used for comparative inoculation work, which will be referred to later.

I may as well say here as anywhere, that by resistance, I do not mean total resistance, for that would be immunity. There are, of course, degrees of resistance, in the plant world just as in the animal world. One person may resist a cold germ or the influenza bacillus better than another, that is, it will cause him only a little discomfort. Another person may not be affected at all, that is, he is totally resistant or immune. I say this because I have misunderstood when I have used the term resistance. The trees in the New York region show all grades of resistance, from individuals where the fungus makes very little headway in the bark, to cases where it grows almost as fast as in the average non-resistant tree.

Characteristics of the Resistant Trees

What now are the characteristics of these resistant trees? How are we going to know one when we see it? I have outlined the leading features as follows:

1. Bark. In the case of this particular disease, it is obvious that the character of the bark is the most important feature since this fungus is primarily parasitic in the living cortex. In other words, the character of resistance must necessarily depend on the living cells of the cortex. Now, careful observation of the resistant trees reveals a most striking feature of the bark, namely its tendency to heal, by means of a callus growth around the margins of the lesions, whether large or small; and it is very apparent that this callus growth wards off the advance of the fungus for a time at least. When the callus growth is once formed, the fungus of the original canker encroaches on it very slowly, or often not at all. Inoculations in the callused margins of cankers showed usually only slight growth of the fungus after two months' time in the summer, or in some cases no growth at all. Several layers of wood could be counted underneath these callused margins—often 6 or 7—before reaching the annual ring exposed at the surface of the canker. This of course, shows unquestionably that the callus had remained healthy at that location for that period of time.

2. Extension of the Callus Tissue.—In many cases the callus tissue is of considerably greater extent than the normal area one would expect around a wound. It may even occur that the whole inner bark around the trunk is of a callused nature, without any open cankers showing at all. For example in a tree of which I have a photograph here (Figs. 2 and 4), the outer bark is sloughing off, revealing callused bark underneath of entirely different appearance, which no one would recognize as chestnut bark. This particular tree photographed represents an extreme in this respect. It seemed as if the whole tree was getting a new kind of bark, and yet this same character appears in all of the highly resistant trees. On cutting into this new callused inner bark it was found plentifully dotted with tiny *Endothia* lesions, which however, never penetrated deeply. (Fig 4). Close to the cambium the white inner bark is quite healthy, generally for a thickness of 5-7 mm. That the mycelium in the small lesions was unquestionably the *Endothia* mycelium, was shown by the appearance of the mycelium, and the presence of the *Endothia* pustules in many of the spots. That these were not late infections, but only slowly growing small lesions, was shown by inoculations in such bark, which revealed scarcely any growth after two months.

FIG. 1

One of the most resistant trees, the smaller tree near the center of the photograph, near the Harlem River, Boro of Manhattan, New York City.

FIG. 2

A very strikingly resistant tree at Valley Stream, Long Island, showing peculiar inner bark. The outer bark is sloughing off.

FIG. 3
One of the "strip" trees in the forest in the Boro of Manhattan, New York City.

FIG. 4
Showing the character of the inner bark of the Valley Stream tree (Fig. 2). At one place, near the center of the photograph, the bark has been shaved showing the small lesions caused by the fungus.

3. The White Secretion.—The most striking peculiarity of the callus tissue, is its abundant content of a thickish, milky, white substance. This came to light immediately when I cut into the callus, and it showed up very clearly when I shaved off the outer layers of dead cork tissue. The white material is not evenly distributed through the irregular grain of the wound tissue, but is particularly abundant in small spots or pockets which are especially conspicuous in the callused margin of the lesion. Soon after exposure to the air the cut bark, and particularly the white substance, redden rapidly, indicating oxidation. This peculiarity is of course true of all chestnut bark, yet here the reddening seems to be deeper and more rapid than the normal. No chemical analysis has yet been made of this substance, but there is sufficient other evidence at hand to warrant a tentative statement that it is very rich in tannin or tannin compounds, and that possibly the quality of resistance is bound up with the nature of this material.

4. The Strip Condition.—Some of the trees showed the living bark restricted to a narrow, flattened, rope-like strip running up the trunk to one or a very few branches (Plate 1, Fig. 3). In these cases all of the bark was of the callus nature, rich in the resistant substance, and plentifully besprinkled with small Endothia lesions, while underneath were a number of layers of functioning wood. The rest of the trunk was bare, weathered gray, with traces on its surface of old cankers, and evidently dead for a long period. This type of tree was so commonly found that I have called it the strip tree.

Inoculations

The very fact that these trees are now alive in this New York region is pretty good proof of their resistance. But of course the most conclusive test is by inoculation with the fungus in question. If the fungus grows slowly in these trees as compared with its growth on non-resistant stock, then no one can deny that they are resistant. I will not bore you with figures of tables, I will only give you the results. The average growth of the fungus in 289 inoculations on the resistant trees was about ⅓ as fast as on non-resistant stock, and taking the rate of growth on those trees which are especially resistant it is about ¼ as fast as on the non-resistant stock. For non-resistant stock the seedlings on Staten Island were inoculated, and the growth on these tallied very closely with growth in non-resistant trees inoculated by Anderson and Rankin.[3]

Another very striking result brought out by the inoculation work was that of the 158 inoculations on branches and basal shoots of the resistant trees, only nine had been girdled after one month's growth, while in the same time 16 out of the 32 non-resistant Staten Island trees were girdled. At the end of the second month, the results were still more striking. Then, in the Staten Island trees, 22 out of 32 were girdled, while in the inoculations on the basal shoots and branches of resistant stock only 22 out of the 153 resulted in girdling. This striking difference was not due to smaller diameters of the Staten Island trees, for particular pains were taken to have them approximately equal to the branches and shoots inoculated in the resistant trees.

Summary of Evidences of Resistance

We may summarize the evidences of resistance as follows:

1. The results of the inoculation tests show that the fungus grows in these trees on the average from ¼ to ⅓ as fast as in ordinary chestnut.

2. The occurrence of the trees in a neighborhood long subjected to the disease, and their presence among the trees of individuals long since dead.

3. Indications of the long period the disease has been present in the trees themselves; such as bare weathered tops, and healed cankers.

4. Peculiarities of the bark; such as extensive development of the callus tissue, and the presence of a peculiar substance or white secretion which is particularly conspicuous in cases of marked resistance.

Is the Disease Resistance Here an Hereditary Character?

As to whether this disease resistance is an inherent character and will be transmitted from generation to generation, or is only the result of particularly favorable environmental conditions such as soil, light or moisture, is a point of great practical importance. I believe that further work will prove that the resistance is heritable, for the following reasons:

1. The resistance is not due to a particularly favorable environment of the trees, for the three groups grow in very different soils and under varying conditions of light and moisture.

2. The finding of the trees in colonies points to a genetic variation. At first I was unable to account for the grouping of the trees, for I had expected to find immune or resistant trees singly, here and there. But if we adopt the hypothesis of a heritable protoplasmic variation—something in their "blood," so to speak, the explanation is easy. We know that chestnut fruits or nuts do not travel far, like the seeds of willow, poplar, maple or ash, and therefore, in any given stand of chestnut, if we could go back from generation to generation into earlier time, most probably the majority of the trees would be found to have arisen from a common ancestor, although of course a few outsiders would have found their way into the group, carried by squirrels or other animals.

3. In a considerable number of cases all the members of the same group of coppice trunks from an old stump show a similar degree of resistance. To attribute such a condition as due merely to chance, occurring as often as it does, would be placing a pretty large burden on chance; and since the coppice trunks are all off-shoots of the same plant, the condition is what one would expect were the resistant quality in inherent character. A correspondence of degree of resistance was also noted, in the inoculations made on branches, trunk, and basal shoots of the same individual tree.

Experimental work is being carried on at Washington to test out the truth of this hypothesis, i. e. to see whether or not the disease resistance is really heritable. The work is being carried on in connection with the propagation of other resistant stock, Chinese, Japanese, etc.; and, as soon as the department is sure of the product, the results will be distributed to nut growers and others who are interested.

In the meantime we can all help by being on the lookout for resistant native trees. I believe they will be found in many places besides the New York region.

FOOTNOTES:

[1] Illustration for this paper will be found opposite page 64.

[2] Metcalf, Haven & Collins, J. Franklin. The Control of the Chestnut Bark Disease. Farmer's Bulletin—467, 1911, P. 5.

[3] Anderson, P. J. & Rankin, W. H., Endothia canker of chestnut. Cornell Univ. Agri. Expt. Sta. Bulletin 347, 1914.

EVENING SESSION

Sanitarium Gymnasium, at 8:00 P.M.

President Reed in Chair

Dr. J. H. Kellogg: Ladies and Gentlemen: Battle Creek has the honor today and tomorrow to entertain the Northern Nut Growers' Association. This association with other associations having similar purposes, is undertaking to do, it seems to me, one of the most important things that can be done for the American people—to show us how we can get our nitrogen, our protein, and our fats without the livestock industry which is wasting at least nine-tenths of the grain, or in fact at least nineteen-twentieths of all our foodstuffs. The great cause of the high cost of living at the present time is that the pigs and the cattle are eating up our corn and other good things that we ought to eat ourselves. If we had a sufficient area of land, perhaps even the sides of our roadways and railways planted out to black walnuts and other good nut trees, we would have all the protein and fat we needed, perhaps as much as we are getting now, and more, and the cattle industry might be entirely dismissed from consideration, and a great deal of labor would be saved. I am sure that there is no place in the whole United States where this Association could have a heartier welcome than here in Battle Creek, or where people could be found who would appreciate its labors any more. You are going to have a very interesting program tonight. We are favored with visits from very distinguished gentlemen from all over the United States, among others Dr. Robert T. Morris, the nestor of American surgeons has come all the way from New York to tell us about some wonderful discoveries he has made, and a fatherless walnut tree he is cultivating, and other things that will be of great interest to us all I am sure. I take pleasure in introducing to you the president of this Association, Mr. W. C. Reed, of Vincennes, Indiana. Mr. Reed.

President Reed: We are simply continuing our program. This afternoon we were in session at the Annex and moved over here this evening so as to be able to present what we have here so we could entertain more of you than we could over there to advantage. You know that most all men have a hobby along some line or other, and those who constitute our leaders, whom we have to look to, and along the line of nut trees of different species and so on, we have learned to look to Dr. Morris as one of the leaders. I have great pleasure in introducing to you Dr. Robert T. Morris, of New York, who will address you on the hickory.

NOTES ON THE HICKORIES

Robert T. Morris, M. D., New York City, N. Y.

When people speak of the "hickory" without qualification, they are apt to have in mind some one kind of hickory which belonged to their boyhood environment. All other kinds which they happened to know, were qualified in some way, very much as the word "fish" in Boston stands for the codfish only, other kinds of fish in the world being described by qualifying names. In the northeast the hickory means the shagbark. In Missouri it means the shellbark. Elsewhere the pignut and the mockernut are called "hickory." Interest in the subject has increased so rapidly of late years that we must all of us be more particular in our descriptions and add qualifying names, speaking always of the shagbark hickory, pecan hickory, or bitternut hickory as the case may be. Sargent describes fifteen species of hickory and in addition a large number of varieties by environment and by hybridization. There is a Mexican hickory, making sixteen species for the North American continent, and the late Mr. F. N. Meyer, Agricultural Explorer from Washington, has found a hickory in China. Previous to this discovery, it was believed that the hickories belonged to the North American continent only.

Botanists divide the hickories into two groups, Apocarya and Eucarya. For convenience in every day conversation, it might be well for us to speak of the "open-bud" group and the "closed bud" group. *Apocarya* or the "open bud" group, includes the pecan hickory, *Carya pecan*, the bitternut hickory, *Carya cordiformis*, the bitter pecan, *Carya texana*, the water hickory, *Carya aquatica*, the nutmeg hickory, *Carya myristicaeformis*, and the Chinese hickory, *Carya cathayensis*. The winter buds of this group will be seen on examination to show the minute, snugly curled-up leaves which are ready to burst forth when the springtime sun opens the fronds of the ferns which have forced their way through

the hard ground with clenched fists. The scale buds in the open-bud group do not cover the tiny leaf forms completely.

In *Eucarya*, or the "closed-bud" group, stout scales close the bud completely against the snow and ice of wintry days, so that we see scales only when looking at the bud. The closed-bud hickories include the shagbark, *Carya ovata*, the Carolina hickory, *Carya Carolinae-septentrionalis*, the shellbark, *Carya laciniosa*, the mockernut, *Carya alba*, the smooth-bark hickory, *Carya leiodermis*, the pallid hickory, *Carya pallida*, the close-bark pignut, *Carya glabra*, the loose-bark pignut, *Carya ovalis*, the Florida hickory, *Carya Floridana*, the Buckley hickory, *Carya Buckleyi*, and the Mexican hickory, *Carya Mexicana*.

Hickories which have nuts with a bitter pellicle, all belong to the open-bud group. These are the bitternut, Texas hickory, and water hickory. Hickories with scaly bark are found in both groups. In the open-bud group, the trunk of the water hickory carries long loose bark strips attached by one end, and in the closed-bud group, we find this characteristic belonging to the shagbark, shellbark, Carolina hickory, and to one of the pignuts, Carya ovalis. That takes us to another occasion for a note. What do we mean by "pignut?" In the North, this term is applied to Carya glabra and Carya ovalis. In the South, it is applied to Carya cordiformis. A name so well established, will have to be retained, but in our Association it will perhaps be best to have an understanding about which one of the hickories the common name pignut should belong. So long as it already covers two species in the North as opposed to one in the South, there are already two votes to one in favor of retaining the name pignut for Carya glabra and Carya ovalis. We may describe these in plain language as the smooth-bark pignut and the loose-bark pignut. The reason for choosing the name "loose" instead of "scaly" is because we are pretty well agreed upon applying the name "scalybark" to the Carolina hickory, the name "shagbark" to Carya ovata, and the name shellbark to Carya laciniosa. The name bitternut may safely be allowed to remain with Carya cordiformis because the other two nuts with bitter pellicle already have distinctive names, Carya aquatica being called water hickory and Carya texana being called bitter pecan. By making fixed points in nomenclature in this way we may head off the confusion which will become worse confounded as the interest in hickories becomes rapidly enlarged, if our committee on nomenclature does not take some decisive step.

Concerning Latin nomenclature, we have further troubles for settlement. Hicoria is the oldest generic name and naturally should have priority but the Vienna Congress of Botanists adopted Carya. So far so good (or bad). Now comes our trouble in giving specific and varietal names. The binomial is clearly applicable enough for species, Carya pecan, for example, but when we come to varieties of the pecan there are two kinds of varieties to be considered, those by environment and those by hybridization. In cases of natural variation we are still within accepted resources in nomenclature by saying for example, Carya pecan, var, Stuartii. When naming hybrid varieties, however, I would suggest that in advance of the abbreviation "var", we place the abbreviation "hyb." thus reading for Brown's pecan, "Carya pecan, hyb. var. Brownii," instead of "Carya Brownii," which latter binomial would throw it among the species. In view of the fact that we are to have in the future hundreds of named hybrids, it seems to me that we must adopt some such definite method for convenience promptly. This method of naming, relates to convenience and is applied to the most evident parent. As a matter of fact, in horticultural circles we are doing precisely that sort of thing, speaking, for example, of "Brown's pecan" meaning a nut which we recognize as being a hybrid, brought to attention by Brown but with the pecan as parent most strongly in evidence.

When I was a boy, the only hickory nuts of any sort available, were those collected from wild trees. The popular boy was one who knew of some trees which furnished the best nuts and who did not keep the news to himself. The squirrels knew the best nuts as well as the boys did and they would go past many hickory trees along fences and groves in order to congregate in the ones which had the nuts with the thinnest shells and plumpest meats of best quality. In the early morning hours I have seen several squirrels in one particularly good hickory nut tree and not a single squirrel in a tree completely filled with nuts, though its branches touches those of the first one. Men are quite as intelligent as squirrels in some respects. Here and there attempts were made at propagating fine hickory trees of various species by planting nuts. It was not generally known at that time that the hickories were so thoroughly crossed like the apples, that they would not reproduce true to type from seed. Attempts were then made at grafting which were mostly failures for many years. We are now on the verge of a great development in hybridization or crossing of choice kinds of hickories and in determining upon which stocks the different kinds of selected hickories may be grown to best advantage. Hybrids between varieties of hickories occur frequently in nature and hybrids between species of hickories occur occasionally. A number of these accidental hybrids have been discovered and some of them are now being propagated. For the most part they do not represent the best quality of the best parent but it is a notable fact that the bitterness of kinds with the bitter pellicle appears to be a recessive character and disappears usually from hybrids between species in which one parent has a bitter nut. Unfortunately, the finer extractive which give character to the nut of the better parent are prone to disappear also. This is in line with our experience in mixing of characters along Mendelian lines. Given a sufficient number of hybrids and we shall have here and there one with spectacular characteristics of special value.

Now that horticulturists at the present moment are turning so freely toward the idea of producing quantities of hybrids artificially, the next generation will see hickory nuts which were not dreamed of in the days when I was a boy. The crossing of hickories is not difficult work. We simply remove the male flowers from branches carrying female flowers before the male flowers have begun to shed their pollen. The female flowers are then covered with oiled paper bags tied

over them for protection and when the danger from self pollination has passed, we take off the bags and add a little pollen which we have kept for the purpose—pollen from some trees bearing remarkably valuable nuts.

Nuts resulting from this cross pollination when planted, give us new varieties of trees which never have been seen before by anybody and that is so interesting that very many people will probably take up hybridization as an incident in recreation. Some of the hybrids will bear very early in their history and others very late. If one is impatient to determine at once which ones are to be valuable, he can hurry the process by grafting a number of cuttings from young seedling trees into the tops of larger trees which are already bearing—labeling each graft, so that he may keep track of the seedling stock from which it came. It is possible to put one hundred or more seedlings in the top of some stock tree at one time.

One reason for delay in propagation by grafting is because the hickories like many other trees are slow in making repair of wounds. Grafts usually perished before being accepted by the stock under grafting methods that were in common use. The best step forward in grafting method for hickories is one that I obtained from Mr. J. F. Jones, Lancaster, Pennsylvania. He tells me that he obtained the method from its originator, Mr. E. A. Riehl, Godfrey, Illinois. This consisted in covering the entire graft, buds and all, with melted grafting wax and including also all of the wound and wrapping of the stock. The buds make their way through this grafting wax without any difficulty, but the grafting wax used by Mr. Jones contained lamp black and that used by Mr. Riehl consisted of a beeswax and rosin mixture. It was found that these seemed to be applicable in the North but not farther south in the hotter sun. Examining into the reasons for this, it seemed to me that in all probability the black grafting wax used by Mr. Jones and the brown or amber grafting wax used by Mr. Riehl, would naturally allow the heat rays of the sun to pass through to the graft while halting the actinic ray of light. The latter is extremely valuable for promoting the activity of chlorophyl, which acts only in the presence of light and in the best way in the best light. The heat rays might have certain destructive qualities. With this theoretical idea of the situation in mind, I employed melted paraffin in place of the grafting wax, covering the scions completely as well as the wound in the stock and the wrappings. This immediately proved to be a success. In fact, it appears to have changed the entire subject of grafting nut trees in such a way that any intelligent boy employing this method can now do better hickory nut grafting than would have been possible at the hands of an expert two years ago. The melted paraffin fills the interstices in which sap might collect and ferment, but at the same time, hardening so quickly that it does not introduce the danger of extension between points of contact with scion and stock. The second point of value consists in allowing the actinic ray in the sunlight to act upon the chlorophyl in bud and bark of the scion and it does not attract the destructive heat ray. This is perhaps the most important single point of value and due to the transparency of the paraffin. Third, the paraffin coating, impervious to air, maintains the sap tension equally in the course of fluctuation between negative and positive pressures occurring between night and day, and under varying conditions of light and temperature. This maintenance of equalised sap tension, I believe to be important. The paraffin is waterproof and prevents evaporation from the scion, which otherwise is prone to dry out before granulation of the wound has taken place in the hickories, as in other species which callus slowly. Fifth, under the paraffin coating of stock and scion, the plant apparently does not have that anxiety which would otherwise lead it to introduce the protective feature of superization, the spreading of a corky layer over the wound surface between stock and scion, thus introducing a mechanical obstacle to union.

This method of grafting has extended the grafting season for nearly two months, apparently. Formerly, I hurried to get all of the grafts in while buds were bursting, in early May. During the season of 1919 I grafted hickories up to August sixth experimentally. The last grafts which caught well in a practical way were put in on July twenty-first. After that the proportion of catches was small and the growth feeble. Incidentally, it may be remarked that filberts grafted as late as August sixth, did perfectly well. The scions employed were cut in late winter and kept in the sawdust of my icehouse. I formerly supposed that ice beneath the sawdust was important, but this year I could not get ice and the scions kept just as well. In July, experiments were tried with grafting directly from one tree to another, using wood of the season's growth. This worked well with hazels, but not with hickories or walnuts, only one out of many hickory grafts catching. That one, however, is significant and I hope to work out principles which will allow of direct grafting of hickories as readily as may be done with the hazels.

When a hickory graft is to be inserted into a small stock or branch, the ordinary cleft graft does well. In stock recipients much larger than the graft a side cleft of the width of the scion only is desirable, or better yet the "split bark" method devised by Mr. E. A. Riehl. A straight split is made in the bark of the end of the stock, and the graft crowded down into this split so that it remains between bark and wood finally. My own method for large stocks, is what I have called "the slot bark method." This consists in turning down a width of stock bark measuring the same as the scion in width. When the scion has been inserted into this slot so made, the bark is turned up over it again and fastened there. By this method I have put scions in the trunks of trees nearly a foot in diameter and at any chosen point, sometimes several feet below the ends of cut branches. One may cut off the top of a large hickory tree and then peg the trunk full of scions by means of bark slots.

Another important point in hickory propagation work consists in the employment of the Spanish windlass for fastening graft and stock together. The old time wrapping of twine or of raffia had to be released in order to allow growth at the point of union of scion and stock. When cord is used it cuts deeply into the new growth, and raffia, which is placed on

flat, will be burst open. In either case new wrapping is required at a precarious time, according to old methods. The Spanish windlass, which is used in surgery for controlling haemorrage, seemed to me to be applicable for fastening scions in place. It consists in a paraffined cord with ends tied in a firm knot but hanging loosely about the graft and wound. A wooden skewer or any small lever, is then inserted into the loose loop of cord and twisted about until the part of the cord about the graft wound is so snug that it holds the scion in place more firmly than it can be held by any other sort of wrapping. In order to prevent the cord from cutting into the bark, two shields of wood or metal an inch in length, are interposed between cord and bark. The lever of the Spanish windlass is fastened with a cord or with a galvanized nail in order to prevent the windlass from unwinding and the whole covered with melted paraffin. This may remain in place for two seasons without change, holding the scion firmly in place all of that time and requiring no attention. The growing stock separates the two shields very much as it might separate two stones in the field and automatically unwinds the Spanish windlass by sheer force, just enough to allow growth without any unloosening of its holding apparatus.

In hickory grafting, much experimental work remains to be done in the choice of stocks for grafts of different species. Almost all of the hickories that have been grafted upon the pecan hickory stock, seem to do pretty well upon that stock, but the converse is not true. The pecan apparently does not do well as a rule when grafted upon other hickory stocks, even upon those of its cousins in the open-bud group. The shagbark hickory, in my experience, has done best upon stocks of the shagbark or mockernut or pignut. A number of years, however, are required in some cases for determining that point. Shagbarks which I have grafted upon bitternuts have sometimes made a remarkably good start. Then at the end of three or four years they begin to slow up, while shagbarks on shagbark stock, starting slowly at first, surpassed the ones on bitternut stock finally.

In the spring of 1919, I topworked two trees standing near together and of about the same size (thirty feet) with Beaver hybrid (a cross between the bitternut and the shagbark). One of the trees was a bitternut and the other a pignut. Almost everyone of the grafts of the Beaver grew thriftily on the bitternut. Those on the pignut stock practically all caught and made short growth and then began to wilt back. Finally, only one shoot remained alive. This very striking object lesson will have bearing in varying degrees in all of our hickory grafting. According to my experience to date, hybrid hickories are grafted more readily than are straight species or varieties. They seem to have lost family pride and seem to take up with any friend offering economic support. In the case just quoted, however, caprice was shown by the Beaver hybrid which took eagerly to a host of the species of one of its parents. It refused to thrive on the pignut which did not represent either one of its parents although that same pignut stock would have been accepted by shagbark scions—the shagbark representing the other parent of the Beaver. This sort of experience throws open the entire subject in such a large way as to show what possibilities of success and failure lie before us in experimental work. The same method of grafting, the paraffin windlass method, was employed for these two trees which were neighbors.

Interesting experimental work is to be done in finding the extent to which different species and varieties of hickories may be grown out of their indigenous range. At Stamford, the bitter pecan from Texas, appears to be perfectly hardy but it makes very slow growth—sometimes less than an inch in a year. The Buckley hickory also from Texas, grows thriftly at Stamford and so does the Carolina hickory Pecans from the northern belt thrive at Merribrooke, but those from the southern belt have such a long growing season, that their new wood is not yet sufficiently well lignified to stand the winter well. Some of them pull through a mild winter in fairly good order, but on the whole they do not thrive.

The commercial side of hickory raising, is being worked out for the pecan only at the present time. We may assume that several of the other species of hickory adapted to growing in the north, will equal pecans in importance, eventually. The reason for that is because some of the other hickories stand quite as high as the pecan in food value and general excellence. At the time of writing, low grade seedling shellbark nuts from the West are selling in the retail market in New York for forty cents a pound. I have seen better nuts of this species being loaded on the cars in Ohio at fifty cents a bushel. The present New York price, to be sure, represents a profiteering war price. Fine grades of shagbark hickories and some of the hybrids will command prices equally high with prices for best pecans in the market of tomorrow.

Voice: Will it be practical to plant nuts, get young plants, and then bud or graft them?

Dr. Morris: Yes, that is what we do. It is practical to plant nuts for the purpose of getting a stock, but not for the purpose of getting nuts. But we plant them in the nursery rows, and then when they are two years old, preferably (some like three-year-old trees), we graft them over to good kinds in the nursery row; then they remain there for a year or two, and are transferred or sold. We now have members of this association who are experts in grafting nut trees who make that a business. It is not generally known that we have in this country three journals devoted wholly to the subject of nut culture. We have nurserymen who make a specialty of grafted nut trees of the very best sorts, so that one may perhaps take up this mode of farming more profitably today than almost any other sort of farming. One gentleman in Pennsylvania told me he made thirty thousand dollars on one crop of chestnuts two years ago, cultivated chestnuts. He had thirty acres, and no tree was yet fourteen years of age. His net profit beyond all expenses was thirty thousand dollars that year. There are probably very few professional men who make more than that a year. Many men are making good, comfortable incomes out of their nut orchards. It is the best insurance against the needs of old age, the best sort of life insurance.

Voice: Do you use anything besides the hickory as stock for grafting on?

Dr. Morris: Yes, we have some experimenting to do in order to learn which stock will best serve for a certain variety. We find that one species or variety of hickory will accept other varieties of that species well, but perhaps it will not accept another species. We do know that certain kinds do remarkably well on certain stocks; but the entire range of that subject has not as yet been worked out.

Question: Does the stock you graft on have any effect on the quality of the fruit?

Dr. Morris: The stock on which you graft is supposed to have no effect at all on the quality of the fruit. But there are some exceptions. We learned that in orange grafting. A naval orange grafted on the wild orange stock might be raggy, not full of juice; while when grafted on the trifoliate orange stock might be heavy and full of juice. So in that case the stock did have some influence upon the graft; and there are other instances. But as a rule we assume that the stock has no influence upon the graft in regard to the validity of character.

Question: Are pecans a variety of hickory?

Dr. Morris: Yes, pecans are hickories. The Indians gave it the name of pekan. The French spelled it pecanne, so that has been spelled as the pecan, without the necessary other part of its name, hickory. We should always say pecan hickory—always.

Dr. Kellogg: Dr. Morris, how old hickories may be used for grafting?

Dr. Morris: I have experimented with trees up to fifty years of age; but the most satisfactory work, perhaps, is done with trees that are not more than fifteen or twenty years of age and three or four or five inches in diameter. Those are the best trees to work with. If we cut off the limbs of a very old tree and try to top work it, it means an enormous amount of work on the part of the orchardist, more work than my employees like to give it. But one may topwork a tree of almost any age, preferably a tree less than twenty-five years of age; and by choice I should say trees not more than ten years of age. We have experts in the audience better qualified to speak on that subject than I am.

Question: Do you prefer the melted paraffin to the old-fashioned way of using bees wax?

Dr. Morris: The old-fashioned beeswax had a certain color, and the black wax with charcoal, with lampblack, both turned the light ray and allowed the heat ray to enter so that the amber of the old resin wax, and the black of the black wax both allowed damage to occur to the tree, in the South particularly, in a hot climate early in the summer, prevented our grafting in the summer because of the turning away of the light ray that was wanted and the absorption of the heat ray that was not wanted. The melted paraffin being perfectly transparent, allows the light ray to set the chlorophyl into activity. All the life processes of the tree are carried on under the influence of the green chlorophyl grains, and these work only in the presence of light.

Question: Can you successfully graft a pecan on the pignut?

Question: What is the best stock to graft pecan on?

Dr.Morris: Pecan stock, I think. I do not think we have anything better. Mr. Reed and Mr. Jones are both experts in that field. They have grafted hundreds of thousands of trees.

President Reed: I think the pecan is the best. The hickory will grow on the pecan very well, the shagbark hickory, but it will not do to change it with any degree of success.

Dr. Morris: The shagbarks will grow fairly well on pecans, but the pecan not well on the shagbark. It is best I think to put shagbarks on shagbark or shellbark. But they do well on pignut. I have got some very good shagbarks on mockernut. On bitternut they grow fast, but at the end of eight or ten years are inclined to slow up. Shagbark can be put on, I suppose, ten other kinds of hickory, but the pecan can not.

Question: How many grafts would be necessary on a nut tree twelve inches in diameter?

Dr. Morris: I should say you would probably have to put in fifty. I would cut off the branches down to about two inches or an inch and a half in diameter, and that might leave fifty stubs to graft. Graft all of them, is one way to do it. Having done one that way, you will then become familiar with the entire subject.

Question: What is the best time of year?

Dr. Morris: I don't know. Some time ago the American Agriculturist said to its readers that there is disagreement about the best time for pruning peach trees. Let us hear from all our readers. So all of the readers wrote expressing their opinions,

and the editor said, "Summing up all of the opinions, the entire testimony in the case, we have decided that the time to prune your peach tree is when your knife is sharp." I had always supposed that the best time for grafting was when the buds were first bursting in the spring, always held rigidly to that, and at that time of the year was in a great hurry. I dropped professional work and lost hundreds and even thousands of dollars in order to see this work go ahead; it is more interesting than professional work. And now this year, with this new method, I have grafted right straight on up to the first of August, and everything growing—deliberately, all through the summer. So that now, at the present moment I do not know. A year ago I could have told you. When I first graduated in medicine, I could answer any question in medicine. After forty years of surgery, I am puzzled over a great many questions. It is the same way regarding grafting.

Question: In summer grafting do you remove the leaves from scions?

Dr. Morris: In summer grafting I have used for the most part scions I have kept in the icebox in sawdust. I have formerly put in twenty or thirty tons in my icehouse for my family to use during the summer. Last winter we could not get any ice, and my scions were just as good kept in the sawdust as if we had had ice; and I grafted those scions in August and the grafts are living. I have also cut off the leaves in grafting, but that is new and you can not depend on it,—stop at one tree, cut off a piece of it, and put it on another tree and have it grow. I have never done that until this year, and it does not succeed in a very large percentage. It is not practical. It can be done—I have proven that; but it is not practical. The best way is to use your scions from last year that have been kept in cold storage in sawdust or leaves.

Dr. Kellogg: When should the scions be cut?

Dr. Morris: There is some disagreement about that. Almost all scions may suffer a little winter injury. Some men prefer to cut in the early part of December before we have had any hard winter, then keep them in cold storage during the entire year, moderately moist, or protected in sand, leaves, or stratification. But I have always preferred February myself, cutting them the last of February before the buds begin to start, then put them in sawdust in the icehouse or cold storage, or bury them under a thick layer of leaves. For budding you transfer immediately. In fact, budding technically comes under the same physiologic principles as grafting. In budding I do that work in my place at Stamford, Conn., about the latter part of July or early August.

Dr. Kellogg: Do you use the same method in transferring buds?

Dr. Morris: Yes, I fix them the same way as I do the graft and cover everything with paraffin. I have even had a little short side graft grow using this paraffin method, a graft two or three inches long.

Dr. Kellogg: Tell us about those fatherless walnuts.

Dr. Morris: In the course of crossing the nut trees, we supposed, as a matter of course, that we must always have the pollen from one tree, or from a tree which bore the staminate or fertilizing flowers, in order to develop nuts or fruit of any sort; but on one occasion I covered a lot of Chinkapin female flowers with paper bags; I didn't have pollen enough to go around and left the bags on because I happened to be too lazy or too busy to pull them off. About a month later when I did take them off I found a full set of chinkapin nuts under those bags. They had received no pollen. That was an observation of a good deal of interest. It may have been that they had gone on by what we call parthenogenesis, and we had the children without the father, had the female parent only, the fatherless chinkapin. It sounds sad. I followed up the experiment with other nut trees, and found that not infrequently we may develop fatherless nuts. The effect will be, according to natural law, to intensify the characteristics of one parent. The female which bears this fruit, this child, without a father, will give to that child an intensification of her own characteristics. That will be the effect of parthenogenesis. That may be continued through several generations perhaps; we do not know. It is new, quite new. (Applause).

President Reed: The next topic is the Digestibility of Nuts, by Mr. Cajorie, of Yale University.

THE NUTRITIVE VALUE OF NUTS

F. A. Cajorie, Yale University, New Haven, Conn.

Mr. President and members of the Northern Nut Growers' Association: It was with great pleasure that I accepted the invitation of your Association to be present at this convention and give a discussion of nuts and nut production, from the point of view of their nutritive or food value. During the last few years our knowledge of nutrition and the parts that individual foods may play in the diet has been greatly increased and in the light of the new discoveries, it is interesting and valuable to view the place that nuts hold.

As you are well aware, nuts have been used as foods by the peoples of the world. In many places nut products have

made up a very appreciable part of the diet. Chestnut flour is extensively used in Southern Europe. Among the peasants of Tuscany, chestnut flour forms a considerable part of the total diet. In this region, also ground acorns are made into bread with cereal flours and in this form is a common food. The hazel or filbert nut is also seen in the form of flour on the shores of the Black Sea. Races living in the tropics have utilized the many varieties of nuts indigenous to tropical climes such as the coconut, Brazil nuts, Java almond, Paradise nut, candle nut and African cream nut. In the Orient, the lichi, ginko and water chestnut, and in Italy and India the varieties of the pine nut are used to considerable extent.

In America, with the exception of a few localities and among a limited class of people, nuts have never made up a staple part of our dietaries, rather they have been used as tasty supplements to otherwise complete menus. That they are prized as adjuncts and are sought after is strikingly shown when we see in our markets not only the products of our native American nut trees, the hickory, walnut, butternut, chestnut, pecan, beechnut and pinion, but the Brazil nut, filbert, English walnut, peanut, coconut, all of which are derived from foreign countries or from trees originally imported to America from other lands.

Analysis of nuts have shown them to be of two types, one rich in fats and protein, the nitrogen containing component of our foods and the other relatively rich in carbohydrates, or starches. With the exception of the chestnut, and the coconut, most of our more common nuts belong to this first class, and chemists have pointed out that in these nuts we have a concentration of protein and fat seen in no other class of foodstuffs. For example, the protein-fat rich nuts have a percentage of protein varying between 15 and 30% and a fat content of 50-70%; compare this with other foods that we think of as being concentrated; eggs, 12% protein and 10% fat; cheese 28% protein, 37% fat; round steak, 20% protein, 14% fat; and bread, 10% protein. This nutritive concentration in nuts places them in a unique position among our natural food products. Our cereals, meats, fruit and vegetables all contain more or less water or refuse that reduces their concentration, while in nuts we find a compact form of almost pure food.

We are dependent on foods for the source of energy that is necessary to perform our work and maintain our body temperature much in the same way that a steam engine is dependent on the fuel supplied it to perform the mechanical tasks assigned to it, and this fuel value of foods in turn, depends on the amount of protein, carbohydrate and fat, particularly the latter, that are present in the foods. At once we see, in our concentrated nuts, a tremendous source of energy, provided that we can digest these nuts and make this energy available.

Despite the fact, as revealed by chemical analysis, that in nuts we have a source of protein and fat in a concentration rarely seen in foods, there have been relatively few experiments to actually determine the digestibility. Prof Jaffa at the California Experiment Station was the first to make a comprehensive investigation along these lines. He made extensive digestion tests on men using most of the more common American nuts. His results, as reported in a bulletin of the U. S. Department of Agriculture, indicated that nuts when they made up a substantial portion of the diet, were well digested by those who ate them and gave no intestinal disturbance or discomfort.

Nuts have had a reputation for indigestibility that was wide spread, not only among people in general, but also among physicians and dieticians, and even Prof Jaffa's clear cut experiments failed to dispell this idea of indigestibility that had been empirically assigned to nuts. A few years ago, a rather extensive series of digestion experiments were inaugurated at Yale University in an effort to settle this question of the indigestibility of nuts and also to test out some of the commercial nut products to find what effect roasting, boiling, and other processes that nuts are subjected to, had to do with the digestibility. Through the courtesy of Dr Kellogg of Battle Creek, it was possible to follow up these experiments with a series here at Battle Creek. It is the result of these tests that I wish to speak of today. One word regarding the method which is the conventional one for such experiments. The amount of food eaten by the individual or animal is weighed at each meal and the composition determined by chemical analysis. The intestinal output is collected, weighed and analysed. From the difference in any substance such as protein in the food and the protein which appears in the body refuse, the amount digested and absorbed or utilized by the body is easily determined. For example; if 10gms. of nitrogen were eaten in the food and one gm appears in the feces, we say that the coefficient of digestibility of that nitrogen is 90%, that is 9 of the 10 gms. eaten were absorbed by the body. The average of a great many such tests on mixed diets has the following standard coefficient: protein 93%, fat 95%, and carbohydrates 98%.

Our digestion experiments show the following results: for protein digestion of nuts, almond 89%, peanut 84%, pine nut 89%, Eng. walnut, 83%, Brazil 88%, and coconut 88%. In all cases the carbohydrate coefficients are 98 or 99%, and in the case of the carbohydrate rich chestnut, normal digestion took place after the nut was heated so as to rupture the starch granules. In all of these cases the nut made up a substantial part of each meal and was eaten in large amounts. The experimental subject, experienced no digestive troubles or discomforture whatsoever except in the case of the English walnut, which evidently contains some irritating substance that causes diarrhea. Except for the pecan which gave rather low utilization, the protein of nuts was digested to a high degree that compares most favorably with our ordinary foodstuffs.

How then explain the undoubted discomforture that many people experience after eating nuts? I believe that the explanation rests on the fact that our common American way of eating nuts, is not the rational way. We would not

consider topping off a heavy meal with eggs, meats or cereals or to eat these in large quantities between meals realizing that we are exposing ourselves to possible digestive discomfort. No more then, can we expect to so eat nuts which are even more concentrated or "heavy" than meat or eggs without occasional discomfort. Unpleasant results from so eating does not condemn the nuts as indigestible, rather it condemns our mode of using that nut. Further, we must recognize that the nut is a hard, compact substance and that unless completely masticated, is not readily penetrated by the digestive juices of the alimentary canal. This was very well brought out in our experiment with dogs. The dog bolts his food and where there were large fragments of the nut in the food, they appeared almost unchanged in the feces, while if the nut is ground fine before feeding, it was readily digested. Comparisons of nut butters and nut pastes with the whole nut also brought out this point. The completely commuted nut butters showed consistently higher degrees of digestion than the whole nut.

With the exception of the starch rich chestnut, the heating of the nut did not seem to effect the digestibility whether this heat was boiling, steaming or roasting. The raw nut apparently is as well digested as the heated products. No differences were found between nut butters whether the process involved steaming or roasting of the nut. I am not speaking of the enhancing of the flavor that heating may bring about, but only of the digestibility.

Dr. Longworthy and his co-workers in the Dept. of Agriculture have investigated in recent years the digestibility of many vegetable oils, among them nut oils, and have found as high a percent of utilization with these as with butter and our other common animal food fats.

I believe that we are fully justified in the conclusion that nuts and nut products, if rationally used in our diets, are as digestible and fully as valuable from a nutritional point of view as our other foodstuffs.

While we can now definitely speak of the high digestibility of nuts, it is necessary to consider other phases of the part played by foods in nutrition. The fact that a food after being taken into the body can be broken up by the digestive juices of the alimentary tract, and the products absorbed, as we have found, to be the case with the nuts, is not the end of the story of the function of that food.

About fifteen years ago, it was discovered that during the progress of digestion, the protein materials are reduced by the digestive juices of our stomachs and intestines to smaller chemical compounds, and that it is these smaller fragments of the protein molecule that are absorbed into the blood and are used to build up our muscles and tissues. These fragments or "building stones" as they have been fancifully called, are all of a distant class of chemical compounds known to chemists as amino acids. Eighteen of these acids have been found as the products of protein digestion.

We may conceive of our bodies as being continually supplied with a mass of these 18 building stones from which it selects the kind and number that it needs to repair the everyday wear and tear of the tissues and in the case of the growing child builds new structures.

Since the date of this important discovery regarding the fate of indigested protein, it has been found that with few exceptions, the body is not able to manufacture these amino acids or to change one kind into another, and must depend on the protein eaten, for a supply of the various kinds that go to make up the body protein. Further it has been found, that many of our commonly used food proteins do not contain all 18 of these amino acids components. In some foods one, two, and sometimes more are lacking, or if present are in very small amounts. If our diet contained only proteins of an inferior grade, we can picture our body requiring building stones of various kinds to maintain the structure of the body and unable to obtain them due to the poor quality of the food, protein. Nutritional failure would be the result. The proteins then must be of the right quality as well as present in the proper quantities, to prevent mal-nutrition. Bearing in mind these facts, it is necessary in studying a food such as our nuts, to determine the kind of protein the individual nut contains as well as to know whether or not it can be digested by the body.

During the past few years, it has been found that we must have in our foods a certain amount of substances whose chemical nature is at present unknown and to which the name of vitamines has been given. It is not my purpose to discuss with you the many phases of vitamines and their relation to nutrition, but I only wish to impress upon you the fact that it is of the utmost importance for a dietary to contain these substances; fully as important as that the protein, fat, carbohydrate, and inorganic salt content shall be satisfactory. Lack of these vitamines brings on various evidences of mal-nutrition. One vitamine which is found in animal fats and the leaves of plants and is soluble in, and associated with fats, is, for that reason, called fat soluble vitamine. Another called the water soluble vitamine is widely distributed in cereal seeds, vegetables, and legumes. The third, the so-called antiscorbutic vitamine because of its action as preventative and cure for scurvy, is found in certain fruits and vegetables.

We then ask the next question: Are nuts adequate as far as their proteins contain these essential amino acids, and do nuts contain vitamines? That is, is their biological value as satisfactory as their digestibility?

Dr. Hoobler of Detroit, in a study of the diets of lactating mothers and wet nurses, a year or so ago, compared the value of proteins from animal and vegetable sources for the elaboration of milk. He found that a mixture of the almond, English

walnut, peanut and pecan, furnished proteins that were equal to the animal food tried, and far superior to other vegetable proteins. Here then is evidence that nuts provide the necessary building stones to form milk that food par excellence for the newly born individual. Drs. Mendel and Osborn, experimenting on white rats have shown that the principle proteins of the Brazil nut will maintain animals through the growing period. Bureau of Chemistry workers and others have found similar results with the coconut and the peanut. I have now, experiments underway at New Haven, on the biological value of the filbert, English walnut, pine nut, almond, and pecan. While these tests are yet incompleted, it can at least be said that to date there is no evidence that the proteins of these nuts are in any way less satisfactory than those of the peanut or Brazil nut that have been thoroughly tested out.

As to the vitamine content, abundant quantities of water soluble vitamine have been found in the peanut and the coconut. Experiments that we have in progress as well as a series conducted here at Battle Creek under Dr. Kellogg's direction give promise to increase this list of vitamine containing nuts to include at least many of our common nuts. Along with our vegetable oils in general, coconut oil and peanut oil contain insufficient quantities of the fat soluble vitamine to maintain growth in young animals. Whether the other nut oils will prove more efficacious in this respect, is now under investigation. As far as I am aware, the antiscorbutic properties of nuts have not been studied.

With the population of the world on a steady increase, it continually becomes necessary for mankind to seek out new sources of food, and utilize products that formerly had received little attention as possible foods. Conditions that disturb normal food production and distribution, such for example as were brought about by the world war, produce serious food shortages in the world, and emphasize how close is the margin that determines whether the peoples of the world have adequate quantities of food or whether they are faced by shortages, and, in many cases, by starvation. In this continual development of our food resources, nuts stand out prominently as offering possibilities which are very great. Not only do they represent a very concentrated form of food which is highly digestible, but they possess a number of characteristic and highly pleasing flavors that recommends them for use in all manner of culinary procedures. The variety of uses to which nuts can be put in the kitchen is amply demonstrated right here in Dr. Kellogg's sanitarium and I feel sure that even he has not exhausted the possibilities of nuts in the dietary. The forms of nut products on the market are steadily increasing. The nut butters, nut pastes, nut margarines, meat substitutes, and so forth, all point to the variety of ways that nuts can be handled as foods.

The tremendous increase in the use of nut oils in the form of the oil itself and as nut margarines within the last few years is a striking example of the utilization on a large scale of relatively new food products. The press cake which remains as a by-product of this oil industry finds ready use as concentrates for cattle feeds. Many of our ideas in the feeding of our domestic animals are undergoing development along with the idea of human nutrition. Just recently, investigators at the Wisconsin Experiment Station, reported that the well known "home grown ration" for dairy cows that consist of cereals, silage and hay, is not a large milk producing diet. Their recommendation is to supplement this ration with protein concentrates. Nut meals recommend themselves most highly as protein concentrates. It certainly is safe to say that the day when the fruits of our nut bearing trees will be allowed to fall ungathered from the trees, is at an end.

There are many problems that still call for an answer by the chemist and dietitian. The nutritive value of the individual nuts should be firmly established in all its phases. The causes that have made the use of certain nuts unprofitable commercially, should be studied with the view of correcting these stumbling blocks. For example, the freeing of the horse-chestnut from its poisonous saponins and enable us to use this starch rich nut as food is well within the range of possibility as indicated by experiments conducted in Austria during the war. Why do nut oils tend to become rancid easily and can this tendency be remedied? Is the freeing of the acorn and its tannin and other objectionable substances a practical consideration? What is the irritating principle of the English walnut?

All these problems and many others wait solution. Research on nuts is in progress in many places. It involves time consuming experiments that are often times expensive. As a result, progress is slow, the amount of research being limited by the financial factor. The value of the pecan nut crop alone of the year 1918, was over 91 million dollars and the value of the imports and exports of nuts and nut products during the same year amounted to over 51 million dollars. If one one-hundredth of one per cent of this sum should be devoted by those interested in the development of our nut industry in this country for the study of the nutritional and chemical properties of nuts, I feel sure that they would be amply repaid for their investment.

President Reed: I believe this will complete our program for tonight. We have quite a full program for tomorrow morning. Mr. C. A. Reed, nut culturist of the U. S. Department of Agriculture, is with us and was to have been on the program tonight, but he has been busy all day and was hardly ready for tonight's program, as he has been busy getting the exhibit in order, and he will be on the program tomorrow morning, and three or four others, among them Dr Kellogg, I believe, so that there will be quite a full morning's program, and we will be glad to have all of you come who can. We meet in the parlor of the Annex at ten o'clock tomorrow morning. If any one desires to join the Association and will speak to the secretary, he will give yow the necessary information.

End of Tuesday Evening Session

WEDNESDAY, DECEMBER 10, 1919, 10:00 A.M.

President W. C. Reed in the Chair

President Reed: Mr. O. C. Simonds of Chicago will talk to you on "Nut Trees in Landscape work."

NUT TREES AND BUSHES IN LANDSCAPE WORK

O. C. Simonds, Chicago, Illinois

In considering material for landscape work the places that come to mind where such work would be required are home grounds, highways, parks, cemeteries, school grounds, city squares and woods. The highways would include city streets, parkways, usually called boulevards, and country roads.

All trees are beautiful and should serve in some place in landscape work. Some_are more beautiful than others and where but few trees can be used the more beautiful would naturally be chosen.

Black Walnuts

Not long ago, a lawyer was talking to me about the beauty of black walnuts. To his mind there is no tree more beautiful and from what he said, he would use it almost to the exclusion of other trees. My own judgment does not fully coincide with his although I consider a black walnut a very attractive tree. It grows to a large size and is generally healthy. Its shape is good and the foliage attractive in summer. The leaves drop early and they are not especially attractive in autumn coloring. Black walnuts are strong in appearance. They lack the gracefulness of the elm and if I were making a list of trees in the order of their appearance, placing the most beautiful first and the least attractive last, I should place several trees ahead of the black walnut, among them sugar maples, elms and several of the oaks. Perhaps the black walnut would come about in the center of the list for most locations. The list itself would vary for different situations and climates. I should advise using black walnuts plentifully along the highways, especially country roads, and somewhat sparingly in home grounds and the other locations which I have named. By plentifully, I do not mean to the exclusion of other trees, for, in some places, there should be more elms and maples than black walnuts, but highways are so extensive that many kinds of trees could be used in abundance to give shade. In woods there are places where black walnuts could be used in profusion.

The objections that one might raise to the use of black walnuts would be, first, the comparatively short season of the leaves. These come out rather late in the spring and drop early, probably these trees can not be improved very much in this respect. Second, boys will sometimes throw sticks at the trees to bring down the nuts. If a boy comes in home grounds to do this, he will be considered a nuisance. Branches are sometimes broken and the trees disfigured from this cause. Along highways this objection might perhaps be lessened somewhat by planting enough trees so that there would be more nuts than the boy would want, or by improving the manner of the boy. Third, the trees are often attacked by caterpillars. This objection can usually be obviated by spraying or destroying the pests in other ways.

Butternuts

The remarks made about the black walnut would apply in many ways to the butternut, its nearest relative. Butternuts have a range extending further north and they are more subject to disease than the black walnuts. Like the walnut, their leaves come out late and drop early. They are subject to the attacks of boys. When healthy, they are attractive in appearance and they deserve to be planted in most places where trees are used for landscape effect, but in the list I suggested, they would come below the black walnut.

Hickories

There is a time of the year when the shagbark, which produces such sweet nuts, would be more attractive than any neighboring tree. It is when the big buds swell and send out yellowish green leaves surrounded by large, red bracts. At this time they are as showy and as beautiful as any flowers. The bracts soon fall, but the leaves turn a rich green and are attractive until early fall, when they are sometimes yellow, and sometimes drop without any marked coloring. The trunk of

the hickory is unique in appearance as the bark separates from the tree in long platelike strips which hang on at one end and give the scraggly appearance from which the tree derives its name. All of the hickories are attractive in appearance, but some of them drop their leaves early. The hickories are difficult to transplant but this is nothing against the beauty of the tree. An established tree is more valuable on this account. In some places hickories are quite subject to disease or to the attacks of borers. Like the walnuts, hickories which produce edible nuts are subject to the attacks of boys, but, on account of the toughness of the wood and the roughness of the bark, they are usually quite able to withstand these attacks. Hickories are suitable for use in all landscape work so far as their appearance is concerned. The fact that they are not so used is due to the difficulty of transplanting them. In the fall when a maple tree has colored up beautifully and a hickory near it has dropped its leaves, we are apt to compare the two unfavorably to the latter, but we should remember the appearance in summer and especially when the leaves first unfold. Hickory trees are beautiful also when the leaves are off, their branches making beautiful etchings against the sky in winter. The pecan, which is the largest of all hickories, is an exception to the general rule because it is planted quite extensively, especially in the South. It is a beautiful tree and where it is hardy there is no reason why it should not be used as a street tree, a tree in home grounds, in parks, or any other place where deciduous trees are needed. It is raised extensively in some nurseries, while the other hickories are raised very sparingly, and some not at all.

The Beech

Some would consider the beech the most beautiful of all nut trees. Its comparatively smooth, bluish-gray bark makes it a distinctive tree at all seasons. Its branches, spreading straight out from the trunk, give it an appearance of strength. Its fine branches form a specially pleasing skyline, its sharp buds are trim and neat in appearance, its leaves are beautiful in shape and texture. Their fall coloring, while not as brilliant as that of the maples, is really beautiful, being either yellow or a rich brown. The leaves are apt to hang on all winter, especially on the younger growth, and then they often turn a straw color. If a list of beautiful trees for February were to be made, I am rather inclined to think that the beech would stand at the head of the list. A young beech with its bluish-gray bark, its straw colored leaves, and flecks of snow here and there, seems to me the most beautiful of all deciduous trees in winter. The young leaves also are especially attractive when they first appear and the blossoms are sometimes objects of interest, although not showy in color.

Hazelnuts

Often in old pastures one finds forlorn, scraggly looking bushes and is told they are hazelnut bushes. One would not pick out bushes like these to plant in his front yard, and yet, when given a chance, there is scarcely a more attractive shrub than the hazel. It is one of the first shrubs to blossom, the staminate flowers hanging in slender, graceful yellowish-brown catkins, while the pistillate flowers are little points of purplish-red protruding from the buds. These blossoms appear long before the leaves. The latter, when fully developed, are beautiful in outline and soft in texture and they have a rich coloring in the fall including various shades of yellow and red. The hazel should certainly be used extensively in landscape work. The nuts, with their leaflike involucres, are attractive in appearance in August and September. In connection with our own hazel one would naturally think of the filbert, which is a European relative. The filbert is often planted for ornament. There is a variety with purple leaves which some people admire.

The Oaks

Of all our native trees, I think the oak excels in beauty of foliage. By many oaks might not be considered nut trees, but nearly all of the acorns are eaten by squirrels or other wild animals and so I think it would be proper to mention oaks when speaking of nut trees in the landscape. In the northern states we have two groups known as the white oak group and the red oak group. The trees of the former have soft, dull green leaves with rounded lobes, while those of the latter have shiny leaves with lobes ending in points of filaments. The former mature their acorns in one year, while the latter require two years to bring them to maturity. The acorns of the white group are sweet, while those of the red group are more or less bitter. The foliage of all oaks is attractive when it first appears, the small leaves varying in color from almost white through pink, yellow, and red to the deepest purple. Perhaps the red oak excels all other trees in the beauty of its summer foliage and its leaves are also richly colored in autumn. The Bur Oak, in addition to having attractive foliage, has a rough, dark bark that gives it an attractive appearance in winter. The white oak, especially when young, holds many of its leaves in spring and these with their brown color, give a warmth to the snowy landscape. One could make a most beautiful park by planting nothing but oaks and they should rank with maples and elms as street trees.

Chestnuts

There is a tree which a few years ago would have been considered along with the oak in landscape work, but which now would not be thought of in certain regions on account of a disease which has practically destroyed it. This tree is the American chestnut. It grows to a large size, and if it were not for this disease, would be worthy of a place in any park. Hundreds of thousands of dollars have been spent without success in endeavoring to exterminate the disease. Some of the introduced varieties are apparently exempt from this disease, but only the future can tell whether the chestnut will

again become valuable in landscape work as well as in the raising of food and lumber.

In designing landscapes, we think first of open spaces and then bound these spaces with trees and shrubs having pleasing shapes and foliage. The tops of these trees form the skyline and the lower growth a margin of lawns, or perhaps of walks and drives. For these purposes the beeches, hickories, hazels, walnuts and butternuts are all valuable, their value being approximately in the order named.

Horse Chestnuts and Buckeyes

There may be some question about including these in a list of nut trees. I understand, however, that the seeds of all of these trees have been used for feeding stock and perhaps some way may be found for making them available as food for men and women. There is no question about their usefulness for ornamental trees. In Europe, the horse chestnut has been used extensively for park and boulevard planting and it is also largely used in the United States. There are several varieties. The leaves appear early, the blossoms coming out later. Our own buckeyes are handsome in appearance and all are adapted for use in landscape work.

The arguments for and against the use of nut trees in landscape work would be somewhat similar to such arguments regarding fruit trees. A luscious fruit tree like the snow apple, would be omitted from the list of trees for the park, not because it lacks beauty, but because its fruit would lead to its destruction. Apple trees might, however, be very appropriate for private grounds. They have sometimes given a name to a home, as "The Orchard". The same is true of certain nut trees, "Walnut Hill," and "Hickory Grove" being not uncommon. The hazel, too, is frequently used in naming home grounds, streets or localities. A name would not be used in this way unless the object bearing it was held in esteem. I am glad there is an association to encourage the raising of nut trees and I hope to see such trees used in this way extensively, for the purpose of developing attractive scenery as well as for food production.

Mr Simonds: When Mr. Bixby asked me to prepare a paper and come here and read it, I wrote back I would prepare a paper and send to him to read; and afterwards Mr. Reed came to see me, and knowing that he would be here, I concluded I would come. I dictated a paper and afterwards I found I had left out a few nut trees, and I want to speak just a word regarding those before I read my paper. One of those is the coconut palm. I was thinking more particularly of trees in this locality when I dictated the paper; but the coconut tree aside from raising the coconuts, I think is the most magnificent palm that we have. There are other trees that some like better, but I think the coconut palm is the most picturesque, the finest tree to plant. I prefer it to the other large palms. It has great spreading leaves, sometimes fifteen or twenty feet long, a feathery top, and the trunk is not quite straight, and I like it a little better because it is not. Then here is the English walnut. I did not speak in my paper about the English walnut, but there is a tree that is a beautiful tree, and where it is hardy it should of course be planted for ornament as well as for the nuts. And then there is the almond which we do not have here as a nut tree, but which they have in California, which has some attractions, and might be planted, although it is really not so ornamental as some of the nut trees; still it is worth planting. (Applause).

President Reed: Are there any questions you would like to ask Mr. Simonds while he is with us, or is there any discussion?

Dr. Morris: There are two or three points for discussion. Mr. Simonds does not think highly of the almond. I do for decorative purposes. When I drive in my driveway at Stamford and face that magnificent blaze of blazing clouds of almonds in the springtime, I think it is something worth while; it is the hard shelled almond. It will grow as far north as the peach does. The only trouble is they are a little more subject to leaf blight and need a little more attention. But where the peach will grow you can raise the almond profitably. Among the hazel nuts the most beautiful of the entire series is the tree hazel that grows about as large as the smaller oaks, and that is said to bear twenty-five or thirty bushels of hazelnuts a year,—enormous crops. That is perfectly hardy here, and the beauty of the tree is such that I believe it to be a very important addition. I would like to hear Mr. Jones' opinion on that point. I use it for grafting purposes for other hazels. The Japanese walnuts, almost tropical in their rapid growth, sometimes grow six feet in a year in rich ground, and with their great sprays of leaves sometimes a yard in length, and the seedballs of the heart nut variety give really a tropical appearance to the grounds where the ground is rich enough. They will grow almost any place, but in rich ground they are certainly very wonderful. Among the chestnuts, of course, we have a number of hybrids now that resist blight very well; and the little chinkapins for lawn bushes are very attractive. One of our most beautiful chestnuts is splendid for a lawn specimen and is evergreen in the South. When I was a boy I never had plums enough; so one of my ambitions was to have plums enough so I could see some of them rot on the ground. We can do the same thing with nut trees—have nuts enough so the boys will be full and have nuts enough. It seems to me it ought to be one of our ambitions to have so many nut trees along the roadsides in the parks, etc., that the boys and the squirrels can not use them all up.

Mr. Simonds: I think the Doctor is right in some of his criticisms. In fact, the almond is something like a peach, and I had not prized it for use in landscape work so very much on account of certain diseases which would be apt to affect it here if it were not taken care of as we would take care of trees in an orchard. The hazel tree, of course, would be attractive if it is hardy here. I have had doubts about its being hardy because of its coming from southern Europe.

Dr. Morris: It is hardy in all Canada. They have fine tree hazels in the park at Rochester. They have there probably the largest tree hazels in the country.

Mr. C. A. Reed: I would like to have more questions asked. I feel as though I had accomplished a real achievement in getting Mr. Simonds here. I was under him a short time a number of years ago and learned something of his skill as a landscape gardener and the reputation that he has; and I felt that we could not hope to have a better authority on these points that he has discussed than we could in Mr. Simonds; and it is something that is constantly coming up. The Department of Agriculture have to consider that people want to know what trees they can plant in the landscape; and I feel particularly glad to have Mr. Simonds here.

Dr. Morris: It seems to me we ought to talk more about the nut-bearing pines in the landscape, because where you are planting pine trees, you might as well plant the nut-bearing kind as the others; they are just as beautiful, and you combine the Greek idea of beauty and utility.

Mr. Simonds: Certainly, that is a tree I have omitted, because in this region we have not had any nuts.

Dr. Morris: There are four pines that will bear nuts here—the Korean pine, the pignolia or stone pine, the Italian stone pine and the Swiss both. There are five nut bearing pine trees that are all market trees for nuts, that I know will grow and bear here, including the lace bark pine.

Mr. Simonds: Are they raising nuts in Michigan on pines?

Dr. Morris: No, but they might. Those five kinds would grow here and bear nuts here, so they have a double value.

Mr. Simonds: I think we ought to raise them. Of course they are beautiful in the landscape.

Dr. Morris: The whole idea of your paper is to approach the Greek ideal—add utility to beauty.

Mr. Simonds: That is what nature does. It makes beautiful leaves, then uses the leaves for plant food.

Mr. C. A. Reed: I wonder, Dr. Morris, if you can tell where these pines can be had.

Dr. Morris: The Korean pine is from northeast Asia, and you can get those from the original pine seed; the lace bark pine is from northeastern Asia where the climate is like ours. The Swiss stone pine and the Italian stone pine are from Switzerland and Italy and closely related—both excellent trees. The fruit now you buy as the pignolia in the markets. Both those are sold as pignolia nuts. It is a commercial nut of Europe. The white barked pine you would get from the West. It has a beautiful fine large nut, and you would get that from any Pacific coast dealers in nut trees.

Mr. Simmonds: Has that another name?

Dr. Morris: I do not know of any other name for it. Wait: The single leaved pine is one. That grows so far north on the Pacific, but we do not know whether it will ripen its nuts here or not. It is perfectly hardy here and would be a beautiful nut tree, grows well. The single-leaved pine—that is *monophylla*. There are four or five pinons that will live, but they do not grow fast enough to make it worth while to raise them in Michigan. The Jeffrey bull pine is another one that will grow here and bear fruit, with a beautiful blue-green foliage. The Jeffrey bull pine is one of the most beautiful and thrifty pines. That is the Jeffrey variety of ponderosa. The nut is very much larger than the nut of the ordinary ponderosa. The nut of the ponderosa is small, but the Indians use them and eat them, shell and all. When we come to using the pines more freely for food purposes, we are going to do what they do in Europe with some of the small seeded pines—crush them and make a mass, squeeze the cream out from the nuts, dry it a little, and that makes very fine rich cream; then the residue is given to the chickens and pigs. There are in all about thirty pine trees now that are used for market purposes where they fruit, and we will undoubtedly increase that number. I do not doubt that fifty species of pine trees will be planted for their fruit by two generations from now when we feel the need more.

President Reed: We will be glad to have questions from any one. I think we get more from the discussions than we do from the papers.

Voice: In regard to the hickory nut, the shagbark, back in northeastern Ohio, four years ago we had quite serious trouble with our hickories there along in the month of June, about the time we get the common June bug, there was a large bug that looked like the June bug that seemed to work at night mostly. We did not see them active in the day time, but they ate the foliage entirely off the lower branches and those limbs from which they ate the foliage died. In some cases, the tree died. I would like to know if anyone knows anything about those. That was new to me. I have had opportunity to answer all sorts of questions about that. I have been asked I guess by a thousand different people about that insect, and I have not been able to learn anything about it.

Mr. Simonds: I can not tell you.

Same Voice: One man told me when he knew I was coming here, "For goodness sakes find out something about that if you can."

Dr. Morris: It probably is the June bug, and turkeys and ducks would solve the problem.

Mr. C. A. Reed: The only suggestion I would make is that in Ohio you have one of the best posted authorities on nut insects there is in the country. That is Prof. H. A. Gossard, at Wooster. If he can not tell you about it, no one can.

Mr. J. F. Jones: I think it is no doubt it is the ordinary May beetle that is doing the mischief.

President Reed: I might say we had quite a deluge of beetles along that line in the nursery a year ago this last June, the first time we have ever been bothered with them. They finally became so thick we had to go through and shake the trees and shake them off. They looked something like the May beetle, only smaller, hard shelled, and seemed to come by the millions; but they only lasted a few days, and it was all over, and we have never seen them since.

Mr. C. A. Reed: There is one more question I would like to ask Mr. Simonds, and that is in regard to the proper distance for spacing nut trees along avenues and in parks.

Mr. Simonds: I think that in both of those situations it is well to give the trees a natural appearance by grouping, and sometimes they can be far apart, and sometimes I think there might be a group of two or three close together, so that they would grow in one group. That will give a more natural arrangement in parks, and we have room enough along the sides of most of our highways to have the same effect there. The policy to be pursued with regard to spacing nut trees along highways would be the same that we would follow in planting any other trees, and one of the most attractive streets I know is now in the city of Grand Rapids; it used to be in the country when I lived there years ago; but along the sides of that street there are native trees, mostly burr oaks, and they have grown just as nature planted them. There will be a group of two or three, then a space, may be a single tree, then there may be a group of five or six; and that natural arrangement is really beautiful, to me far more beautiful than a straight row of trees, uniform spaced. On that same street sixty or seventy years ago my uncle planted where there were no trees—it is a continuation of this street—rows of sugar maples, and they grew and finally made splendid trees, and a great storm came along and broke down two or three, and that was a source of great regret to my uncle; but his son thinks, perhaps, it was a good thing, because it opened a beautiful view out into the country. Now by grouping trees we can save beautiful views. If we plant uniformly, we get monotony. With this belt of burr oaks spaced as I have described, you have variety on your sky line. Some trees are a little farther up than others and catch the sunlight, and we get shade and light. That is the way I should plant nut trees. If I were planting black walnuts or butternuts I would group them, but see that the tree has in some directions space enough to develop as far as it wishes.

Mr. C. A. Reed: Mr. Simonds is about to go. That is the reason I precipitated this question at this point. It was asked with reference to the law which these gentlemen, sitting at my right here, were responsible in putting through in the legislature of this State—provision for planting food trees along the highways; and it may be before Mr. Simonds goes, they have something further to ask.

President Reed: These questions are very important to draw out information. Is there anything else you wish to ask before we leave this topic? If not, we will call on C. A. Reed to present his paper next. It was carried over from last night, I believe.

NUT CULTURE IN MICHIGAN

C. A. Reed, Washington, D. C.

There is evidence on all sides that the people of Michigan are deeply interested in nut culture. Some have invested in pecan lands in the Far South; no doubt some own Persian (English) walnut, almond or filbert orchards on the Pacific Coast; and others are at the point of planting nut trees in Michigan. Everybody would go nutting in fall if he could. Michigan leads all other northern states in what its institutions and some of its people have done toward developing the nut industry.

Some thirty years ago the Lake Shore and Michigan Southern Railroad Company showed its interest in nut production, when it planted many miles of chestnut trees along its tracks running north from Adrian. Between 1888 and 1892 there were planted on the grounds of the sub-experiment station at South Haven, a number of pecan trees of Iowa and Missouri seed, Japanese walnuts, a number of filbert plants and a collection of almond varieties. At about the same time, Prof L. H. Bailey set out half dozen pecans and Japanese walnut trees on the campus of the Michigan Agricultural

College. Later, Professor L. R. Taft added several seedling Persian (English) walnut trees to the group.

In traveling over the southern part of Michigan, one cannot go far without seeing signs of interest in nut trees. Everywhere the black walnut has been spared or planted. In certain sections it is to be found about practically every farm house or at least near enough by to furnish the winter supply of the family nuts. The chestnut is less common in any part of the state than is the black walnut, not appearing to any considerable extent except in the lower southeastern corner. It has not fared well in the state either as a native or planted tree. The Persian or so-called English walnut has attracted considerable attention from time to time, and under especially favorable surroundings one occasionally finds thrifty specimen trees. The pecan, the Japanese walnut, European hazel or more popularly called the "filbert" have all been given limited trials at various times. Even the almond has had a day in Michigan. Quite possibly the pistache has been through the same experience; but if so, the fact is not generally known. That species is from arid Asia and wholly unlikely to succeed in the latitude of Michigan although a young tree of a Chinese species ornamental because of its fine feathery foliage, green in summer but which takes on a brilliant hue in fall is, or was the last we know, doing well on the private grounds of Dr. Robert T. Morris, near Stamford, Conn.

Among the kinds of nut trees from which we can select varieties for planting in Michigan, there are eleven or more distinct species. With such a range as this, one might ask, why not go into nut growing in Michigan on the same scale as in the growing of apples and peaches. There are probably better reasons why this is not being done, but two very good ones are that there are not enough available trees of good varieties to plant more than a single orchard of respectable size in the state; and the other; it would not pay to put good Michigan land to nut trees of such varieties as are now available even though they could be had.

If nut trees can't be had and wouldn't pay if they could then why publish an article on "Nuts for Michigan Planting," is probably what will run through the minds of most readers of these lines. It is certainly a logical question, but there are at least ten reasons why nut trees should be planted in Michigan.

1. The forests of Michigan have reached the point of depletion such that for the sake of future generations, trees of some kind other than fruit must be planted.

2. While planting, we may as well select those capable of performing more than a single service; in other words, trees of maximum possible use. Oaks, poplars, ashes, pines, elms, etc., all have their places, but not one in the group can produce anything of food value to humankind.

3. Nut trees of most kinds, rightly used, are valuable for timber purposes and are very effective in the landscape.

4. Members of the walnut family including the hickories are especially appropriate along the highways and city streets. They are sturdy, long-lived and not easily damaged by storms or neighbor's boys.

5. Nuts are among the very best of the meat substitutes. They contain much of the same food elements as do meats, although in different proportions. Some contain starch and to that extent can be used as are the cereals and Irish potatoes. Nuts are the only vegetable product grown in Michigan, which in raw condition afford a complete and fairly well balanced food for human beings. Every pound of nut food that can be raised from a tree along the street or in the fence corner on the farm is clear gain, and that much added to our national food supply.

6. Nuts are rapidly assuming importance as factors in the lists of American foods.

7. Many species of nut trees are adapted to some parts of Michigan. By planting the best that are now available, and by constantly being on the lookout for better sorts, superior varieties will be certain to develop in a short while, the same as has been the case with all older orchard fruits and farm crops.

8. Whoever intelligently plants nut trees performs a distinct public service. He will receive the gratitude of more than the present generation.

9. Among all kinds of trees, none are more appropriate for memorial purposes to the men who did not come back from France, than is the black walnut. That species itself took a valiant part in warfare. It furnished material for gunstocks the same as in previous wars, but in the World War it rendered what was considered by eminent authority, a greater service in supplying propellors for aeroplanes. The shells of the nuts contributed their part toward the making of carbon for gas masks, and no one knows the extent to which walnut kernels made up the delicacies sent from home to the boys in the trenches. With such a service record as this, the black walnut is entitled to a memorial of its own. Its value as a timber tree, as an ornamental, and as a food producer, together with its great range of adaptability from North to South and East to West, should justly entitle it to recognition as a National tree.

10. Michigan has a law providing for the planting of nut trees along its highways. Thus, the state has officially put its approval on the idea and has become a leader in the encouragement of this great kind of economy and thrift. It has taken

a step toward conservation in a direction which is highly developed in certain parts of Europe. The product is sold to the highest bidder and the income used in the upkeep of the road system. In that manner the roadways of those sections take care of themselves. In this country millions of dollars of state and federal moneys are being used this year, (ending June 30, 1921), in the construction and upkeep of public roads.

Desirable as it would be to accomplish these ends, it could not all be done at once. Even though there were an abundance of available trees of tried kinds, it would take a long time to plant them and to care for them until they might become of profitable bearing age, also public opinion would need to be remolded in order to insure their care and protection. Still it can and will be done. The movement is already on; the Michigan law began to operate soon after being passed, and the Division of Forestry at the Agricultural College is raising the trees for planting. Public opinion regarding the care of the trees and their product will take care of itself when the value of the trees and their products becomes apparent. Both in California and in Oregon not only nut but fruit orchards and vineyards, grow beside the roadways with no protection other than that of public opinion; and what has been done in one part of the country can be done in others as well.

The eleven species referred to as being available for Michigan use are as follows: The almond, beechnut, butternut, chestnut, filbert, (hazel), pecan, shagbark hickory, shellbark hickory, black walnut, Japanese walnut, and the Persian or so-called English walnut.

Taking these up in order we will consider first the

Almond

Except as an ornamental, the almond does not offer a great deal for use in Michigan. It is sometimes said to be as hardy as the peach, but only as this refers to the tree and not to the fruit, is it true. Certain hardshell almonds edible, yet so inferior to the improved varieties as to have practically no market value, do sometimes succeed in lower Michigan but their value is limited to their beauty when in bloom and to the production of a low grade product. In form and general appearance these almonds are much like peach pits. Very often they contain much of the same bitter taste of Prussic acid common to the kernel of the ordinary peach. They are interesting to observe while growing especially as they begin to ripen. The covering outside the seed is thin and leathery and while ripening, splits and peels outward in curious fashion.

Perhaps the only recognized variety of almond of this class which is known to have fruited in the East is the Ridenhower from southern Illinois. Trees can be had from some of the nurserymen.

The Beech

One of Michigan's noblest, hardiest, and most often abused trees is the American beech. It is common from north to south. No tree is more handsome and none, unless possibly it be the white birch, is so often defaced. Dr. Robt. T. Morris, of New York City, reminds us that according to the scriptures, man, genus *Homo*, is a finished product made by and in the image of the Creator. A safe assumption is that the scriptural reference is not to the creature whose initials appear on the trunk of a beech or whose knife has removed bark from white birch. His genus is not *Homo*, and he is not scripturally recorded.

The beech is not directly important as a nut bearing tree, but indirectly it is as the nuts are rarely harvested. Indirectly it is of great value. No food is better for turkeys and hogs than are beechnuts. A bushel of beechnuts that can be used in this way replace at least a bushel of corn. The difference in cost of production should make beechnuts worth several times as much as corn.

In Europe a valuable oil used as a drug and for salads is expressed from beechnuts. Possibly individual trees could be found somewhere in Michigan which produce nuts large enough, good enough, and in quantity enough to justify their recognition and propagation as named varieties.

No matter whether distinct varieties appear or not, the beech is well worthy of planting in many places about both the farm and the city lot.

Butternut

A member of the walnut family known also as "long walnut" and as "white walnut" is the true butternut. It has a smaller range of adaptability than does the black walnut but is found considerably farther north. On the Atlantic coast, its native range extends into Nova Scotia. In parts of New York State and New England, it is one of the most common species. It is well known in Michigan where, to many people it is the favorite of all nuts. The tree is less durable and long-lived than is the black walnut. It is less well suited for use in the landscape and its timber value is probably the least of any native

walnut.

Within very recent years one or two promising varieties have been introduced by the nurserymen. The first and only one now available is the Aiken from New Hampshire. The nut cracks well and the kernels are of pleasant flavor, but as a variety it has not been tested long enough to determine its adaptability to conditions in other states nor the extent to which budded trees will be productive.

Chestnut

Perhaps the greatest, of all tree tragedies is represented by the chestnut. Once a dominant species in many parts of the East, it is now merely a wreck of its former self. In whole states along the Atlantic Seaboard, it has been wiped out by a fungus disease introduced from Japan some 25 years ago. Pennsylvania allows no chestnut trees to be shipped outside its limits for fear of further spreading this disease. So far as known chestnut trees from west of the Wabash River are free from infection. From Illinois, there have recently been introduced several varieties of chestnut supposedly of pure American parentage which are quite the equal in size of the European sorts but which have the sweet flavor of true American strains. In protected places in the southern part of the Lower Peninsula these chestnuts should be well worthy of trial. They are, indeed, splendid chestnuts. The principal varieties are the Rochester, Progress, Fuller and Boone. The last is not related to the others; but is the result of an artificial cross between the American sweet chestnut and the Japan Giant.

Hickory

Next to, or perhaps equal to the black walnut, the hickories are among the best known of Michigan's nut trees. Belonging to the same family as do the walnuts, they require much the same soil for their best development. They are slower of growth and even harder to bud and graft or to successfully transplant. Nevertheless, some of hickories bear splendid nuts in liberal quantities. Quite a number of good varieties have been named and a few propagated. They are mainly of the shagbark species although some are shellbarks, some pignuts, and a few hybrids. The true shellbark is not found in Michigan and would probably not succeed there as well as do others. In character of growth, the shellbark is much like the shagbark but the nuts are much larger, and the shells extremely thick. Among the good shagbarks there are the Swaim, Weiker, Kentucky, Manahan, Taylor and Vest.

True hickories ordinarily do not attain important habits of bearing until from 15 to 25 years of age.

Pecan

The pecan is easily the favorite and most important nut of American origin. Contrary to current ideas, it is not an introduced species nor are the best pecans grown in California. The pecan has become one of the leading nuts of this country by rapid but natural processes. In the forests, it is indigenous as far north as the southern part of Indiana, and in western Illinois it is found at the latitude of Chicago. Seedling trees at South Haven and on the campus of Michigan Agricultural College have borne occasional crops but the climate of Michigan is too severe for pecans to bear regularly. The trees of northern origin should do well enough over much of lower Michigan to be worthy of planting. Good varieties are the Major, Greenriver, Niblack, Indiana, Busseron and Posey.

Black Walnut

Already the black walnut had been referred to in this article. In its further behalf may be said that like the pecan it is one of America's most rapid growing valuable trees. It does not grow with the speed of a poplar, a willow, or a linden. Neither does any other tree of value or longevity. Two 6-year-old trees of the eastern black walnut grown in the Wiliamette Valley of Western Oregon, bore approximately a peck of nuts apiece, in 1919, when they were photographed by the writer. In good soil and under favorable conditions of growth, it will be seen that the black walnut is not always slow in developing but that it is sometimes a rapid grower.

Three varieties of black walnut are now available from the nurserymen. They are the Thomas from Pennsylvania, the Ohio from some 20 miles south of Toledo, and the Stabler from Howard County, Maryland 15 or 20 miles outside the District of Columbia. All are prolific, precocious and of superior cracking quality. The Thomas was discovered and first propagated some 30 years ago. The young grafted trees show a tendency to begin bearing in the nursery rows.

At the present time, the black walnut is regarded as being of greater promise for planting in the northern states than is any other species either native or introduced.

The Japanese Walnut

To a considerable extent this species has been confused with the Persian walnut, although the two are quite unlike. This is a dwarfish species with dull green rough leaflets often as many as 15 or 17 per leaf, which often bears nuts in clusters of a dozen or more. While green the outer hulls of the nuts are rough, and somewhat sticky.

The Persian walnut is a standard-sized upright growing tree with bright green leaflets, usually 5 to 7 per leaf, and smooth, round nut hulls which split open and shed the nuts automatically.

The Japanese walnuts hybridize freely with other species of walnuts and produce nuts of all types; not infrequently crosses of this kind resemble butternuts so closely as to be practically indistinguishable from them.

True Japanese walnuts have a range in form of two distinct types. The better known is of guinea egg shape; the other, often known as the heartnut, is of distinct heart shape. Neither is large; the former is of about the size of a guinea egg or smaller; the latter is still smaller. Both are like the black walnut in being encased in a rough outer husk, which upon maturing shrivels and adheres to the surface of the nut. The shells are thinner than are those of the black walnut, but thicker than are those of the Persian walnut. When well matured, the shell of the heartnut tends to open slightly at the apex, after which it can be readily split in half with a knife blade. The flavor of the kernel is much like that of the American butternut.

The Japanese walnut is ordinarily hardy wherever the black succeeds. It is by no means uncommon in Michigan where it is especially appropriate for family planting. For the present, seedling trees will have to be relied upon almost wholly, as very few varieties have been propagated. So far as the writer is informed, the only named variety available from a northern nursery is the Lancaster introduced by J. F. Jones, a nurseryman at Lancaster, Pa.

Persian Walnut

Perhaps no species of nut tree has attracted as great attention in Michigan as has the Persian walnut. Under some conditions it does well for a time in the eastern or northeastern states, but on the whole its performance is distinctly erratic. Commercially speaking, it is of importance in this country only on the Pacific coast. Trees on the campus at Michigan Agricultural College and at many private places in the central part of the state, have come to little. Usually they grow well in summer only to freeze back nearly as much in winter. In Saranac County, eastern Michigan, close to Lake Huron there are a few young orchards that are in good condition, but a half mile back from the lake the results are discouraging. The same is true next to Lake Michigan from Grand Rapids south to the Indiana line.

The only recommendations that can be made relative to planting the Persian walnut in Michigan are, that it be planted very cautiously in any part of the state and except under very favored circumstances it be not at all in the middle of the state.

Do not undertake to grow the trees by planting the nuts or by buying seedlings. The most desirable trees are those of hardy varieties, budded on the black walnut as a stock a foot or more above ground.

The Filbert

The filbert has been one of our tantalizing species of nut trees. In England, trees grow to ages of from one to two hundred years, bearing profusely meanwhile. There, for many years, they are grown under apple trees with currants below them. In Germany, we are told that strawberries are grown below the currants and gooseberries. We are waiting for the Yankee who will be first to grow peanuts or potatoes below strawberries. In the eastern part of this country, plants of the European kinds are disappointing in two ways. First, they are uncertain as to their ability to bear; and second, they are highly susceptible to a fungus disease found everywhere that the native hazels abound. The native species is quite able to resist this disease, but the introductions ordinarily succumb to it quickly.

In the Pacific Northwest, where by many filbert culture is believed destined to become a successful and paying industry within the next few years, not infrequently some varieties begin to blossom as early as in December. The blooming is largely responsible for the failure of eastern trees to set and mature crops of nuts.

Several nurserymen are now endeavoring to find varieties of commercial value in the eastern part of the country. Apparently they are meeting with some success as far as their work has gone. Many of the varieties they are testing are proving inferior, but a few have borne good nuts in gratifying quantity for several years. During the past winter, a good many froze severely, although they are commonly hardy under severe weather.

Wherever they are planted, they should have fertile soil, from 20 to 25 feet of space each way and should be trained to tree form. After 10 years or so, they should be headed back severely, unless regular pruning has been practiced in the meantime. Filberts fruit only on new wood.

To those who have read this article to this point, it is now apparent that the nut industry of Michigan lies almost wholly in the future. The native varieties form an excellent ground work for that future, but to properly take advantage of that base, it will be necessary for practically every nut lover in the state to lend a helping hand. The first great movement necessary is to examine the nuts in the fall as ripen in order to find the best of the walnuts, hickories, native hazels, beeches and introduced chestnuts, walnuts and filberts. In this everyone can help. Whoever finds a tree of any kind bearing superior nuts will render a great service by sending specimens, together with his or her address and that of the owner of the tree to the Federal Department of Agriculture at Washington, D. C., or to Willard G. Bixby, Treasurer of the Association, Baldwin, Nassau County, N. Y. Be sure to carefully note the exact tree, from which the nuts were obtained and if specimens are sent from more than one tree, they should be kept separate and each carefully labeled. Such nuts will be examined and if found to be the equal or superior to the varieties already being grown, they will be named and arrangements made for this propagation and test.

No prizes are given by the Government but good nuts sent the Government will be eligible to entry in the contest of the Northern Nut Growers' Association. If enough specimens are sent the Department, some will be forwarded to the Treasurer of that Association who has charge of awards.

According to very recent reports, the outlook for a nut crop during the coming year was never better. This should, therefore, be an excellent year for finding the trees bearing the best nuts.

President Reed: I believe Mr. Reed expects to give an additional talk tonight with lantern slides.

Mr. C. A. Reed: There will be an informal talk, a question box this evening for the benefit of any interested in the general discussion of nut culture in the United States. I notice the guests of the institution are deeply interested in nut growing in their particular states; so the arrangement for this evening is to give those persons an opportunity to come out and ask questions.

Mr. Olcott: While Mr. Reed is on that subject, I would like to ask if there is a chestnut as large as the Boone or other chestnuts grown by Mr. Riehl of as good flavor as the American Sweet chestnut. A good many people are asking me from time to time what the merit is in those large chestnuts. Invariably they have found that the quality is not as good as in the American sweet chestnut. I have been assured and Mr. Reed says that the kernel of these is very good. I wonder if there, are some of them better than others—of the very large chestnuts.

Mr. C. A. Reed: There is a difference. The Boone that Mr. Olcott refers to is a cross between the American species and the Japanese. The Japanese has not a good flavor; it is considerably below that of the American; but the Boone is quite good; but there are some of Mr. Riehl's chestnuts that are better. Mr. Riehl's are believed to be the pure American sweet chestnuts and some of them are very good, perhaps not quite as sweet as our American sweet, but they are exceedingly satisfactory and very popular in the Chicago markets where Mr. Riehl's chestnuts are going.

Mr. Bixby: This fall I received a chestnut which I am satisfied was Japanese, which is very large, and seemingly about as sweet as the American. I did not have the American there to test it by, but it was very interesting to me, and I am planning to get scions in the spring to follow it up further. It was seemingly a Japanese chestnut, and pretty nearly as large as the Boone.

Mr. J. F. Jones: I might say that so far as I have tested them, some of the Japanese are quite sweet, but the meat is generally tough, not brittle and sweet like the American.

President Reed: I believe Mr. Linton is with us, and we shall be glad to hear from him.

NUT TREES FOR HIGHWAYS AND PUBLIC PLACES

William S. Linton, Saginaw, Michigan

For a number of years it has been a source of gratification and pleasure to me to be identified with the membership of the Northern Nut Growers' Association. True, "a long distance membership only," but nevertheless a connection that all must admit has borne fruit, or nuts, as you may prefer to state it.

To this association and its official journal must be given full credit for the pioneer work in a great and good movement that will sweep, not only over the United States, but over every clime and county in the world's Western hemisphere as well. Your seed sown in the peninsular state of Michigan, was the first to sprout in a substantial way in so far as public planting of nut trees by a sovereign state is concerned, and it was our good fortune to have as staunch supporters for the plan such able and persistent workers as my good friend, Senator Harvey A. Penney of Saginaw, Professor A. K. Chittenden of the Michigan Agricultural College, and last, but not least, Honorable Frank F. Rogers, Michigan's excellent

State Highway Commissioner. Upon the latter will largely devolve the duty of carrying out the law's provisions, as provided in Senator Penney's bill passed at the last session of the Legislature, and that it will be well and practically done, goes without saying.

And now to my theme, "Should the Country Roadsides be Planted and Why." The present high cost of living, and in fact the cost of living at any time is a fruitful and serious problem. Our vast natural resources during the century gone, of forests, of game, and of grazing lands, have almost to the point of extinction been rapidly passing away, and it behooves us, who have profited thereby and now owe a duty to our race to artificially provide wherever and whenever we can for the future of humankind. In what better way can this be done than in utilizing the immense acreage of America's vast system of highways, (now absolutely wasted except for the sole purpose of travel), to reproduce the very finest of our country's magnificent trees, to again afford beauty, grateful shade, valuable timber and the choicest of food in great abundance for the generations to come.

Were this not a convention devoted to the advancement of nut growing alone, I would be glad to extol also for road planting fruit trees of every kind of adequate size and character, and free or nearly so, from the ravages of disease or insect pest, would be glad to praise the stately, hard maple, with its clear, sweet sap, producing the syrup and sugar that are the delight of childhood and age, and would be glad to recommend the useful basswood with its valuable lumber and its fragrant yellow flowers, producing that nectar from which our most delicious honey is made, and would be glad to recommend for our highways, certain other majestic trees needed by man and beautiful in the landscape.

But the object of this association and convention is a specialized one, as undoubtedly it should be, owing to the important field it covers, and therefore the nut trees and it alone for planting on highways and in public places should be the subject of this paper.

If we were to confine ourselves to one native variety or species for our Northern territory, the great majority of people would unhesitatingly say, let it be the Black Walnut (*Juglans nigra*). Attaining as it does a height of 100 feet and more, and a trunk of four feet and over in diameter, with a symmetrical top of splendid foliage, bearing the richest of nuts and its timber the most valuable in the country, with a natural range extending from Michigan to Mississippi and from Delaware to the Dakotas, it should be universally planted throughout the United States along thousands of miles of our great trunk line roads.

Its nearest American relative, the butternut (*Juglans cinerea*) preferring lower lands along river bottoms, attaining an average height of 60 feet with a trunk of 3 feet, its wood suitable for cabinet work, its bark with medicinal properties, and its nuts of splendid flavor, should be planted where soil conditions call for it.

For their rich, delicious nuts, alone, saying nothing about their clean, handsome foliage, their rough, strong wood—the best of any grown for many purposes—the hickories, among which are the Shagbark (*Carya ovata*) and the big shellbark (*Carya laciniosa*), should be planted in many places. They both frequently attain 100 feet in height with straight sturdy trunks averaging from three to four feet in diameter.

The other nut trees suitable for roadside planting, are not specially attractive to mankind for their fruits, as heretofore used or utilized, but may eventually become so under modern methods of cooking or proper treatment. In their raw state, however, all are edible and also palatable to most people, but their chief food value today, is to provide rich provender to domestic animals and birds, or the desirable wild life of the woodlands, all of which devour them eagerly, adding quickly to their weight and greatly to their quality and flavor of their flesh. I refer to the three magnificent oaks producing sweet acorns, viz., the White Oak (*Quercus albaq*), the Bur Oak (*Quercus macrocarpa*) and the Swamp White Oak (*Quercus plantanoides*). They are all emblematic of great strength and grandeur, reaching the majestic height of 100 feet, with trunks four or five feet in diameter; the leaf coloring at times is indescribably beautiful and the timber owing to its great solidity and strength is of the utmost value.

Last, but not least, the American beech, with a three or four foot trunk and almost 100 feet in height, distinct and beautiful, will demand the attention of those who plant our highways. Its nuts, feasted upon by many forest denizens, may be classed with the sweet acorns heretofore referred to, but the tree has a grace and charm all its own and it thrives from the warm waters of the Gulf to the icy shores of Lake Superior.

At this time we cannot recommend what has been a noble, almost fascinating tree, 100 feet its usual height and sometimes spreading 100 feet almost in extent, with a trunk that in some cases reached a diameter of 10 feet, with clusters of golden catkins fragrant in midsummer, resulting in great quantities of delicious nuts in autumn. Such was the chestnut, *Castanea dentata*, of the past, the fate of which, and almost extinction, has been a tragedy in the ranks of our native trees that has brought bitter regrets to all lovers of this partician of the forest. Good news comes from the far East, however, to the effect that some specimens of this famous tree have escaped or proven immune to the blight, and if the latter, it means the saving of the species and its replanting in soil and territory where it may thrive as of yore.

Having now enumerated the varieties of trees that should be selected in the main for the planting of highways and in

public places, the question now arises as to the best method of carrying on the work in a practical way throughout the country.

Individuals or small communities certainly can not be depended upon to do it, as the result would be of a patchwork character that would not be pleasing to the eye or beneficial in its results.

Only federal, state and municipal governments can take charge of this great work and carry it forward to completion.

The State of Michigan, now as you know, by legal enactment, causes state authorities to plant the trunk line, highways, the county to plant the roads of the county systems, and the cities and villages and townships those minor roads that are within their borders.

In case of individual effort, where an owner of land plants food-producing trees along the highways in front of his property, he is reimbursed by stated amounts covering each tree so planted, the returns coming to him by a reduction in the amount of his own taxation.

This so-called Michigan plan carried on throughout the entire country, would call for a supply of trees of the character named far beyond the ability of the commercial growers to supply, and in my opinion can be worked out only by seed or seedlings of the various varieties. And why not? The cost would be much less than of any other method, and only a few years would pass before substantial returns would commence to come. It has been stated and it is true, that the seeds of the trees named do not always produce superior nuts, but in a great majority only those of a common or inferior kind. However, choice specimens will appear also, and from these of the better class grafting may be done to enrich all.

Then again, it is a question as to whether the important tap roots of the important nut species should be disturbed or destroyed in transplanting. It would seem to be the proper plan, therefore, in order to avoid too great an expense, that the nuts or seed should be used in a great majority of highway planting, the trees to remain where first placed on approved roadside lines, and the proper distance apart.

It may be said that too great a time would elapse between the planting of the seed and the maturity of the tree, but as time goes nowadays, it would not be an unreasonable period, and there are those within the sound of my voice now, who will witness in their maturity the magnificent trees producing their valuable products and adding to the beauty of the landscape and to the welfare of mankind.

This Association has been the pioneer in this great movement, and it will be the credit to those connected therewith in the generations to come, in that they have all contributed in a very marked degree to the everlasting benefit of mankind.

President Reed: Is there any discussion?

Mr. C. A. Reed: I believe Senator Penney is to discuss a topic very closely affiliated with this one and perhaps it would be well to defer the discussion until we hear his address.

President Reed: We will be glad to have Senator Penney present his paper next, then. It is along the same lines—legislation in regard to tree planting.

Senator Penney: When my friend, Mr. Linton, started off to discuss his paper, he said he was a long distance member, and you can see the effect in the fruits he has borne or the nuts he has borne. Ever since I was taken sick up north, he has been trying to tell me I was a nut. I was taken sick up there in the deer hunting camp, and my friend, Mr. Linton, assisted in getting me out and rushing me to the nearest hospital, and it happened to be an insane asylum in northern Michigan.

LEGISLATION REGARDING THE PLANTING OF NUT AND OTHER FOOD PRODUCING TREES

Senator Harvey A. Penney, Saginaw, Michigan

I wish to express my hearty appreciation to your Association for the distinct honor of being invited to address your meeting upon the subject of "Legislation Regarding the Planting of Nut and Other Food Trees." I believe that my invitation came as a result of having been responsible for introducing a tree-planting bill in the Senate of the 1919 session of the Michigan State Legislature, and later in securing its passage.

This bill purported "to regulate the planting of ornamental, nut-bearing and other food-producing trees along the highways of the State of Michigan, or in public places, and for the maintenance, protection and care of such trees, and to

provide a penalty for injury thereof, or for stealing the products thereof."

For several sessions of the Michigan Legislature prior to 1919, bills had been introduced intending to accomplish this result, but each time heretofore they have regularly failed to pass. This fate included one introduced by the writer during the session of 1917. I am now fully convinced that none of these bills, although a step in the right direction, seemed to provide the proper working machinery or necessary features to put them into practical operation, and hence did not appeal to the legislative committees, nor to the members of the several legislatures.

During the regular session of 1919, with the valuable assistance of Hon. W. S. Linton of Saginaw, a new bill was prepared providing an entirely new method of supplying and planting such trees, and for putting such a law into effective operation under the jurisdiction of the state. It was made to work in harmony with the rights of the property owner adjoining the highway, and with the duties of those state officials whose departments were perfectly adapted and equipped for putting the law into active operation.

I am going to attach an enrolled copy of the tree planting bill at the end of this paper, so that it may be made a part of the permanent records of the Association. It will therefore be unnecessary to give a detailed account of all the provisions contained therein.

I will, however, mention a few of the principal points so that you may understand its purpose. It provides that the Public Domain Commission which has charge of the state forest reserve lands and parks, together with the Michigan Agricultural College, are given authority to grow and acquire suitable seeds, scions or trees for planting under the provisions of this act. A department of the Agricultural College determines the kind of trees which are adapted or suitable for planting in different soils or places. In order to insure a uniform system of planting, this duty is left to the State Highway Commission and the State Board of Agriculture, acting jointly. The trees belong to the state, but the nuts or other products belong to the owner of the land adjoining the highway. A penalty is imposed if these trees are defaced with advertisements or signs, and neither can they be cut down or destroyed.

But just as you find legislatures differing in their opinions upon public matters, so you must expect them to differ more or less upon the feasibility of most any bill that is presented for their consideration. All kinds of arguments are made for and against any bill. I remember that one Senator in the committee thought that trees planted along the highways bearing nuts or fruit would constantly be subject to a lot of tampering and molestation by the traveling public. But another Senator came back with a reply that seemed to be very convincing, when he stated that he had a fine row of cherry trees growing along the front of his farm, and had never experienced any trouble of that kind from such a source.

I have always felt that if the merits of a good bill were properly explained to a legislature committee, there will be no hesitancy in having it favorably reported out and finally passed. I believe the legislature of 1919 took this view of the tree planting bill introduced by myself, as it was passed by both the Senate and the House, and later received the signature of Governor Sleeper, thus making it an established law of Michigan.

I must not forget to mention the fact that after this bill had been passed by the legislature and still needed the signature of the Governor to make it a law, a number of Michigan's representative and influential citizens wrote to Governor Sleeper, urging him to affix his signature thereto. Among those was Dr. J. H. Kellogg of Battle Creek, who has more than a nation-wide reputation in his profession and is at present a strong factor in the success of this association.

This law is intended not only to ornament the public highways of Michigan, but also to furnish nut bearing and other food-producing trees that should assist materially in the problems incident to the high cost of living. It would seem that such a law should be duplicated in every state where practicable, and also be promoted by the National Government upon National Highways.

The people of Michigan recently voted to amend the State Constitution so as to permit the issuance of $50,000,000.00 worth of bonds for the improvement of public highways. By the time that this large sum has been apportioned over a period of say ten years, and the road moneys furnished and expended during this time, as federal aid by the federal government, local counties and townships are added thereto, it has been estimated that the vast sum of nearly $200,000,000.00 will have been used solely for the improvement of our state highways.

With a wonderful highway system thus established, beautifully adorned by the state with nut-bearing and other trees, the roads of Michigan should become a great attraction in which our citizens would not only have a just pride, but serve as a model of excellence for the whole nation to imitate.

Mr. C. A. Reed: Mr. President, I would like to ask the Senator what danger there is likely to be in the protection of these trees when they are once planted. Is the tree going to have right of way, or is the telephone company going to have right of way in cutting out the top; or is a new bred consciousness going to have authority. If it is possible that the trees will be destroyed as many have been, perhaps the legislation may be changed in some way. Suppose we want to give them good care, what are we going to do?

Senator Penney: The law has a section in it providing for defacing and damaging the trees or cutting them down. I have a copy of the bill there. As my throat is in bad shape perhaps it might be well to have the secretary read the bill. It is not very long.

Mr. Linton: In this connection I would also ask for the reading of the bill by the secretary. This is a bill that may be copied by other states throughout the Union, and if there is any criticism that is just, in reason, for changing any of the features in the bill, they should be decided upon at this meeting or by a committee. Because a uniform bill throughout the country is really something desirable, I think, in connection with this legislation. And I would add further: Michigan does not have an entire monopoly of Highway legislation at the present time, but is in a prominent position in connection therewith. The chairman of the committee on post offices and post roads of the United States Senate is Senator Townsend, of this State. It is his bill that will cause the national highways to be constructed from ocean to ocean. Senator Townsend is one of our best beloved citizens; his heart is in this work; and I am sure from what I know of him (and he is a close friend of mine) that he will enter heartily into the spirit of embodying in national legislation something of the character that we have in state legislation in Michigan so that it may apply to the whole country as well. And for that reason I would like to have the bill read. It is a short one, and any additions or any amendments thereto I know will be gladly received by Senator Penny or myself.

Mr. Olcott: Mr. President, I think that is one of the most important subjects that can come before this Association; not only that, but the interest of every member should be enlisted particularly in this subject. The possibilities of the extension of that work are almost unlimited and directly in line with the objects of this organization.

President Reed: I am just wondering whether we would have time to have it read now, or postpone it to a little later. Dr. Kellogg is with us now.

Mr. Bixby: This bill is very short. (Read bill.)

Senate Bill No. 59 (File No. 150)Introduced by Senator Penney

STATE OF MICHIGAN

50th Legislature

Regular Session of 1919
SENATE ENROLLED ACT NO. 18

An act to regulate the planting of ornamental, nut bearing or other food producing trees along the highways of the State of Michigan, or in public places, and for the maintenance, protection and care of such trees and to provide a penalty for injury thereof, or for stealing the products thereof.

The People of the State of Michigan enact

Section 1. The State Highway Commissioner and the State Board of Agriculture, acting jointly hereunder, shall have authority and it shall be their duty to select and plant by seed, scions or otherwise, ornamental, nut bearing, or other food producing trees, (to be supplied by the Public Domain Commission, or the Michigan Agricultural College, as may be recommended or approved by the Division of Agriculture of said college,) suitable for shade trees, along the State trunk line highways and all other highways of the State of Michigan, upon which State reward has been paid or earned:

Provided, that in no case shall such trees be planted except by and with the consent of the owner of the property adjoining such highway. The State Highway Commissioner shall establish rules and regulations for uniform planting or proper placing of all trees under the provisions of this act, and all such trees shall belong to the State, but the products thereof shall belong to the owners of the adjacent land. Nothing herein contained shall authorize the State Highway Commissioner, or the State Board of Agriculture to cut down or interfere with shade trees now growing along any such highway, without permission in writing from the owner of the adjoining property. All expenses incurred in carrying out the provisions of this section shall be paid out of any moneys in the State highway fund that may be available therefor.

Section 2. Counties, townships, cities and villages may annually appropriate money to be used in planting, pruning and protecting, and whenever necessary in acquiring shade, nut bearing and ornamental trees to be placed along and within the respective limits of said municipalities. The expenditure of any such fund shall be vested in the highway commissioner in the case of county roads, and in the proper highway authorities of the city or village as the case may be.

Section 3. The owner of any real estate in the State of Michigan that borders upon a legal highway upon which State

reward has not been paid, shall have the right to plant said approved ornamental, nut bearing, or other food producing trees along the line of said highway adjoining said land, and shall receive annually a credit of five cents upon his highway repair tax for each tree so planted by him and growing in good order, not less than six feet in height when planted and not less than twenty and not more than forty feet apart. All of said trees and their products shall belong to the owner of said land: Provided, that no bounty shall be paid or deduction allowed under the provision of this section upon any one tree or row of trees for a longer period than five years. The owner of such trees shall have the care thereof and shall have the duty and responsibility for the trimming, spraying and cultivation thereof.

Section 4. The Michigan Agricultural College and Public Domain Commission are hereby authorized to grow and acquire suitable seeds, scions or trees for planting under the provisions of this act, and to establish proper rules and regulations for distributing the same at nominal cost, or otherwise, to counties, townships, cities, villages, and citizens of the State for the aforesaid purpose, and also for State parks or other public places.

Section 5. It shall be unlawful to cut, destroy, injure, deface or break any ornamental, nut bearing, food producing or shade tree upon any public highway or place, except where such trees shall interfere with the proper construction or maintenance of such highways. It shall be unlawful to affix to any such tree any picture, announcement, play-bill, notice or advertisement, or to paint or mark such tree, except for the purpose of protecting it, or to negligently permit any animal to break down, injure or destroy any such tree within the limits of any public highway. Any person violating any of the provisions of this act shall be guilty of a misdemeanor and on conviction thereof shall be punished by a fine of not less than one dollar or more than twenty-five dollars, and in default of payment of any such fine may be imprisoned in the county jail for a period not exceeding thirty days. Such person shall be liable to the owner of the trees for treble the amount of damages sustained.

Luren D. Dickinson,
Lieutenant Governor, President of the Senate.

Tom Reed,
Speaker of the House of Representatives.

Approved, March 28, 1919.
Albert E. Sleeper,
Governor.

Mr. C. A. Reed: Mr. Chairman, I *move* that before adjournment the chairman appoint a committee of three members of this association to carefully review this bill and either report in favor of any suggestions that they may wish to make in regard to its amendment or give approval of the bill as it stands.

Mr. Linton: I support the motion.

President Reed: It is moved and seconded that the chairman appoint a committee of three to carry out the recommendations. All in favor say Aye; contrary, No. It is Carried.

Senator Penney: That law is adjusted to the laws of Michigan and any other state proposed would have to adjust it to fit their laws.

President Reed: I would like to have Mr. C. A. Reed on that committee, Mr. Olcott and Dr. Morris.

C. A. Reed: Then, Mr. President, in addition to that we are going to take the liberty of adding an *ex officio* member, Mr. Littlepage, an ex-president and also a good thoroughgoing nut.

Mr. Jones: My understanding is the provision for six-ft. trees. Six foot nut trees unless they have been transplanted several times will hardly succeed. I would say use small trees along the highway.

President Reed: I think that would need to be worked out. I think a six foot tree is a little dangerous in some varieties. The committee might find it wise to offer some suggestions in that line.

Voice: If you plant a tree six feet high, you are sure of having a tree there.

President Reed: I believe Dr. Kellogg is about ready now, and we will hear from Dr. Kellogg whom you are all acquainted with.

THE SOY BEAN

Dr. J. H. Kellogg, Battle Creek, Michigan

It is evident that the live stock industry is shriveling up. The livestock inhabitants of the country—the pigs, sheep and cattle—are much smaller in population at the present time than they were twenty-five or thirty years ago, and are getting smaller all the time. The price of meat is high and is going to continue to climb. It is away out of reach of the average laboring man even at the present time. I heard Dr. Charley Mayo say at a clinic not long ago that meat is so high he could not afford to eat it and he didn't see how anybody could; and as a matter of fact, he didn't need it anyhow, and so we could easily get along without it. As a matter of fact, as Mr. Bill said some years ago it is not really so much the high cost of living as it is the cost of high living; and the use of meat is such an extravagant and expensive thing it is very important that people should know how to get along without meat.

The experimenters of the agricultural experiment stations have shown us that it takes thirty-three pounds of dry digestible food substance to make one pound of beef—31 or 32 pounds to make a pound of beef, and 33 or 34 pounds to make a pound of mutton. Seven pounds of digestible food substance will make a pound of dry milk. So we can readily see that there is an enormous waste of foodstuff. Only about ten per cent of the corn raised is used for feeding human beings. The rest is fed to animals and a large part of it is wasted.

So it is exceedingly important, it seems to me, that this nut industry should be encouraged in every way. A half million acres of nut trees well advanced and producing would produce all of the fat and more digestible fat, and all the protein and more digestible protein, than we are now using in the entire country. We are producing more than enough food in corn and other foodstuffs to feed nearly three times our present population, and most of it is wasted in the energy which the hog, the steer and other animals use up in running around and keeping warm. That is where the great loss comes. In nuts we have a choice foodstuff as digestible as any other foodstuff, and Prof. Torrey and Prof. Mendel and others who have recently made experiments have shown that the protein of the nut and the protein of vegetables in general is not so putrescible as the protein of meats. There are good reasons for it. It does not undergo putrefaction so readily any way, and besides meat carries along with it the bacteria which produce putrefaction.

Meat is the filthiest thing that goes upon our tables. If the number of bacteria in milk was as great as the number of bacteria in meat, nobody would think of eating it. If the bacteria in water were as numerous as in milk, no one would be willing to drink the water. It is a very curious thing that we permit in milk and in meat a condition of things we would not tolerate in air or water for a moment. Every morsel of meat a person eats contains some billions of the bacteria of the very worst sort. Bacteria found in meat are those which produce colitis, appendicitis, abscesses of the teeth and diseased conditions of the tonsils. They predispose to a good many infectious diseases of the intestine, and no doubt predispose to cancer. It is pretty well established at the present time that cancer is a disease of meat eating men and animals. About one cow in fifty has cancer, whereas every seventh dog taken to a hospital sick is found to have cancer. Dr. Mayo recently gathered some statistics on this matter, and he told me and some other doctors that dogs under eight years of age, every fourth one has cancer; every third one of dogs ten years of age has cancer, and half of all the dogs over twelve years of age have cancer and would die of it if left to themselves. These statements were based on laboratory animals that were killed when they were well and not sick, so the observation ought to be fairly reliable.

I was to say particularly a few words about the soy bean. I am not going to try to tell you very much about it, because I do not know very much about it. If you want to learn all about it, you can easily do so by writing to Mr. W. J. Morse, of the Bureau of Plant Industry, U. S. Department of Agriculture, Washington, D. C. Farmers' Bulletin 973, one of the very best on this subject, tells all about the culture of this exceedingly useful legume. The soy bean is really the beefsteak of China and Japan. In those oriental countries, soy beans have been used for centuries. It is more nearly like a nut than a bean. Perhaps I better show you the pictures first, and then have the curtains raised so we can get a better inspection of the beans.

The composition of the soy bean is very remarkably different from that of the ordinary bean. It contains forty per cent of fat, on the average and about forty per cent of protein—sometimes more than forty per cent. The protein is sixty per cent more than in our best ordinary foods; and the fat is five or six times as much as that found in the ordinary bean.

A thousand different varieties of the soy bean have been gathered by the Bureau of Plant Industry of the Department of Agriculture at Washington. Five hundred of these varieties have been tested, and thirty or forty of them have been found to be adapted to this country, and very useful. You can see in this picture the great mass of pods to be found growing on the plant. This slide shows how unusually well they grow in the field. You can see the pods scattered all through the plant. A large part of the foliage is made up of pods. This is one of our own fields of the beans that we raised this year. It is rather difficult to raise the bean in this latitude, because it requires a long time to mature. It requires about 110 days for some varieties. We have, however, a variety we raised here that we got from the agricultural department of Ontario. We found it matured very well indeed in 120 days. We planted the bean here the first week in May and harvested it the first week in September; so its season was about 120 days. I found this particular bean was new to the agricultural department at Washington, and have sent them some of the seed, and I think they are going to make some trial of it.

This is a view of a field of the Hahto variety which is a particularly fine variety for use as a shelled bean. In China the soy bean is very little used as we use beans. They do not cook the bean and eat it as we do; but instead they make it into a cheese which they call tofu, and this cheese is made by soaking the beans, grinding them into a pulp, then boiling for ten or fifteen minutes with about five volumes of water; then the milky mass is precipitated with sulphate of magnesia or citric acid, a very small amount because they use it as a curd. I have here a sample of the curd which I will pass around in a moment for you to see. This picture shows this curd pressed in large cakes. The soy bean curd is stored on wooden trays in a dark room. It is also stored in large earthen jars. They cure it and make cheese out of it which very closely resembles our American milk cheese. They also use the beans for sprouting.

The bean lacks only two things. It lacks lime and the fat-soluble vitamines. It contains a considerable amount of the fat-soluble vitamines. It is one of the very few seeds that is found to contain a sufficient amount of the fat-soluble vitamine to promote growth, so that animals will grow and develop normally on the bean alone without any other sort of fat-soluble vitamine. If the bean is sprouted, a large amount of this fat-soluble vitamine is produced by the plant itself. This is also found to be a valuable means of preventing scurvy—by sprouting the beans in this way and using the sprouts as a salad. The sprouts are used as a green vegetable. It is an easy way of getting green vegetables at any season of the year. It takes the place of ordinary greens.

Here is a courtyard full of pots in which the fermented soy beans are placed. This is a very interesting scheme they have for making a substitute for meat extract. By this means they prepare an extract which closely resembles extract of beef. In fact, it is rather a finer flavored product than meat extracts. It is made by first cooking the beans, spreading them out in the yard on trays and allowing a fungus to grow, and after two or three weeks the whole mass is put into pots of brine in the yard and allowed to remain there for a year or more, and at the end of that time the brine has become soy sauce.

This shows a mass of soy roots. It has been suggested it might be very useful to nut growers as a means of fertilizing the soil, a crop which will fertilize the soil for the trees and at the same time give a valuable return for the labor and expense. The little nodules on the roots are very numerous and show well here. They produce nitrogen, concentrated nitrogen from the air as do the nodules on the roots of alfalfa. The *Scientific American* recently stated that the soy bean is one of the most promising of vegetables. It provides food for man and beast. Given enough soy beans and granted the art of preparing them so that they might be served as food having sufficient diversity and palatableness, neither meat nor fish nor fat would be needed. In this respect the Germans did not prepare for war. If they had had the soy bean industry well developed it might have helped them through, and the map of the world might have been seriously changed from what it now is.

I think one of the finest of the soy beans is the Hahto variety. They grow one or two in a pod. I saw some of these beans in the market in Jerusalem forty years ago. When about three quarters grown and used as shelled beans they are exceedingly palatable. If at the dinner table today you will call for a soy bean omelet, you will be quite surprised. Dr. Morris tried it this morning and was kind enough to say it was the finest he ever ate.

The soy bean is the best of a large part of the cookery of the orient. We have been introducing it here the last few months, and it is very palatable, very digestible, and our patients like it very much. If you are interested in the soy bean, write, to W. J. Morse, or to the Agricultural Department, Bureau of Plant Industry, and they will give you a lot of interesting information about it. In starting the planting of the bean, it is necessary to inoculate the soil as in the starting of a planting of alfalfa.

President Reed: Mr. Bixby has prepared a paper on "Judging Nuts" which there is not now time for him to read. It will be inserted in the proceedings at this point.

JUDGING NUTS

Willard G. Bixby, Baldwin, Nassau Co., N. Y.

That there are differences in nuts is apparent to everybody. The selecting of the best nuts out of a lot of two or three usually presents no difficulty, and, when the number of nuts to be judged amounts to a dozen or so, it is generally possible to pick out the best, but, when one has before him nuts from several hundred trees, the problem becomes a very different one, and the person who tries to pick out the best from such a lot soon becomes aware of his own limitations. If, in addition, he has sufficient respect for consistency to try to be so exact in his judgment as to be able to go over a large lot of nuts today, we will say, and several months hence go over the same lot again and render the same verdict on each one of them, he will doubtless give the matter up as an impossibility, and yet that is just what is wanted and expected of those who judge the nuts which are sent in to the annual contests, which contests have resulted in bringing to the attention of the nut growing world the nuts of so many fine trees.

The experience of the last two or three years in being one of the judges who passed on the nuts which were sent in to the contests convinced me, almost at the start, of the desirability of getting methods where it would be possible to go over a large lot of nuts now and several months hence, and render the same verdict on each one of them, but now how to do it was not at first apparent, and the methods for doing it which will be outlined are the results of much work, many attempts, and the discarding of many of the methods tried.

Considering the methods used in judging fruit, animals and fowl has helped to some extent, but this assistance did not go far. The beginning of improved methods of judging any of the above, is the establishment of a score card, as it is called, which is nothing more than an enumeration of the characteristics and a decision as to the relative value of each one. Usually the values assigned to each characteristic are such that when added up the total will be 100 points. Score cards of this character are in general use.

The first attempt to make a score card for use in judging the nuts to which the Northern Nut Growers' Association gives its attention, so so far as I am aware, was that of a committee of the Northern Nut Growers' Association, which reported at the Fifth Annual Meeting at Evansville, Ind., 1914, and which report will be found on page 20 of the report of that meeting. Prof. E. R. Lake was chairman of the committee. The score card for butternuts, black walnuts and hickories which it recommended is noted below:

General Values	**Points**
Size	10
Form	5
Color	5
Shell Values	
Thinness	15
Cracking	20
Kernel Values	
Color	10
Plumpness	5
Flavor	10
Quality	20
Total	100

This score card has served as a basis for all the work that has been done in judging nuts since that work has largely fallen to me. It was early found desirable, however, to change the score card in one or two respects, and it has since been changed two or three times as the experience gained in judging nuts saw it was desirable. The score card now in use is noted below:

General Values	**Points**
Weight	10
Form	5
Color	5
Shell Values	
Husking Quality	5
Thinness	10
Cracking Quality	20
Kernel Values	
Color	5
Proportion of kernel 20	
Quality and Flavor	20
Total	100

The first time one attempts to judge a large number of nuts whether with the aid of such a score card as that proposed by Prof. Lake's Committee or without it, he gets into practical difficulties at once. These difficulties are not with the score card but in its use. Take for example the characteristic, size, the first one on Prof. Lake's score card. How can a person tell from the nuts of a hundred hickory trees which is the largest and which is the smallest and which are intermediate; in short how can he arrange them in order of size, the largest at one end of the line and the smallest at the other with a uniform graduation in between. Anyone who tries to do such a thing quickly finds that it is impossible to do this correctly if one has only his eye to aid him in determining size. The inability to do so quickly becomes apparent if a person tries to

arrange such a lot of nuts in order of size at one time and then several days later tries to arrange the same lot of nuts in order of size again. It is almost certain that they will not get arranged the same both times. The differences between the nuts are usually so minute, and, what is more important, the difficulties of correctly estimating size by the eye alone are so great that it is practically impossible to do it. An expert on this point can do it of course much better than one who is not, but even the expert is only too well aware of his limitations and of the impossibility of properly doing the above. The same difficulty is apparent with every characteristic on the list and while judging by experts with the aid of a score card, is, so far as I am aware, the method used in judging fruit, farm animals, poultry, etc., the crudeness of this method is only too evident to the experts themselves. Two or three years ago it seemed very far inferior to what actually measuring these characteristics would be, although such measurement at first seemed difficult, not to say almost impossible. Much work has been done on this, and it is very gratifying to say that this measurement has been found possible to an extent that was not dreamed of before the work was started. Before outlining the methods worked out to do this a little discussion will be given on Prof. Lake's score card, the characteristics which it pointed out, and the reason shown for changing some of them.

Size is a characteristic which is apparent to everyone, yet the actual measurement of size in the case of a large lot of nuts presents difficulties which seem practically insurmountable. A serious attempt was made to measure the length, breadth and height of the nuts examined and gauges were made which should do this exactly and quickly. These were finely discarded and the characteristic "weight" adopted in place of size. This has to quite an extent replaced size in considering farm products. When we used to buy potatoes by the bushel we used to get a bushel basket full, now we get the legal weight of a bushel of potatoes and instances of this kind might be multiplied almost indefinitely. While weight and size are not exactly the same thing, yet they are so to a large extent in the case of a given commodity, such as nuts of one species, and weight can be accurately and rapidly determined.

Plumpness is another characteristic which we all understand as far as the difference between a nut with a plump well filled kernel is concerned, and one with a shriveled up kernel, but when it comes to arranging the kernels of a lot of nuts in order of their plumpness, the one who tries to do it becomes ready to give up before he really gets started. It was found that the ratio of the weight of kernel to the weight of the entire nut which is termed "proportion of kernel" was never large in the case of a nut with shriveled kernel. It was small in the case of a nut with a thick shell and a plump well filled kernel, but, as stated above it was never large in the case of a nut with a shriveled kernel and a good deal of work on the subject convinced me that the characteristic "proportion of kernel" could be very well substituted for plumpness.

There seemed at the present time little use for separating flavor and quality as there seemed to be some question as to what was intended by the terms separately and so they were considered together. I would like to state here that little consideration has so far been given as to whether the number of points awarded for each characteristic are such as to cause the nut that will ultimately be considered of most value commercially to get the first prize or not. The score card of Prof. Lake's seemed so good that it was thought far more important at present to develop methods of measuring these characteristics. A careful study of the nuts sent in to the contests, it was thought, would point out most parts of the score card where improvement could be made, and this has already proved to be so to a considerable extent. The methods of quantitatively measuring the different characteristics and determining the number of points to be awarded for each will be outlined one at a time.

Weight: This is determined by an accurate scale, one weighing to 1/10 gram was used, and the same scale was used directly or indirectly for determining six out of the nine characteristics considered. In determining weight, five average nuts (as far as could be determined by appearance) were weighed and the average weight determined. Having at hand the weights of the largest and smallest nuts of the species under examination, the largest nut was awarded 10 points and the smallest 0 and the nuts of intermediate weight were awarded intermediate figures. The method of doing this will best be seen by taking a specific instance e. g. the Lutz black walnut, the average weight of which is 26.4g. The Alley black walnut, the average weight of which is 10.0g is the smallest good black walnut which has come to our attention, while the Armknecht black walnut which weighs 28.9g is the largest one of which we know. The Armknecht black walnut would be awarded 10 points for weight and the Alley 0 points and a table would be made up for use in determining the number of points to be awarded for intermediate weights as noted below:

Black Walnuts—Weight

Heaviest Armknecht 28.9 grams; Lightest Alley 10.0 grams.

Weight of nut.							**Points.**
28	grams	and	less	than	30	grams	10
26	"	"	"	"	28	"	9
24	"	"	"	"	26	"	8
22	"	"	"	"	24	"	6
20	"	"	"	"	22	"	5

18	"	"	"	"	20	"	4
16	"	"	"	"	18	"	3
14	"	"	"	"	16	"	2
12	"	"	"	"	14	"	1
10	"	"	"	"	12	"	0

After the average weight of five nuts of a given variety has been determined, an inspection of the table shows at a glance the number of points to be awarded for weight, which, in the case of the Lutz Black walnut, is 9. In case a nut should be entered which was very much larger or smaller than provided for, the table can be extended for use temporarily. The table, however, should be revised before being used the next year. For example, had a nut come in weighing 30.5 grams this might have been awarded 11 points, and had one weighing 8.5 grams come in this would have been awarded-1 point in order to give each nut full credit, for excellence in size or to penalize it for lack of it. It will be noticed that by the method outlined the size of a nut is determined exactly and the same number of points for size (or weight) would be awarded today, next week, next month, or next year, barring of course real changes, e. g. those caused by actual loss of moisture, *etc.*

Form: It was only recently that a method of measuring this characteristic has been suggested and this has been tried out only experimentally. By form is meant attractive appearing shape which has been held to be absence of hollows, ridges, angles, *etc.* A round, smooth nut would be held to have perfect form in distinction from nuts that are rough and full of ridges or edges. The only method of measuring that has been suggested and which it is believed will work out satisfactorily is to first select an average nut and weigh, then fill up the hollows in the surface of the nut with wax just covering the ridges till the surface is smooth, and weigh. This will give the weight of the nut plus the weight of the wax needed to fill up the hollows on the surface. As the specific gravity of the wax is 4/5 that of the nut the figure actually used is weight of nut plus 5/4 weight of the wax, which gives the weight of a nut of the size of the sample with the hollows in the shell filled up or the weight of a nut of perfect form of the size of the sample. The measurement of form is then the weight of the average nut divided by the weight of a nut of the same size of perfect shape, that is without hollows or ridges.

A measurement of form of a black walnut gave the following:

Weight of nut	22.5	grams
Weight of nut and wax	24.6	"
Weight of wax	2.1	"
Weight of 5-4 wax	2.6	"
Weight of nut and 5-4 wax	25.1	"
Form	22.5÷25.1=89.7%	

When a nut has perfect form there will be no hollows to fill and no wax will be needed and the weight of nut and 5/4 of the wax will be the same as the weight of the nut and therefore its form figure will be 100%. The number of points to be awarded for any measurement of form would be determined by making up a table as was made up for awarding points for weight, but such a table cannot be made up till after an examination of form values for a large number of nuts. This will be done later.

Color: The color of shell was measured by making up samples of water colors of all gradations of color between the lightest shell and the darkest. From these, five were selected as showing in five steps the differences noted, the lightest being marked 5, the next 4 and so on down to the darkest which was marked 0. With these color standards in front of the one judging, it was only necessary to take the nut to be judged and lay it on the standards of color and the figure on the shade which the nut most nearly matched was the figure awarded for color.

Husking Quality: This represents the ease with which the husk can be removed. In view of the well known fact that husks of all nuts do not come off with equal facility the need of such is apparent. Its measurement will be the proportion of husk removed by a standard husking operation.

Thinness of Shell: This was measured by providing a means for bringing two metal surfaces together, keeping them always parallel. The nut to be cracked was placed between these surfaces and an arrangement of scale levers provided so that the pressure exerted on the nut could be weighed. The surfaces were brought together till the nut was cracked and the pressure required was noted. This measures the thinness of the shell or more properly the strength of the shell, the weakest shell of course being the one that takes the least pressure to crack. This pressure was measured in kilograms for by doing so it was possible to utilize some stock apparatus. After the pressure required to crack has been noted a reference to the table below will tell the number of points to be awarded. We will take for an example the the same nut as taken to illustrate weight e. g. the Lutz black walnut whose average cracking pressure is 312kg and which therefore would be awarded 2 points for thinness of shell. In this connection it should be stated that this table would seem not to be made out on the plan followed heretofore by taking the thinnest shelled nut of which we know, the Alley,

as the low limit of the table. While the Alley black walnut takes the least cracking pressure of any we know which we can identify as from a particular tree, one black walnut was cracked which I believe came from the Ten Eyck tree which had a cracking pressure below 80kg and hence the table was made of sufficient extent to include this. It is my intention to get additional Ten Eyck nuts this year and check the matter up.

Black Walnuts—Thinness of Shell

Weight required to crack: Thinnest, Alley 110kg; thickest, Triplett 348kg.

Weight in kg.	Points
50 and less than 80	10
80 and less than 110	9
110 and less than 140	8
170 and less than 200	6
200 and less than 230	5
230 and less than 260	4
260 and less than 290	3
290 and less than 320	2
320 and less than 350	1
350 and less than 380	0

Transcribers note: Point 7 was missing in the original document.

Cracking Quality: This characteristic is perhaps the one which seems to most people the most difficult to measure, but, while it was some time before methods of measuring it did occur to anyone, its measurement is effected very easily. In cracking nuts a part of the kernel will usually drop right out, some times it is a large part, occasionally all, and sometimes it is but a small portion. A perfect cracker is one where the entire kernel drops out after cracking. This would have 100% cracking quality. When 4/5 of the kernel drops out after cracking and the remaining 1/5 can be extracted only by recracking or by picking out, the nut is said to have 80% cracking quality. In other words, the cracking quality is the ratio of the weight of the kernel which drops out after cracking to the entire kernel. The operations of determining cracking quality in practice are first, selecting five average nuts; second, cracking them and weighing the part of the kernels which drop out after cracking; third, extracting the balance of the kernels and getting the weight of all the kernels; fourth, dividing the weight of the part of the kernels which drop out after cracking by the total weight of the kernels, and the result is the cracking quality. After an examination of the figures of a large number of nuts, the table below was made up from which the number of points to be awarded for any given cracking quality is readily obtained. Taking the Lutz black walnut as an example again we find that the weight of the kernels which dropped out after cracking was 24 grams while the total weight of kernels was 32.5 grams which gives a cracking quality of 73.8% which would be awarded 13 points for cracking quality.

Black Walnuts—Cracking Quality

Percentage of kernel that drops out after cracking.
Highest, Alley[4], 100%; Lowest, Butler, 22.9%.

Cracking Quality.		Points.
100%		20
96% and all higher percentages under	100%	19
92% and all higher percentages under	96%	18
88% and all higher percentages under	92%	17
84% and all higher percentages under	88%	16
80% and all higher percentages under	84%	15
76% and all higher percentages under	80%	14
72% and all higher percentages under	76%	13
68% and all higher percentages under	72%	12
64% and all higher percentages under	68%	11
60% and all higher percentages under	64%	10
56% and all higher percentages under	60%	9
52% and all higher percentages under	56%	8
48% and all higher percentages under	52%	7

44% and all higher percentages under	48%	6
40% and all higher percentages under	44%	5
36% and all higher percentages under	40%	4
32% and all higher percentages under	36%	3
28% and all higher percentages under	32%	2
24% and all higher percentages under	28%	1
20% and all higher percentages under	24%	0

Color of Kernel: This is determined in the same way as the color of the shell by comparing with a standard color scale, and the step of the scale whose color most nearly matches the color of the kernel being examined gives the figure to be awarded.

Proportion of Kernel: This is the ratio of the weight of the kernels of five average nuts to the entire weight of such average nuts. After this has been determined a comparison with the table below which was made up after an examination of the proportion of kernel of a large number of nuts, the number of points to be awarded is readily determined. If we take for example the Lutz black walnuts again we find the weight of five average nuts 132.0 grams and the weight of the kernels of these nuts 32.5 grams which gives for the proportion of kernel 24.0% which would be awarded 8 points.

Black Walnuts—Proportion of Kernel

Ratio of weight of kernel to weight of entire nut (without husk)
Highest, Ten Eyck 36.4%; Lowest, Seefeldt, 16%.

Percent of Kernel.	**Points**
36% and less than 37%	20
35% and less than 36%	19
34% and less than 35%	18
33% and less than 34%	17
32% and less than 33%	16
31% and less than 32%	15
30% and less than 31%	14
29% and less than 30%	13
28% and less than 29%	12
27% and less than 28%	11
26% and less than 27%	10
25% and less than 26%	9
24% and less than 25%	8
23% and less than 24%	7
22% and less than 23%	6
21% and less than 22%	5
20% and less than 21%	4
19% and less than 20%	3
18% and less than 19%	2
17% and less than 18%	1
16% and less than 17%	0

Quality and Flavor: Absolutely no progress has so far been made in measuring this characteristic or more correctly these characteristics for, strictly speaking, there are a number of them instead of one and the only method available at present is tasting by experts. It is very much to be desired that methods for measuring this be worked out and several lines on which to work in order to accomplish it have been thought of but as yet no definite progress has been made.

While the characteristic as yet unmeasured is one of the most important and most difficult even for experts to estimate correctly when there are large numbers of nuts to be examined, the fact that it is possible to measure the other eight is a matter of a good deal of satisfaction and this satisfaction is the greater because with the methods that have been worked out it is possible for any ordinarily careful person to do the work about as well as it is for an expert and, as the work of judging a large number of nuts is very considerable, the elimination of a large part of the need for expert services is very gratifying. The services for example of such experts as Dr. Morris and Capt. Deming are obtainable only occasionally and for a short period. Now that the nuts sent in are rapidly increasing, it would have been impossible to have handled the contests without some improvements in the methods used.

While the same score card has been used for butternuts, black walnuts, and hickories it seemingly can be used quite well for English walnuts, Japan walnuts and pecans also, in short, for all nuts belonging to the botanical family Juglandaceae and perhaps for hazels. Separate ones will evidently be required for beechnuts, and chestnuts. The tables for determining the number of points to be awarded for a given value of any characteristic are likely to vary for each species. Inasmuch as there are fourteen species of hickories exclusive of the pecan that have to be considered and apparently even more species of walnuts not to mention beechnuts, chestnuts and hazels, one might think that nearly 100 tables would be required. A study of the matter, however, has shown that the number really needed is very much less, and the more that nuts are examined the more it seems possible to make one table answer for a number of species and have the number of points a nut receives indicate to a certain extent its value as a nut to grow, and not simply the value of a given variety of a certain species.

The hickories and the walnuts require a word in passing. There are at least nine species of hickory either native in the northeastern United States or that will grow there and it is quite possible that further study of the hickories will add to this number. Seven of these belong to the scale bud class, *Eucarya*, the shagbark, *Carya ovata*, the shellbark, *Carya laciniosa*, the scaly bark, *Carya Carolinae-septentrionalis*, the mockernut, *Carya alba*, and the close-bark pignut, *Carya glabra*, the loose-bark pignut, *Carya-ovalis*, and the pallid hickory, *Carya pallida*; while two belong to the open bud class, *Apocarya*, the pecan, *Carya pecan*, and the bitternut, *Carya cordiformis*. Hybrids between many of these species are found occurring naturally and seemingly hybrids between any two are possible, and the fact of many of them being hybrids is not evident on an inspection of the nuts. It is a noteworthy fact that quite a proportion of fine hickories that are being propagated are evidently hybrids and the number of our fine hickories which are evidently hybrids increases as they are studied more carefully. In many ways it would be desirable in the contest to offer prizes for the best nuts of each species of hickories, but the difficulty of determining the species from the nut alone, and the fact of such a proportion of our finest nuts being hybrids is sufficient to discourage the attempt. What was done in the 1918 contest, and what would seem to be the best thing that can be done is to offer the prizes for hickory nuts simply. Most of the prizes are taken by shagbarks but when a nut not a shagbark gets into the prize winning class, we make a class that would include it. For example, in the 1918 Contest, three shellbarks and one mockernut came into the prize winning class, whereupon a special lot of prizes for shellbarks and mockernuts were given. This enables us to do what would be accomplished in offering prizes for best nuts of each species of hickories. The same score card and tables therefore are used for each of these species. It is convenient, in judging nuts, to differentiate between the pecan on the one hand and the other hickories on the other, although study recently put on the matter would seem to show that this distinction is not exact and that some nuts, for example, which apparently are pure pecans are really pecan hickory hybrids.

The differences between the structure of the shell of the nuts of certain of the walnuts is greater than between the shell structure of the hickories and the walnuts may be divided into three classes. Hybrids between a number of species are found which have been formed naturally, and seemingly hybrids between all species are possible. It is convenient in judging nuts to differentiate between English walnuts, black walnuts, and butternuts, which nuts are representative of the three walnut classes and to include with the butternuts, the Japan walnuts. This will strike many people as a strange classification, i. e. to include the butternut and Japan walnut, but I feel sure that no one who has given the matter much study will so consider it. Whenever the two grow in proximity they hybridize so freely that one may be almost certain of not getting pure species if he plants nuts and raises seedlings. Indeed I have received many such hybrids which have been called either butternuts or Japan walnuts. As a matter of fact the same difficulty exists in distinguishing butternuts and Japan walnuts that exists in distinguishing hickories. There is no name which includes the butternut and Japan walnut as there is to include the various species of hickories, and, as such a name is urgently needed, I have used the word "butterjaps." This includes butternuts, Japan walnuts and hybrids between them. While it doubtless will be convenient to continue the names butternut and Japan walnut it should be understood that usually they will mean simply nuts which, as far as appearance is concerned, would seem to be one or the other, but very likely may be hybrids between the two species and might be more properly called by some name e. g. "butterjaps," which would include the two species and hybrids between them.

At this point the Convention took a recess to enable a photograph to be taken and immediately after reassembled for a business session.