ANNUAL REPORTS

OF THE

FRUIT GROWERS' ASSOCIATION,

FRUIT EXPERIMENT STATIONS

AND

ENTOMOLOGICAL SOCIETY OF ONTARIO.

1900.

THIRTY-SECOND ANNUAL REPORT

OF THE

FRUIT-GROWERS' ASSOCIATION

OF

ONTARIO.

1900

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CONTENTS.

The Canadian Fruit Exhibit at Paris, 1900.

FORTY-FIRST* ANNUAL MEETING

OF THE

FRUIT GROWERS' ASSOCIATION OF ONTARIO.

1900.

To the Honorable John Dryden, Minister of Agriculture :

SIR,—I have the honor to submit the Report of the Forty-first Annual Meeting of the Fruit Growers' Association of Ontario. At this meeting especial prominence was given to methods advisable for checking the spread of the San Jose Scale, the revision of the proposed bill providing for the grading and inspection of fruit, and the development of the export trade in Ontario fruits.

I am, Sir,

Your obedient servant,

L. WOOLVERTON,

Secretary.

GRIMSBY, January, 1901.

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* This Association was first organized in Hamilton in the year 1859, under the title of the Fruit Growers' Association of Upper Canada.

Secretary.

FRUIT GROWERS' ASSOCIATION OF ONTARIO.

OFFICERS FOR 1901.

President—W. M. Orr, Fruitland.

Vice-President—G. C. Caston, Craighurst.

Secretary-Treasurer and Editor of the Canadian Horticulturist—L. Woolverton, M.A., Grimsby, Ont.

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Agricultural Division No	1—(Stormont-Cornwall)	W. A Whitney, Iroquois.
" "	2—(Lanark-Ottawa)	R. B. Whyte, Ottawa.
" "	3—(Frontenac-Brockville)	Harold Jones, Maitland.
" "	4—(Hastings Prince Edward)	W. Boulter, Picton.
" "	5—(Durham-Victoria)	Thos. Beall Lindsay.
" "	6—(York-Toronto)	Elmer Lick, Whitby.
" "	7—(Wellington-Hamilton)	Murray Pettit, Winona.
" "	8—(Lincoln-Monck)	A. M. Smith, St. Catharines.
" "	9—(Elgin-Norfolk)	J. S. Scarff, Woodstock.
" "	10—(Huron-Grey)	J. I. Graham, Vandeleur.
" "	11—(Perth-London)	T. H. Race, Mitchell.
" "	12—(Essex Lambton)	Alex McNeill, Walkerville.
" "	13—(Algoma-Manitoulin)	C. L. Stephens, Orillia.

Auditors.

A. H. Pettit, Grimsby; George E. Fisher, Freeman.

Committees.

Executive.—President, Vice President and Secretary.

Finance.—W. M. Orr, M. Pettit, A. M. Smith.

Board of Control Fruit Experiment Stations.—W. M. Orr, A. M. Smith, Wellington Boulter.

New Fruits.—Prof. H. L. Hutt, O.A.C., Guelph; Prof. W. T. Macoun, Central Experimental Farm, Ottawa; L. Woolverton, Grimsby.

Transportation.—W H. Bunting, A. H. Pettit, E. D. Smith, T. H. P. Carpenter, Alex. McNeill, W. Boulter.

San Jose Scale.—M. Pettit, G. E. Fisher, E. Morris, W. M. Orr, Robt. Thompson, W. H. Bunting, J. D. Wigle, Major Hiscott.

Grading and Inspection of Fruit—A. H. Pettit, E. D. Smith, Elmer Lick, Major H. J Snelgrove, W. H. Bunting, G. C. Caston, E. J. Palmer, J. M. Shuttleworth, Eben James, R. H. Ashton, D. J. McKinnon, T. H. Race.

Codling Moth.—Joseph Tweddle, E D. Smith, W. M. Orr and A. H. Pettit.

Fruit Packages.—A. H. Pettit, L. Woolverton, E. D. Smith, D. J. McKinnon, W. H. Bunting, Joseph Tweddle, W. M. Orr.

Industrial Fair.—W. E. Wellington, Murray Pettit.

London.—J. S. Scarff, T. H. Race.

Ottawa.—R. B. Whyte, Harold Jones.

American Pomological Society.—W. M. Orr, G. C. Caston, L. Woolverton, A. M. Smith, M. Pettit.

Quebec Fruit Growers' Association—Harold Jones and R. B. Whyte.

Life Members.—A. M. Smith, St. Catharines; D. W. Beadle, Toronto.

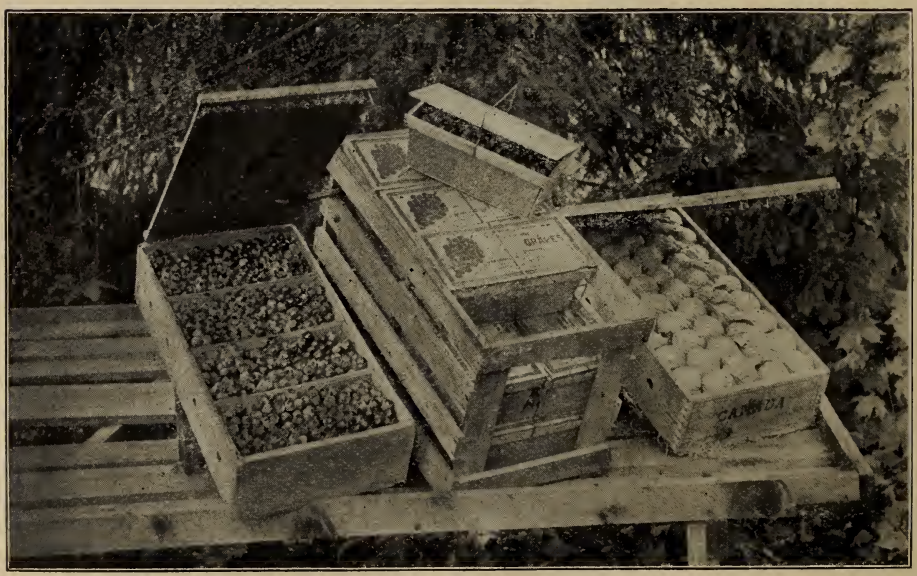
Honorary Members for 1901.—J. S. Clark, Bayview, P.E.I.; L. B. Rice, Port Huron, Michigan.

A. H. Pettit. R. B. Whyte. J. I. Graham. Prof. Macoun. T. H. Race. Harold Jones. A. McNeil. Elmer Lick.

M. Pettit. W. A. Whitney. G. C. Caston. L. Woolverton. J. S. Scarff.
Prof. Hutt. W. M. Orr. Thos. Bengough. A. M. Smith.

OFFICERS AND DIRECTORS FOR 1901 AT BRANTFORD MEETING.

Bushel Boxes of Apples, Half Bushel Boxes of Pears and Packages of Grapes, Packed for Export for Ontario Department of Agriculture.



Wilder Grapes and Kieffer Pears Packed for Export for the Ontario Department of Agriculture.

FRUIT GROWERS' ASSOCIATION OF ONTARIO.

ANNUAL MEETING.

The annual winter meeting was held in the Council Chamber at ten o'clock a.m. at Brantford, Wednesday, December 19, 1900.

W. M. ORR, Esq., President, in opening the meeting, said: Ladies and gentlemen, the time has come to call this meeting to order. I am glad to know that all the officers and directors of our Association are present, and that so many are with us who are interested in this work. After the vicissitudes of another year we are to meet and greet you. We meet in this beautiful city of Brantford for the second time to hold our annual meeting on the invitation of the Board of Trade of this city, and of the Farmers' Institute of the County of Brant. This is the 41st annual meeting of this Society, reckoning from its first formation in 1859, and notwithstanding its venerable age the end of the century finds it in the full strength and vigor of youth. We review its history with a great deal of pleasure and satisfaction, remembering the excellent work it has done for horticulture, its many pleasant associations, and the valuable assistance we have received from it in our work. We have an excellent programme, giving a list of subjects that are full of interest to every fruit grower in Ontario, and we are fortunate in having secured some of the leading scientists and horticulturists in Canada and the United States to attend this meeting and deliver addresses. I am sure that the business to come before you and the subjects to be discussed will receive your best thought and attention. All are invited to take part in the discussion, and ask and answer questions. We hope that this, the last meeting of our Society in this century, will prove both pleasant and profitable to all who attend it.

The SECRETARY read correspondence from the following places asking for the next meeting: Brighton, F. H. Lazier, Executive Committee of East Northumberland; J. H. J. H. Mowat, Town Clerk; Sam. Nesbitt, apple packer. Cobourg, H. J. Snellgrove, Secretary Cobourg Horticultural Society; J. D. Hayden, President; Directors Cobourg Horticultural Society, Mayor and Corporation, J. B. McColl, M.P. Kingston, The Horticultural Society. Orillia, East Simcoe Agricultural Society, the Board of Trade, C. L. Stephens, Secretary Orillia Horticultural Society; Mayor and Corporation. Walkerton, Secretary South Bruce Farmers' Institute.

The SECRETARY also read a letter from William A. Taylor, Secretary of the America. Pomological Society of Washington, and stated that five members had been delegated by the directors to attend the next meeting at Buffalo and it was decided that any other members who would like to attend would be duly certificated as representatives of the meeting at Buffalo by handing in their names to the Secretary.

All these letters were referred to the directors for consideration.

COMMITTEES.

The PRESIDENT announced the appointment of the following committees:

Resolutions—W. A. Whitney, E. D. Smith, M.P., and Mr. Dempsey.

Fruits—Prof. Macoun, Messrs. Morris and Race.

New Fruits—Professors Macoun and Hutt and the Secretary.

Mr. MORRIS (Fonthill): Having a large collection myself, I would like to be relieved from that Committee.

The PRESIDENT: I will name Mr. Dempsey in place of Mr. Morris. For the Committee on Nominations the President nominated two and the meeting three. I nominate Mr. Murray Petitt and Mr. T. H. Race

The following nominations were made and confirmed by the meeting: Mr. Dempsey, Mr. Harold Jones, Mr. Alex. McNeill.

Mr. Joseph Tweddle (Saltfleet) read the report of the Committee on the Codling Moth, and also the act relating to noxious insects with the amendments suggested by he committee this morning as follows:

REPORT OF COMMITTEE ON CODLING MOTH LEGISLATION.

Mr. President and Gentlemen,—Your Committee beg leave to report the following: Committee met and drafted the enclosed recommendations which were later discussed in an interview with the Hon. Mr. Dryden, Minister of Agriculture at Toronto, and arrangements were made with the Provincial Legislature to incorporate such in an act to compel the destruction of said moth in such municipalities as shall enforce the same by By-law of the Municipal Council. Such an act, with regulations by order in Council, was passed, a copy of which here follows: The regulations in council were not passed until May 24th and required until June 9th before a By-law could be legally passed.

An Act for the Prevention and Destruction of Certain Noxious Insects.

Her Majesty, by and with the advice and consent of the Legislative Assembly of the Province of Ontario, enacts as follows:—

1. This Act shall be known as *The Noxious Insects Act.*

2. The following provisions of this Act shall come into force and take effect as to every municipality the council of which shall by by-law declare this Act to be in force therein. The council may at any time repeal such by-law, and thereafter this Act and any regulations made thereunder shall cease to apply or be in force as to such municipality.

3. Under the recommendation of the Minister of Agriculture the Lieutenant-Governor in Council may make such regulations for the prevention and destruction of insects injurious to trees, shrubs and other plants as may be deemed advisable. Such regulations shall come into effect and have the force of law after publication in two successive issues of *The Ontario Gazette.*

4. Every municipal council adopting this Act shall in and by the by-law adopting the same appoint one or more inspectors whose duties it shall be to inspect all orchards and to enforce the provisions of this Act and the regulations made thereunder, and to report upon the same to the Council.

5. In case the occupant or the owner of any lot neglects or refuses to comply with this Act or with any regulations made thereunder, the Inspector may cause the necessary work to be done, and shall within ten days make a report in writing to the Council stating the amount of the cost thereof and the Council may thereupon direct that this amount or such part thereof as may appear to them equitable, shall be entered upon the collector's roll against such owner and shall be collected in the same manner as other taxes.

6. Immediately upon the passing of a by-law by any municipal council for bringing this Act into force, the said council shall cause to be delivered to the occupant or owner of every lot affected, a printed copy of this Act and of the regulations made thereunder, together with a copy of the by-law and the name and address of the Inspector appointed to enforce the Act.

7. Any person interfering with the Inspector, or attempting to hinder or prevent him in the enforcing of this Act, shall upon conviction thereof, before any of Her Majesty's Justices of the Peace, be subject to a fine of not less than one dollar nor more than twenty dollars, and in default of payment of the same to be imprisoned in the common jail for the period of not less than ten days, nor more than twenty days.

Regulations by Order-in-Council.

Approved by His Honor the Lieutenant Governor, 24th day of May, A.D. 1900.

Upon the recommendation of the Honorable the Minister of Agriculture, the Committee of Council advise that pursuant to the provisions of "The Noxious Insects Act," (63 Victoria, Cap 47), the following regulations be made for the prevention and destruction of the "Codling Moth."

"1.—It shall be the duty of every occupier of a lot within the municipality, or if the land be unoccupied, it shall be the duty of the owner of such lot, within one week after receiving notice as provided for in the Act, to place bands (as hereinafter described,) upon the orchard trees located upon said lot, as follows: Upon all bearing apple trees and pear trees, and upon all orchard trees of bearing age within forty feet of such bearing trees.

2.—The bands shall be made of " Burlap " or "Sacking," or similar suitable material, and shall not be less than four inches in width, and of three thicknesses, and shall be securely fastened at a convenient point between the crotch of the tree and the ground.

3.—The occupant or owner shall have these bands removed and inspected, all larvae therein destroyed, and the bands replaced at intervals of not more than two weeks during the months of June, July and August.

A number of fruitgrowers attended special meetings of the Saltfleet Township Council on June 8th and 9th asking that such By-law be passed. The Council declined to act but requested that a series of public meetings, be held throughout the township at the earliest possible date to discuss the advisability of such action, posters were put up throughout the township, and small bills were distributed through the public schools to the residents and ratepayers, and five public meetings were held and resolutions were passed at each, favoring the enforcement of the act. These were presented at the next meeting of the council, July 9th, at which the By-law was passed, and three inspectors appointed to look after enforcement of same. Some time was required to get the necessary printing done and placed in the hands of the ratepayers as required by the Act and its regulations consequently the Act could not be enforced before the 20th of July. Although most of the growers attended to the work earlier there were a few who did not until they were forcibly reminded of their duty by the inspectors on their second visit some two weeks later. About the last week of July and the first week of August, we commenced the work of destroying the larvæ, and chrysalids in our own orchards on the 9th of July. Thus it will be seen that the act could not under these circumstances be enforced early enough to catch the whole of the first brood, but would allow part of the moth to escape and lay their eggs for the second brood. Another feature of the case was that this work had to be done just in the haying and harvest season amongst the farmers ; and I understand that the inspectors were privately instructed by the council board not to be too severe in enforcing the Act under the circumstances but rather to proceed as far as possible without making its enforcement a hardship. Another troublesome feature of the work was the scarcity of canvas ; such was the demand in Hamiliton that the regular price was doubled and trebled before the season was over ; in fact the supply became exhausted and felt paper had to be resorted to. It is currently reported that in some cases bands were put on and never attended to through the inspectors being lenient and not making their final rounds ; and I have no doubt that this is true to a small extent. However, the intention of the present council board if re-elected is to thoroughly enforce the act another year and if possible make it a complete success and no doubt they will have the support of the people generally (with some few objecting). Many who were doubtful of the success of the work at first after seeing the great numbers of larvæ, caught, especially the fall and winter brood are now in favor of it. A few who were sworn to defeat the council at the next contest for having pa sed the By-law are now friendly toward them, and from careful inquiry lately public sentiment seems to be strongly in favor of the continuance of the work.

In reference to the conditions of the season it is considered that it has been a very favorable one for the propagation of the pest, being mostly dry and warm without any long continued cold rains to destroy the moth when on the wing or hinder her in the operation of depositing her eggs and also in hatching of the same, added to this the large brood wintered over from 1899, the crop of that season both of apples and pears being a fair one furnishes a food supply for their propagation. Yet such numbers have been destroyed as to permit of a good season's pack of clean fruit, whereas had they not been destroyed but permitted to continue their propagation under such favorable conditions we could not have expected to harvest but a small percentage of fruit free from their ravages, but with provision for the destruction of this season's winter brood we hope to be at a great advantage over the past season in destroying the pest during the coming year. Your committee herewith exhibit specimens of infested bands and trust that the Act and its regulations with some necessary amendments may soon be adopted throughout the Province by which means it can only be most beneficial. All of which is respectfully submitted.

Signed JOSEPH TWEDDLE,
Chairman of Committee.

Since writing the within report your committee have met and recommend the following changes in the regulations:—

1st. That clause 1 be amended by adding the following words after the word "Act": "to scrape all rough bark, and all loose bark around wounds, from all the trees mentioned in this clause."

2nd. Also by striking out all after the words "upon all bearing apple and pear trees."

3rd. That the following words be added to clause 3: "also that the bands be removed and all larvæ destroyed between the 15th day of November and the 15th day of April following, each year.

(Signed) JOSEPH TWEDDLE,
Chairman of Com.

Mr. Tweddle moved the adoption of the report, seconded by Mr. E. D. Smith. Mr. Tweddle also exhibited the bands used by him in exterminating the moth.

Mr. G. C. CASTON, Craighurst: What mode do you take of killing them when you find them? Do you pass them through a wringer or dip them in hot water?

Mr. TWEDDLE, Fruitland: We just loosen the band at one end, because if you do not pull it off carefully they will break the cocoon between the bark of the tree and the band. We open the upper part of the band a little in advance of the lower side and break them with a knife or take your thumb to them, which is about the most rapid way.

Mr. MURRAY PETTIT, Winona: The results with me have not been very satisfactory. The Act was not put through in time to get all the machinery in operation early enough, but going though our trees on our first inspection we destroyed from 25 to 75 to the tree, on the later inspection not so many, but our apples were very bad with codling moth. They had been sprayed three times as well; but we cannot expect to destroy them all the first year—it will take a year or two to do it—and it looks to me that killing them in this way is the most certain and practical way of doing it.

E. D. SMITH, Winona: I wish to corroborate what Mr. Pettit has said in regard to our neighborhood. I feel satisfied that the thorough carrying out of this law for only one season will entirely rid the township of this moth. I do not think this season's operations can be taken as a criterion of what it will do, because there were orchards that were never inspected, or if they were the moths were never killed, and if there are a few of those left in a township they nullify nearly all that is done. But there is this fact, that we have slaughtered millions of them. I have slaughtered an average of 100 a tree, and when it is calculated that each of tnese is capable of depositing fifty eggs, it can be seen what an immense number of apples they are capable of destroying and what an enormous amount of good has been done by our work thus far.

A. M. SMITH, St. Catharines: If neighboring townships do not do this, what then?

E. D. SMITH: There is no doubt they migrate very rapidly, but if they can be subdued in one township it will not be long before the whole Province will take holdof it.

Mr. TWEDDLE: I handled about ten orchards this year, spraying and picking fruit, and we found the work of the moth varies considerably in different orchards. Along under the mountain where it is warmer than towards the lake shore, they did a great deal of destructive work, but as you got to the lake shore there was very little loss in the crop. There were apples destroyed, but only what was needed for thinning out. There was one orchard especially along the brow of the mountain, which lies to the south, and a year ago it had no fruit to amount to anything, having been neglected, but this year it had a heavy crop, there being no moths. In watching this insect I made these observations; that even on the south side, where it is warmer than on the north side, there is more fruit infested with the larvæ than on the north side; and there is more on the outside fringe than on the underside; and I believe that the moth loves heat, and goes to all the warmer spots. That orchard lay to the south and was nicely protected with a row of maple trees on the north side and an orchard on the east side of it, and it got the full benefit of the sun, and I think the moths gathered in there at that season of the year and destroyed the crop.

ALEX. MCNEILL, Windsor: Would the prevailing winds from the orchards on the mountain have anything to do in carrying th moths from the infested orchards there.

Mr. TWEDDLE : I do not know. We had another orchard situated just on the same level, which lay to the south, but it was quite free.

Mr. CASTON : Is this canvas you have brought here a fair specimen of how you found the moths ?

Mr. TWEDDLE : We find a great many in our orchards as bad as these, some not so bad. One of these bands was taken off a tree that stood near a pile of apples.

Mr. CASTON : I believe this practical demonstration of what is really the best method of fighting the Codling Moth is of great value to the country. Of course in the northern sections the moth is not so bad as in southern Ontario. The Committee will have to get Municipal Councils where orcharding is the main business to take hold and enforce that Act. It will almost be impossible to do it in townships where fruit growing occupies a secondary place. We would be surprised if we had the damage done by this pest to our apples in past days figured up in dollars and cents. A great amount of fruit has had to go into the cull heap on account of these moths. I believe we would run two very important industries together, that is bacon and apples—that is, if the hogs ran in the orchards and picked up any fallen apples, as I believe that in ninety-nine cases out of a hundred the moth is in the apple when it drops. That, in addition to the canvas bands, would almost exterminate it.

T. H. RACE : Do you find that this moth makes its way up any shade tree ?

Mr. TWEDDLE : We find it does not.

Mr. MCMICHAEL (Waterford) : I have had experience in regard to bandages around fruit trees. After pretty heavy rains in the spring we go through the orchard and scrape off all the rough bark down the trunks and we take an old carpet and tack one end there so that it will be permanent, and we have a claw hammer to pull that out and destroy the larvae and tack it back again. Then we leave it until fall and destroy all the later brood. My experience has been that these moths do not travel from one orchard to the other very extensively. I know of an orchard just to the east of mine, when we take ours off pretty clean we do not have them to come back very much in the other. Of course they do travel on the wing from one orchard to another to some extent.

Mr. MCNEILL : Mr. Ellwood of St. Thomas, an apple buyer, tells me that he hunts the country for the hog orchards, and usually finds that where the hogs are allowed to run he can get a good quality of apple comparatively free from Codling Moth. That corroborates what Mr. Caston said.

Mr. TWEDDLE : I had two orchards side by side last year. In one the pigs ran and the other they did not. The first was twice as bad as the second. There may be other causes for it. I think pigs running in an orchard a good thing. Will Mr. McMichael tell us how often he changes his bands ?

Mr. MCMICHAEL : Every twelve or thirteen days during the early part of the season, and the last crop we leave until the apples are all taken out of the orchard.

Mr. TWEDDLE : I believe the President put three bands on a tree a year or two ago, and another of our neighbors did the same thing this year and found just as many larvæ in the upper band as in the lower, and as many in the upper and lower as in the middle.

Mr. MCMICHAEL : It is generally conceded in our experiment stations that one-half of the larvæ leave the apple before it drops, consequently the pigs would not get those, but having the stick in our bands we get a large percentage of the larvæ.

Mr. TWEDDLE : The larva goes down on a web in the night and curls up, so the stick would likely not get it.

Mr. HUNTER (Scotland) : I have found them going up as well as coming down. I found them, when they had not matured thoroughly in the apple, go up the trunk again and go into another apple. Perhaps you think that rather strange, that they should go into the second apple, but the larva goes into the first apple at the calyx end through a very small opening, but the second time it goes in through the side.

Mr. MCNEILL : Are you perfectly certain about them entering the apple ?

Mr. HUNTER ; I saw them going up. It was mostly at night. I saw them crawl up the limb. They leave a web as they go. They enter the side of the apple. They get a leaf near the apple, they cut the leaf and make their way into the side of the apple and destroy the matured apple—one of the very best generally.

Dr. SAUNDERS (Director Experimental Farms, Ottawa) : I should want to see it myself to be quite sure of it. It is well known to be the habit of the second brood of

moths to lay their eggs on the sides of the apples. I would not be prepared to dispute the statement at all, because there is so much we do not know about all these things we are always open to receive information from everybody; but it is one of those conclusions that I should think would need a good deal of proof, because it is so contrary to the experience of all of us who have watched these insects from the beginning of their lives to the end, and I have never before heard of an instance of a larvæ leaving the fruit that it occupied until it was full-grown. It is possible, however.

Mr. HUNTER: As soon as the seeds are fairly cut or destroyed the fruit ceases to develop, and shrivels up, and that sometimes takes place quite a bit before the larvæ is full grown, so it must have something else to feed upon before it gets full growth. That is why I watched them.

Dr. SAUNDERS: We find some fruits that are seedless that complete their growth and get full size, such as seedless pears and oranges, so that the presence of the seed is not an actual necessity to the growth of the fruit surrounding it, though we commonly think the presence of the seed importance to the growth of the apple. I know that the growth of the larva at that season of the year is very rapid, and an egg laid on the side of an apple would produce a larva that will enter right to the core and destroy the seeds in a very short time, so that the finding of the larva in the apple later in the season, and seeing evidence of its having entered from the side, is not to my mind proof that the larva was partly grown when it entered. In most cases I think it would be found that the larvæ were from the eggs of the second brood of moths.

The PRESIDENT: Were these larvæ apparently full grown?

Mr. HUNTER: Nearly so. I would remark that a larva just hatched from an egg does not make a large hole, but these that I speak of are large. Another thing is that the leaf is glued over, and I doubt very much whether any of them enter from the side at first at all. The way I have seen them generally enter is in the calyx.

The SECRETARY: It would be well if those who have experience would give us some idea of the cost of this work before we vote that this be adopted in different localities.

Mr. ARMOUR: I see Mr. Tweddle reported that felt paper could be used in place of burlap. This would be cheaper than burlap.

The SECRETARY: Perhaps it would not be so good.

Mr. ARMOUR: I think just as good.

The PRESIDENT: It is not so durable.

Mr. ARMOUR: But you have to change every two or three weeks, anyway.

The PRESIDENT: Burlap will last for years.

The SECRETARY: I understand the gentlemen who have been trapping this insect with bands have had to kill each moth individually with a knife. I would like to ask if there is not a quicker way of doing it?

Mr. OASTON: We have heard two ways suggested—one by dipping the bandages into hot water, and the other by running them through a wringer.

Mr. TWEDDLE: It won't work at all. So many larvæ are between the trees and the bands that they drop out; then you have to hunt them out. I can get felt paper at just the same cost as the burlap, two and a half or three cents a pound; that would be about a cent a tree, or forty-five cents per acre for the burlap. It would cost about a dollar an acre for the work of the whole season. A man will go over an acre in an hour if he only gets 8 or 10 or 12 larvæ to a tree; but if he has fifty or a hundred it will take him two hours.

Mr. MCKINNON (Grimsby): I found it took about half a day to the acre. I had sometimes as many as sixty or seventy under one bandage, and in a couple of weeks more there would be as many again.

Mr. TWEDDLE: It is not a great cost at any rate. It would make the cheapest method of destroying them.

Mr. MCKINNON: It cost me three dollars for two acres this year, and I counted nothing on the burlap because I had fertilizer bags that I cut up.

Mr. TWEDDLE: It would not exceed $2 an acre unless the trees were very large and the larvæ numerous. After you get the burlap it will last three or four years.

A. M. SMITH: I received a circular the other day from an enterprising Yankee who has got out a band made of fine wire that he claims is going to do the work and last several years at a cost of two or three cents apiece.

Mr. McMichael: My experience is that the moths are very loth to come under bands that let the light through. A wire screen would have that tendency.

Mr. Tweddle: That has been my experience. White cotton is no use; they won't go under it. They seek a loose bark first, it is better protection from the light. With regard to that scraping, I don't find many larvæ around the loose bark where there were bands on the trees, but we did find numbers of them where a piece of thick, loose bark, dead or even alive, was hanging around the edge; it would seem to be greater protection and they would go in there even though there was a band on the tree we would find great numbers of them. That is the reason we suggested that the bark be scraped off around the band.

E. D. Smith: My experience of the last two years is that the cost of destroying them will not exceed fifty cents an acre.

The President: Does that include bandaging for the first time?

E. D. Smith: No, killing them off.

The motion to adopt the report was carried.

REPORT OF THE COMMITTEE ON TRANSPORTATION.

Your Committee on Transportation beg leave to report as follows:—

That owing to the advance in the price of all kinds of material entering into the construction and operation of the railways of this country; on January last, the railway companies withdrew and abolished all special rates and concessions. Amongst these was the arrangement entered into by your committee with the Canadian Joint Freight Association, whereby grapes in carloads had been carried during the season of 1899 at a reduced rate.

Your committee therefore met together early in the year and canvassed the situation as thoroughly as they were able, with the time and information at their disposal, and decided to present the following memo. of requests, through the Joint Freight Association, to the various railway companies, for their consideration, that is to say:—

1. Restore last season's special, making it apply to mixed fruits in carlots, to all destinations in Canada.
2. Make mixed fruits in 5 ton lots to one consignee, third class.
3. Make mixed fruits in ton lots, to one consignee, second class.
4. Place apples in barrels in carlots for shipment in Canada, eighth class.
5. Grapes in barrels, or large baskets, for wine purposes only, fifth class.
6. Encourage the export of fruit to the British market.
7. Devise means whereby a better distribution of fruits by freight in Canada may be accomplished.
8. Where refrigerator cars are iced en route, actual cost only to be charged.
9. Permit barrel apples in mixed cars to carry the apple car-load rate.

To which after very mature deliberation, the following reply was received in June last, viz.

1. From points west of Toronto to Toronto and east thereof, also to points on the main line of the C.P.R. east of and including Pembroke, on the basis of fourth class for grapes C.L. Mixed cars of grapes and other fruits, including apples in baskets, crates or boxes, to be on the basis of fourth class for the grapes, third class for the other fruits and fifth class for the apples in barrels. Minimum weight for mixed cars containing apples in barrels, 24,000 lbs.

2, 3 and 4 declined.

5. Straight carloads of grapes in bbls. from and to above named territory to be fifth class C.L., minimum 24,000 lbs.

6 The Canadian lines to give all reasonable encouragement to export traffic.

7. The railroads to give all convenient despatch to shipments of fruit by usual way freight trains.

8. Cost of ice to be made as reasonable as circumstances will permit.

9. Provided for in No. 1.

The foregoing practically means that the concession granted in 1899 be restored an dthe additional arrangement granted whereby mixed cars of basket and barrel fruit would be carried at their respective carload rates with a minimum of 24,000 lbs.

The committee felt that the entire list of changes as asked for were not unreasonable, and would if granted result in furthering the distribution of the large output of fruit that was at that time in prospect. The experience of the season which has just closed has shown that the efforts of the committee have not been without advantage to such fruitgrowers and shippers as have been in a position to avail themselves of the privileges secured.

It must be borne in mind that the R. R. companies are exceedingly averse to make any changes in their rates for quantities less than carloads, and the most feasible way for shippers to help themselves is for a number to unite together and where possible to ship in carlots, thus getting better rates and usually much greater despatch.

There is still a lamentable lack of proper cars to handle the fruit crop to best advantage ; during the past season there has been considerable loss to shippers through improper cars and delays in transit by freight, and through bad handling and overloading cars by express.

As the fruit output increases it will be the duty of this Association to bring what pressure to bear it may be able, to impress on the transportation companies the advantages of catering to this trade.

With reference to ocean transportation, your committee have no data as to what improvement, if any, has been made in that respect, although we are glad to note that great success has characterized the shipment of tender fruits to England during the past few months. You will however no doubt be favoured with full particulars of these shipments before this meeting is over.

We cannot close this report without referring to the courteous and attentive manner with which your committee was received by the railway officials and their manifest desire to be informed of the needs of the fruit trade.

All of which is respectfully submitted.

WM. H. BUNTING,
Chairman of Committee.

Mr. BUNTING, after reading the report, said : Personally I feel very much pleased with the result of the work of the Committee. We have not accomplished all that we would like. We have not had our requests granted as fully as we would like to have had, but the fruit industry has been brought to the attention of the chief officials of the various roads and it is encouraging to observe the attention that was given to the matter, and to know the desire of the railway people to help us if we can show it to be to their advantage. We must be able to bring to them a business that is worth their while taking hold of. We must be able to show them from time to time that not only the wants of the trade are urgent, but that the advantages to the roads would be great, and that is the best argument that we can bring. The only way that we can get that, it seems to me, is by co-operation in the various sections, and if the Committee appointed to carry on this work could get the information showing the wants of the various sections and the disabilities under which they are laboring, so that the matter can be brought intelligently and properly before the railway people, I believe that there is a possibility of vast improvement in this respect. I have very great pleasure in moving the reception of this report.

Mr. MCNEILL (Windsor) : I would second that motion, and at the same time say a word or two in reference to the importance of this work. Here is a place, it seems to me, that this Association is called upon to do something, and if we wish to keep up the traditions of our Association here is a line along which we can work, and work successfully. While we ought to be pleased with the success we have attained, it is simply on the ground that we ought to be thankful for small favors when we can get no more. Certainly the concessions are greater than I thought the committee could get from the railroads, but they are nothing like what we as business people deserve from the hands of the railway companies. This transportation question is one of the greatest obstacles to our trade, and very little progress will be made until we have better transportation than we have yet. The concessions they have made are not at all yet what they should be. We are discriminated against as fruit growers particularly. We are hampered in our business. We could increase largely our business if our freight rates were more favorable. This Association, I think, can look back over a long career of usefulness in the matter of educating the public along the line of growing fruits. That, I think, is conceded on all

sides. It has done a noble work, and those that have gone before us deserve every credit; but the production of fruit in this Province has reached such a stage that we more than supply our own markets, and there is a glut at almost every point of production, while there are other parts suffering for it. Mr. Whyte, the gentleman who has charge of the pork packing establishment in Seaforth and Stratford, told me in the presence of Mr. Race that for a basket of grapes which we were glad to get 11 cents for at the most—10 cents usually—they would in the same season have paid 50 cents for in Brandon. Another gentleman from Calgary told us that they paid $1 per basket for exactly the same basket that we were glad to get 11 cents for. There was some of that for the middle man, but the larger part of that was for the freight. Such instances could be multiplied a thousandfold to show that, while there is a glut at the point of production, there is a scarcity that reduces consumption on account of freight rates. We are discriminated against as fruit growers. Take grapes alone. While a carload of wheat coming down from Manitoba can be brought here for between $40 and $50, these very cars go back during the month of September—just when we are sending our fruit up to Manitoba—these cars go back empty in train loads. And these are the very cars we like to get on account of their having a window at each end and having a draft through that is equal to this celebrated cold draft that is so desirable on board ship. With those grain cars we could get the very conditions desired, and yet if we ask to have one of those grain cars filled with grapes—of not as much value as the carrying of wheat that came down in the car—they ask us not $40 or $50, but nearly $100 to send the car back. There is no sense nor reason in that. We use the car for a shorter period of time—load it and unload it quicker. We can go around the whole range of fruit and find the same difficulty. Shipments of stock would illustrate the discrimination. We are also discriminated against as Canadians. An American can ship fruit into this country and get a cheaper rate than we can. My friend, Mr. Boulter, can go down to the county of Essex and barter there for a carload of peaches. All we can say to Mr. Boulter is, "We have the peaches here; you want to can them." He offers a certain price and we refuse that, and he can go to Grand Rapids, Michigan. There is a duty of 50 cents a bushel on the peaches coming into Canada, but he says, "I will get a freight rate from Grand Rapids to Picton that is cheaper than your rate from Leamington to Picton." That is only one matter of discrimination as Canadians. They will haul American fruit cheaper than Canadian fruit. That can be multiplied in a thousand instances. Then again, the freight rate on the American side is positively cheaper—not relatively—than on our side. For instance, I can go to Detroit and get a rate of 19 cents per hundred pounds from Detroit to Chicago, whereas if I want to go to the nearest market we have to the east of us—that is London, about half the distance—they charge me 32 cents per 100 pounds, proving clearly that this whole matter of freight wants to be reconsidered. I am very much surprised that there was not one point taken up here. We are to be congratulated in having one on the committee who takes so much interest in it and has worked so hard and faithfully as Mr. Bunting, but he will remember how the railway company talked to us. He will remember no one could be more polite. Why not? They were getting everything they wanted; what temptation was there to be anything but polite? It appears to me I would be good natured myself if I were getting a few hundred dollars a day out of the party to whom I was talking; it is a first-rate lubricator for geniality. We had nothing to complain of on that score at all, but this I noticed: that in all their questions, and in all the arguments we could use to them, the only question they cared about was: "How much are you getting out of this thing?" "Why, you are looking well and hearty and hale, you do not appear to be suffering over this business"—they would say to us—"what do you want a cheaper rate for?" "We want to make a little more money." "Oh, you get three meals a day, and dress fairly well." Everything they inquired into was how much we were making out of our freight; and it appeared to me that as long as they felt that we were getting anything out of it at all, then just so long they were not able to make concessions. Take in this matter of grapes alone; we got that concession largely because we put before them these facts: that if they did not make a concession there, the grape industry would go down, in certain parts of the country anyway—and it did partly on account of frost—but it will never be revived again on account of the freight rates. They did not ask for one moment as to the actual cost of carrying the stuff. The facts that I have cited here discriminating be-

tween fruit and other productions show that they do not enquire into the actual cost of carrying these things, but they simply enquire into what they can get out of the business—as they call it, "How much the traffic will bear." To put it in another way, they simply stand in the position of people who can squeeze the public, and they squeeze just to the extent that the fruit growers can live in this case. All their arguments and questions are along the line of finding out how much they can take from the average farmer and have him live, and they will fix their freight rates just at that. They argue that the farmer and fruit grower who is above the average will make a good thing, and they try to devise methods by which they can get at his surplus, leaving the fellow under the average to drag out an existence and work sixteen or eighteen hours out of twenty-four so as to make up for his want the other way. The railway companies, as they are organized at present, are in a position to hold the same relation towards commerce in this land that the old barons four or five hundred years ago held upon the banks of the Rhine, when they built their castles and by force of men and muscle could exact from all who passed their doors a certain tribute. To-day they use brain, not muscle, and they say because they use brain they are entitled to all they can get out of it. Now, my opinion is we must get together and match them either in brain or muscle. I do not say that it is any more honorable to steal by strength of muscle than by force of brain. That is an ethical question I cannot discuss here. A careful investigation has convinced me that the railways are in a position to take just what they will out of the traffic; and when we go to them we have nothing to offer them except, as Mr. Bunting very honestly put it, that we can do something for their interest. It is only when we can show that we are working in their interest that we can get any concession at all. I say that it is not the proper position to be put in. We are the people who are making the wealth—they are simply conveying it; and while I am perfectly willing that they should get a fair recompense for the work that they do, I say it is a shame and a scandal on the fruit growers here that they should stand without protest this condition of affairs, by which the railways can take exactly what they please and we have no remedy in the matter. We ought at some stage of our proceedings to do what we can to remedy this state of affairs. The only way I see is for us to join with the other bodies of intelligent farmers who are gathering throughout the country and asking the Government to take this matter into consideration and at least appoint a Commission to investigate the whole affair and endeavor to get at some solution of this transportation business. It is the only remedy that I see. It is a step in the right direction. It will not be solved within the next one, two, five or ten years; indeed if it is solved within the next fifty years we may be thankful, but it has to have a beginning. I will second this motion and pass the report, at the same time congratulate the Committee on the success they have had, and move this resolution at a later stage of the meeting.

Mr. McKINNON: Mr. A. M. Smith and myself move that the report of the Committee be amended by adding this: "That in the opinion of this Association the time has arrived when a Railway Commission appointed by the Dominion Government should be given full power to regulate freight and passenger rates upon an equitable basis."

Mr. A. H. PETTIT: I want to make one remark in regard to the report. While we are expressing ourselves as pleased with the change in the classification rate as being in our favor, if you will notice, the rate before was on 20,000 lbs. Now, with a lower rate and classification we have it put at 24,000. Now, 24,000 is too much for any car to carry of perishable fruits. The grower views it from this standpoint: we are getting a lower rate, but a 24,000 lb. car will not hold it; it is impossible to put 24,000 lbs. of grapes in our cars to-day and ship them with any kind of success. The grower will come out with damaged fruit. So that really the reduction is not so great to the grower at least, and the railway company will get the same amount they got before, because they will make you put 24,000 lbs. in instead of 20,000. I think that should be changed. I say 20,000 lbs. is enough for any car to carry.

Mr. BUNTING: I think a little explanation will be necessary. The minimum of 24,000 lbs. in the report refers to carloads of freight only when barrel packages are placed in cars, barrel apples or grapes. The minimum for basket freight still remains at 20,000 lbs. Of course that is regarded this year as somewhat of a hardship, where it was desired to put in a few packages, but after that grew up it resulted in raising

the minimum from 20,000 to 24,000. The report is necessarily somewhat technical in reference to classification, but I might say that the reductions that were asked by the Committee were equivalent to about 20 per cent. of a reduction upon the ordinary rates that had obtained heretofore. With reference to grapes that was practically the only concession that was given—a reduction of 20 per cent. for grapes only in basket lots.

Mr. W. BOULTER (Picton): Did you get a yearly rate from the Traffic Association?

Mr. BUNTING: This rate obtains until it is cancelled, I presume.

Mr BOULTER: Are you positive they will not raise the rates up on you when the winter comes on?

Mr. BUNTING: Yes, rates go up.

Mr. BOULTER: The next time you go before them, ask for a yearly rate.

Mr. CASTON: I think we might sum up the situation in this way: We have practically only two railways in this country; they are competing for the through traffic to the seaboard, and discriminate in favour of the Americans and against the Canadian, and about the only solution that is offered is either Government ownership or a Railway Commission. I believe this resolution is along the right lines, and although we may get some minor concessions we will never have radical change until we have either. Government ownership or a Railway Commission with power to settle these matters.

Mr. J. M. SHUTTLEWORTH: I have some bills of lading in my possession through St. Louis to Liverpool via Montreal, and I also have some of the same date from different points in Huron and Bruce, and the freight from St. Louis to Liverpool via Montreal over the Grand Trunk was actually a little less than the freight from points in Huron and Bruce to Liverpool. That is hauling over the same road.

Mr. E. D. SMITH: I can point out a similar glaring case of apparent injustice. The freight rate from here to St. John's, Newfoundland, by way of St. John, New Brunswick, is less than from here to St. John, New Brunswick. We have known of all these cases of injustice for many long years, and have frequently gone before the Traffic Association. As long as I can remember the injustice of the railways has been agitated, and we have got nothing. I was a member of this Committee that was before the Traffic Association last year, and I can assure you that Mr. McNeill's description of the way that it was received the year before has just about hit the nail on the head. They are just as courteous as they can be, and they get you out after your interview in as short a space of time as they can without offending you in any way, and they throw a little sop or two —as you will see we have got something—which does not amount to much. I think, as Mr. McKinnon's resolution states, the only remedy we can ever expect will be Government supervision of the rates of railways. The railways are going to fight, it is their business to fight, to get all out of the traffic they possibly can. They just figure the thing up how they can get the most money out of it, and if they think this freight is going to be carried anyhow, they charge as high as they can for it. There are only two railways in the country, and they have practically agreed on rates, and so there is no real competition. I feel like supporting the resolution.

Mr. MCNEILL: They have not only agreed on rates, but they have the thing fixed against their own selfish greed so that they cannot cheat each other. They have actually got the mechanism down so fine that one cannot cheat the other, and they just go into it on that score. They have got this Traffic Association business around them so nicely fixed that, although in years gone by they did attempt to cheat each other, now there is no competition or chance for it. The Secretary of the Manufacturers' Association recently received a letter from the Department of Railways and Canals stating that the Association would be consulted in future before new rates schedule issued by the Railway Companies were approved. You are all aware that the Railway Committee of the House has control of these rates. It does not amount to a hill of beans. They can do as much as a Commission will do, but we don't expect them, and they never will; nevertheless they have nominal control of these rates. They nominally assent to all the rates. Now, there is a concession to the manufacturers. If you will just take the statistics, as I took the trouble to do a few years ago, you will find that our business far exceeds theirs in the amount of money invested, in the number of people engaged in it, the value of the annual product, and in everything that should constitute a business; nevertheless they are consulted and we are not.

Mr. McKinnon's motion was put and carried unanimously.

The SECRETARY: I would move that this Committee on Transportation be continued during the coming year, and exert themselves still farther in our interest. The names of the Committee are: W. H. Bunting, St. Catharines; A. H. Pettit, Grimsby: E. D. Smith, Winona; T. H. B. Carpenter, Winona; A. McNeill, Windsor.

Hon. JOHN DRYDEN: I have had some experience in dealing with these railway men in connection with some other matters, and I quite agree with what Mr. Boulter has said. There is only one way you can approach the railway authorities, and that is, if you can show them that by a change in the rates they can increase the product of the country, or in any way take such a course as will tend to advance the interests of the railway, they will listen to you; but if you go to them and say in effect, "If you change this rate I can make so many more hundred dollars a year than I do now," they will just smile and look pleasant and go on with their business and pay no attention to it, for they are sharp enough to see your argument. A few weeks ago, in Montreal, we got considerable additional concessions in live stock in this country, but it was along the same line. I used my best endeavour to put my arguments so as to show them that we were going to increase the trade of the country, increase the production of the country, which, of course, meant adding revenue to the railway.

The SECRETARY read letter from Mr. Thos. Beall of Lindsay, regretting inability to attend, and suggested that it be referred to the committee on resolutions; he also read letter from W. E. Wellington of Toronto, regretting inability to attend. He then said: We have received invitations for next year's meeting from several places in addition to those named this morning. We have one from the Horticultural Society of Belleville, and one from the city clerk of Belleville, also a personal letter from Mr. Reid. I suppose you will refer these letters to the Directors for consideration with the others to-night. I have a letter from Mr. Hamilton, Grenville, P.Q., regretting his inability to attend, but he is mailing documents to Dr. Saunders, one regarding the Canadian exhibit of fruit at the Paris Exhibition, 1900, the other on Horticulture in France.

REPORT OF COMMITTEE ON NEW FRUITS.

PRESENTED BY PROF. H. L. HUTT (ONTARIO AGRICULTURAL COLLEGE) GUELPH.

The duties of this committee are to be on the lookout for anything new in the line of varieties of fruits. Any new and valuable fruit which may be brought to our attention we are glad to take careful note of and report to this association. I think it a somewhat remarkable fact that the greater number of our best varieties of fruits are of chance origin, such as the McIntosh Red and others. Of course we have had and still have men who have done valuable work in the raising of fruit by cross fertilization. The late Charles Arnold, of Paris, has given us the Ontario, one of our valuable winter apples, and our friend, Dr. Saunders, has done much for us in that line. but still there is much more that might be done in the way of improvement in our cultivated fruits. We have not reached perfection by any means, and there is room for valuable work along this line. The number of fruits that have come before us this year has been rather small—smaller than usual—and a great number of them are hardly worth mentioning. Some of them are promising. We have given more extended descriptions of the more valuable of them.

The object of this committee on new and seeding fruits is to be on the lookout for any new seeding which may give promise of value and report upon the same to this association.

It is a somewhat remarkable fact that by far the greater part of the fruits now cultivated are of accidental or chance origin. Nature has produced them and man has discovered and adopted them. For every one, however, which has been considered worthy of adoption and propagation, thousands have been produced which were of little value and received no attention.

There are a few men in our own country and in the States who are doing careful work in the raising of new fruits by cross-fertilization and following out the principles of plant breeding. The names of such men will no doubt remain in the annals of horticul-

ture ; but there is still room for valuable work along this line. We have not yet reached perfection, and there will probably always be room for improvement in the different classes of cultivated fruits.

The number of samples which have come before the notice of your committee this year is smaller than usual, but among them are a few which give promise of value. In the following notes, brief mention is made of the varieties which have been received, and those of promise are more fully described :

Seedling Apples.

No. 1. The Russell apple.—The origin of this variety, which has been fruited at the Central Experimental Farm, Ottawa, during the past five years, has been furnished by Mr. J. P. Cockburn, Gravenhurst, who gave it its name. He says it is a seedling supposed to have originated with a Mr. McRae, of Russell County, from seed brought from the Niagara district. Mr. Macoun gives the following description of it, as it had been fruited at Ottawa :—

" Medium to above medium in size ; skin pale yellow, almost completely covered with deep red ; very handsome ; a few gray dots but these are not prominent ; stem long and slender ; cavity shallow but open ; calyx closed ; basin shallow and slightly wrinkled ; flesh white, tender, melting, juicy, subacid with a suggestion of Fameuse flavour but slightly astringent ; core large ; skin thin and tender ; quality good. Ripens unevenly from August to middle of September. This is the best table apple of its season which has been fruited at Ottawa. It may not prove valuable commercially on account of its uneven ripening, but it will be very useful for home use.

No. 2. A seedling apple from J. Ryerson, Orillia, Ont.—On this variety Mr. Woolverton has made the following comment :—(*Canadian Horticulturist*).

" This is certainly a most attractive looking apple, almost equal to the Gravenstein in appearance, and of a season to continue its use from the time when this variety is over in October throughout November and December. In form it is oblate with deep russeted cavity and large deep basin. The skin is straw colored background, almost covered with stripes and splashes of bright red. The flesh is white, fine, juicy, of an agreeable aromatic flavour. This is a promising apple."

No. 3. Seedling from G. H. Caughell, Aylmer, Ont. Medium sized, yellow, sweet summer apple.

No. 4. Seedling from Miss Orgill, Glen Orchard, Simcoe county, Ont. A small red, crab like apple of rather poor quality.

No. 5. Seedling from W. H. Lambert, Vanbrugh, Ont. Medium-sized streaked autumn apple, of fair quality.

No. 6. Seedling from Alex. Skinner, Lindsay, Ont. Large, red, above medium in quality, ripening in autumn.

No. 7. Seedling from A. Olifford, Richard's Landing, St. Joseph Island, Ont. A large handsome apple, somewhat resembling Ben Davis, of only fair quality, but may be useful, on account of its hardiness, in the northern sections.

No. 8. Seedling from J. P. Oockburn, Gravenhurst, Ont. Medium-sized apple, splashed and washed with bright red on sunny side, quality above medium.

No. 9. Seedling from Wm. Sprendborough, Bracebridge, Ont. A small, red winter apple called Willen, of good quality, may prove of value in the northern sections.

Seedling Pear.

A seedling from Robert Marshall, Snelgrove, Ont. A medium-sized handsome pear with bright yellow skin and red cheek. A chance seedling, supposed to be a cross between Anjou and Louise Bonne. The flesh, however, is as tough as a turnip, although the flavor is superior to that of Keiffer. This pear could no doubt be shipped successfully to the ends of the earth, and would in all probability keep long after reaching its destination. Some have suggested that it might be profitable for shipment to the Old Country market because of its handsome appearance and long keeping qualities, but we do not think it advisable to propagate a variety with which no shipper would dare allow his name to appear.

Seedling Peaches.

No. 1. A seedling from W. E. Wellington, Toronto, Ont, grown in the City of Toronto. Upon this variety, Mr. Woolverton makes the following comment :—

"This seedling measures 3½ in. in diameter and weighs one-half a pound. The flesh is yellow, juicy, and excellent, and quite free from the pit. We know of no peach of this season to compare with it. We have finished Elberta, Late Crawford, Steven's Rareripe, and Longhurst, and are now gathering Smock and Winter, but these latter are small compared with this fine sample."

No. 2. A seedling from Thos. H. Lewis, Jarvis, Ont. A large handsome peach, very much resembling early Crawford, but a little more highly colored.

Seedling Plums.

No. 1. A Japan seedling of Luther Burbank's, grown at W. W. Hilborn's, Leamington, Ont. This is another of Burbank's promising Japan plums. It resembles the Burbank in size and appearance, but is two or three weeks later in ripening. The tree is thrifty, vigorous, and very productive.

No. 2. An American plum, a seedling of Wolf, raised at the Central Experimental Farm, Ottawa, Ont. In this connection, Mr. Macoun has given us the following notes :—

"A large number of seedling American plums have been grown at the Central Experimental Farm, but none have proved superior to some of the named varieties. This year, however, one fruited which will probably prove a valuable acquisition. The fruit is very large, roundish, firm. color deep but lively red, very handsome. Bloom moderate. Suture merely a distinct line. Flesh yellow, juicy, sweet, rich. Stone large with flesh clinging to it. Skin thick and tough ; quality very good. Ripens last of September. Tree vigorous. Where late native plums are desired, this should prove valuable."

Seedling Gooseberries.

Three very promising seedling gooseberries were received from Mr. C. L. Stephens, Orillia, Ont., who has been giving considerable attention to the growing of seedling varieties.

No. 1. A seedling of Industry ; fruit large like Industry ; and so far has proved free from mildew. Promising.

No. 2. A large greenish white berry, very much resembling Whitesmith. Promising.

No. 3. Medium sized green berry resembling Downing.

No. 6. A large handsome berry resembling Whitesmith in size and shape, but of a bright yellow color. Promising.

H. L. Hutt,
L. Woolverton, } Committee.
W. T. Macoun,

Professor Hutt moved the adoption of the report, which was seconded and carried.

Dr. Saunders : I would like to make one remark in this connection. Prof. Hutt has told us about the Keiffer pear that the flesh is as tough as a turnip, and it might do for shipping. I was in the Covent Garden Market when I was in England, and one dealer said, "We used to get good prices for these Keiffers, but we can hardly sell them now." It is very evident they are being gradually educated to appreciate good pears, and I do not think it would be well for us to encourage the exportation of anything that we are not prepared to eat ourselves. (Hear, hear.)

Mr. Morris (Fonthill) : I would suggest that the Committee on New Fruits carry their work a little further. It is of very little benefit to report on a seedling that they find in Canada, because in five years, perhaps, they would not find one of sufficient merit to be propagated. What I would suggest is that they examine all new fruits offered by Americans, by all nursery men, wherever they find a catalogue offering us something new as a specialty, that they write to them and get a sample of the fruit and report on that, and then we will have a report so that by the time a nurseryman gets to selling those

trees in this country, the people will be in possession of the facts as to the value of those fruits. I think this would add very much to the value of their reports.

Prof. HUTT: We would be only too pleased to extend our work in that line if we could get hold of the new varieties sent out by American nurserymen, which is a difficulty. Of course we will have them after a time at our experiment stations. Mr. Burbank is willing to send along anything he has, and we would be only too pleased if the Americans would send over their new fruits and let us try them. I think sometimes our work is not known enough. If the people knew that we were on the lookout for things of that kind, and that these things always come before our Association and are taken care of, they would be more inclined to send in anything on that line. Can you suggest, Mr. Morris, any way we could get hold of those American varieties?

Mr. MORRIS: I suggest you get hold of the American lists and send each one a card asking them for their catalogues, and see what they have to offer.

Mr. WHITNEY (Iroquois): Some fruits have been highly recommended by the Committee Is it the usual course to have these fruits tested more fully by our Experimental Stations? I think we ought not to drop it with the mere report, but carry it on to the Stations and have them further tested.

L. B RICE (Port Huron, Mich.): As far as our nurserymen are concerned, any who are propagating a good fruit would undoubtedly send samples to your Committee upon writing to them, but if it is a fruit that they are ashamed of they won't send it to you and you might just as well report against it on the start. We are fairly honest (laughter) and we are getting more so, as are you (laughter), and when we find anything that is not good for you we will not send it to you, because we are afraid you will get posted up too well.

Mr. SHERRINGTON (Walkerton): We ought to trace them up for a few years to see if they hold out.

The PRESIDENT: That would be very much enlarging the work of the Committee, and I think when the propagators of these fruits see the report of the Committee, that will give them some idea whether it is worth while going on trying to propagate or not. It appears to be all that we can do at present.

E. D. SMITH: Something might be done in the line suggested by Mr. Morris. When a new grape, like Campbell's Early, was first introduced, samples of that fruit could be sent to the Committee and they could report as to quality, size, bunch and berry and so on, and a good deal of information could be got in that way.

The PRESIDENT: I think Mr. Morris' suggestion will be accepted by the Committee, and anything that can be done in that way will be done.

Prof. HUTT: If any new varieties are promised we will try to get a scion of it at Ottawa and Guelph, and if anything comes of it we will let you hear further.

EXPERIMENTS IN FRUIT GROWING AT THE CENTRAL EXPERIMENTAL FARM.

By Prof. W. T. Macoun, Experimental Farm, Ottawa.

It is a great pleasure to have this annual opportunity of meeting the representative Fruit Growers of Ontario. By coming to this meeting I get many hints which are useful to me in my work, and which will enable me better to forward the interests of the fruit growers of Ontario and the Province of Quebec. I can assure you I am very glad indeed to bring before you the results which we are trying to achieve at the Experimental Farm, because, as you know, the Farm is being supported by the people of this country, and it is only right that our work should be brought before you so that you may pass judgment upon it and offer any suggestions that you think necessary. The work was begun in the Horticultural Department of Central Experimental Farm in 1887, when Mr. W. W. Hilborn was Horticulturist. He began the orchards there, and continued in this work until 1889. In the spring of 1890 Mr. John Craig, the late Horticulturist, took charge and continued in that position until the autumn of 1897, and in the spring of 1898 I was appointed to take charge of the work. Mr. Hilborn began planting in the autumn of 1887. The farm began to get cleared, and he had a large stock of fruits on hand and he

was anxious to get an orchard started, so he planted out a limited number of varieties that autumn. The experience which was had that winter demonstrated quite strongly that it was not wise to do any fall planting in districts such as that at Ottawa. A great many trees died, and our experience with fall planting since, which we have done in a very limited way indeed, goes still further to demonstrate the ill effects from planting in the autumn. The wood of the trees seems to dry out, and they become more easily injured by frost. They are also liable to be heaved. It was not until the spring of 1888 that the main part of the orchards were planted, and during that year a very large number of the standard varieties and many of Russian origin were brought together, and every year since that time the number of varieties has been increased so that now we have about 700 kinds of apples growing in Ottawa. The main object in testing fruits at Ottawa was to determine their hardiness, productiveness, quality, freedom from disease and other points. Then in connection with this we were to try experiments with different methods of culture, different methods of spraying, etc. We have been trying to carry out all these different branches of work at the same time. The conclusions we have reached are that there very few varieties of apples indeed which are quite suitable for the Ottawa district. Out of the 700 varieties that we have growing, there are probably not more than a dozen which kill back at their terminal branches, so that we are not troubled with winter killing above ground, but the two principal causes of death among the trees are sun scald and root killing, and the third cause I may mention is blight, so that the apples that will withstand the sun scald, root killing and blight are the varieties which will succeed in Eastern Ontario and the Province of Quebec. As I said, we have only a very few apples which we could recommend. We have tested about 200 varieties of the so-called Russian apples, but outside of their usefulness for growing in the most northern parts of the country the newer varieties of Russian apples have not proved of value. Of the older fruits, of course the Duchess of Oldenburg, Red Astrachan, and Yellow Transparent are the three very good apples for their season. The varieties of apples which we have found from experience to be the best suited for growing in districts such as that at Ottawa are, for summer, Yellow Transparent and Duchess; for autumn, Wealthy; very early winter, McIntosh Red and Fameuse, where it can be grown with natural protection. We find that where we are at the Experimental Farm somewhat exposed, it does not do very well, but in the vicinity of Ottawa where it has some protection it does very well indeed. Then for the late winter we recommend Scott's Winter, Gano and Pewaukee, and also Salome. The other varieties which are perfectly hardy are Lawver, Golden Russet and Ben Davis. The Salome was originated in the States, and was one of our most promising apples; this one shown here was grown in Western Ontario; you will notice its color is yellow while the one grown in Eastern Ontario is red. That is certainly Salome, but they were not highly colored this year. I may say that the Salome is a very productive fruit and quite hardy. The quality I might also say is good; it is not high-flavored, but it is juicy and pleasant to the taste.

Mr. CASTON: Do you find the tree a thrifty grower?

Prof. MACOUN: We have found them a thrifty growing tree. This is a McIntosh Red, which as you know was originated fifty or sixty miles from Ottawa. This we consider one of our most valuable apples, and for its season, the most valuable apple that we have growing in Ottawa. Fruit growers are planting very largely of this variety every year, and I think it is going to be one of our leading dessert fruits. Complaint is often made that this apple is a shy bearer, but we have not found it such at the Experimental Farm; It is not a heavy bearer, but it yields a moderate crop every year. For the past two years in succession we have taken two barrels of apples off a tree twelve years planted, so you see that is not doing badly. I believe in certain sections it is much troubled with scab, but in the Ottawa Valley we have very little scab, and we are not troubled with that disease. This is a small specimen of the Gano; they usually grow a third larger than this. This apple is a seedling of the Ben Davis, and I regret to say is no better in quality, but it is a very hardy tree, an early bearer, productive, and where apples of this quality find a market, I think it will prove quite profitable. Here is the Winter St. Lawrence, another hardy variety and which is doing very well in the Province of Quebec; it is a little later than the ordinary St. Lawrence. Here is the Kinnaird that is going to do very well in our part of the country. It has a flavor like the Northern

Spy and although not quite so good in quality, is a very desirable dessert apple. The tree is growing in the most exposed part of the orchard, and has been there nine years. It seems perfectly hardy. It is one of the seedlings from the South-western States. Practically all the varieties we are recommending are of American origin, that is, the trees of autumn and winter apples. The best of the early apples are from Russia. I think we must look in future for the origin of our best apples to Canada and the United States, and I believe it is quite likely that we shall get our ideal apples from the South-western States, for this reason, that nearly all the apples which are originated in the northern parts of Canada are early varieties, and what we are after is a late keeping variety. Now if you can get a variety from the South-western States which combines hardiness and late keeping and good quality and other good points, you are going to get the ideal apple. The Ben Davis, although it is not of good quality, is perfectly hardy, and it seems to me that there are more chances of getting a late keeping variety from places where growth is longer in the season than it is to get them where the growth is very short.

Dr. SAUNDERS: What about the Swazie Pomme Grise?

Prof. MACOUN: It is not a late keeping apple. I have some specimens here. This is a hardy sort, and one of the most valuable apples for dessert purposes. It has a delicious flavor, and is well worth growing for home use. The tree is not very productive, and is not very thrifty on that account, will not prove perhaps valuable from a commercial standpoint. At the Experimental Farm we have been trying to originate some new varieties of apples, and as Dr. Saunders brought before you last year, his special work has been in originating apples which would be hardy in the North-west Territories. I think from the results which were brought before you last year you will realize that he has done very much work in that respect. Now we are trying to originate varieties which will be useful in Ontario and the Province of Quebec, and I have now some two-year-old seedlings which we are going to put out in the orchard in the spring, and I hope to get a good many hundred of them—seedlings grown from the best apples fruited at Ottawa—and I am hoping that from these we shall get a few varieties which will be better than any of those that we have. Prof. Hutt has stated that the best apples we have are from chance seedlings, but we must remember that those chance seedlings have originated over a very long period, probably two or three centuries, and I think the chances are much greater that we shall get some good sorts by a systematic growing of seedlings We are also doing a little in cross breeding by combining the late-keeping qualities of some varieties with the dessert qualities of others, and I have chosen as the male and female parents the McIntosh Red and the Delaware Winter or Lawver. This Lawver is an apple which you can keep in an ordinary cellar for eighteen months. It just gradually withers up, and they can be eaten at the end of eighteen months, although of course there is not a great deal of juice in them at that time.

Mr. RACE: They keep better if kept from the air as you would in barreling apples.

Prof. MACOUN: Yes, they would keep in much better condition. The Lawver is moderately productive, of a high color, and the quality, although not highly flavored, is juicy, sprightly and pleasant. We think that by combining this very high flavored variety, the McIntosh Red, with this other kind, that we may originate some new sort which will be more valuable than any of those that we have. I stated that the chief cause of death at the Experimental Farm was from root killing. We have tried to prevent this by experimenting with cover crops and, I think, have demonstrated quite thoroughly, that the trees can be protected very much by the use of these cover crops. We have found that the best cover crop for the Ottawa District is the common red clover. By sowing this about the middle of July a very good stand can be obtained of from ten to twelve inches in height, and this will protect the roots of the trees in winter and hold the snow, and there is not nearly as much danger from winter killing.

Mr. MCKINNON: Does it encourage field mice?

Prof. MACOUN: We have not found that it has so far. Of course, the young trees should always be protected from field mice anyway, and it will not matter if the clover is there or not. No one should allow his young tree to go through the winter without protecting them in some way from field mice. I think young trees can be protected from sun scald by means of a tree protector which is now in use in the Western States, made of a very thin slab of wood which you can wrap around the tree and twist the wire

together, and this stands about two and a half feet wide and protects the trunk of a tree from the rays of the sun in the spring, and there is a good circulation of air between the protector and the tree. We have found that the sun-scald has not been nearly so bad when we used those protectors, and they will prevent the mice from getting at the trees.

Prof. HUTT : Put them on in the fall and keep them on in the spring ?

Prof. MACOUN : Yes, but it is not necessary. If you want to save your protectors it is better to take them off rather than get the weather all summer. In connection with these cover crops I may say we have tried several different methods of tillage in our orchard at the farm. As you know, the usual method recommended is to have a cover crop that you plow under in the spring, and then cultivate the orchard until July. I found that at Ottawa the soil, which is rather light, was very liable to be carried away with the wind, and it required something to protect the surface of the soil throughout the season, so that I found it was better to leave the cover crop all summer, as we do not suffer from drouth there, there being apparently plenty of moisture in the soil; so that instead of plowing the clover under in the spring we start cutting it with a field mower, and we have had as many as five good cuts from this clover during the season. By cutting it just when the bloom is showing you can save the strong plants, and your second, third and fourth crops will be almost as good as the first. In calculating the amount of green clover which was left lying on the ground I figured out there was about twenty-five tons left to rot on the surface of the soil. This is plowed under after two seasons, and the ground is re-sown with clover.

I mentioned to you that there are very few varieties of the better class of apples which were proving hardy at Ottawa. In order to see if we could not get varieties to succeed there that do well in Western Ontario, and other more favored parts of the Province, we are trying experiments in top-grafting, and have used as stocks such hardy varieties as Haas, Gideon, McMahon White and Hibernal. Those varieties are not subject to root killing or sun scald. The results so far seem to justify the conclusion that we shall be able to grow such varieties as Ontario, Northern Spy and Baldwin at Ottawa—whether for commercial purposes or not I cannot say, but at least for home use, as we have Northern Spy which has been fruiting for several years now, grafted on Wealthy, and although the union is not good the tree is perfectly hardy. We are also trying experiments with different kinds of stocks. You may remember that in his address last year Dr. Saunders spoke of his hybrids being originated from crossing the Pyrus baccata, the Siberian Crab, with some larger apples. This Pyrus baccata is very hardy, and we are using it for grafting other root varieties on, and we are hoping to get better varieties in this way. Dr. Saunders reminds me that our experience has been that Northern Spy grown in the ordinary way will not succeed there; the tree sun-scalds and root kills, and is quite a failure, but we have had several crops of good Northern Spy apples from being top-grafted. The conclusions, then, that we have reached in regard to apple growing in such a cold climate as that of Ottawa, are : that you must use warm, well-drained soil, use cover crops, and grow only the very hardiest trees, and root graft them preferably on hardy roots. In regard to pears, we have tested a large number of varieties at Ottawa, but very few kinds have reached the fruiting age. The varieties which have fruited are the Bessemianka, Sapieganka and Baba of the Russian varieties, and Longworth and Flemish Beauty of the American varieties. None of these varieties except the Flemish Beauty is worth growing anywhere where pears can be bought, because the Russian pears, although they appear quite hardy, do not keep any time; in fact, they begin to rot before they are ripe, which is a remarkable thing about them, and they are gone before you are able to use many of them. They are also very subject to blight, and on that account are not desirable to grow. While the Flemish Beauty is not perfectly hardy at Ottawa, we have one tree which has been planted since 1890 and which has borne several crops of fruit, and we are hoping that by grafting from this tree we may be able to get a hardier strain from that variety. So that our success in growing pears has not been great. We are in the position, however, to recommend people not to plant pears in that part of the country. We have tried nearly all the European kinds of plums that are advertised in this country, but find that very few of them can be grown successfully. Some seasons you would get a few plums, but in the majority of cases the flower buds are killed by frost, though the wood is perfectly hardy. The hardiest European plums we have found there are Glass' Seedling, Early Red, Richmond and Barnett's Yellow. The last three

were brought from Europe, and are varieties which Prof. Budd was the means of disseminating. The Japanese plums are about the same as the Europeans at Ottawa. In protected places they have borne well in the vicinity of Ottawa, but when exposed the flower buds are killed by frost in the same way as the Europeans. The chief hope at Ottawa is with the American plums, and although perhaps they are not worthy of being spoken of when compared with the European plums, yet where we cannot get European they are very good indeed, and the fruit growers around Ottawa are planting them more extensively this year, some kinds now being developed by nurserymen being very good indeed. I might mention the following as those which we recommend, ripening in the order named :—Atkin, Cheney, Bixby, Gaylord, New Ulm, Wolf, City, Silas Wilson, Stoddard, Hawkeye, Wyant, American Eagle and Hammer. This is a selection taken from over 100 varieties, and I think comprises the best of those on the market, unless it be some kinds we have not been able to get. In cherries we have not had very good success either. The principal reason, however, is that the original orchard was comprised of trees which were grafted on the Mahaleb and Mazzard stock, and during the winter of 1895 and 1896 then there was very little snow on the ground nearly all the orchard was root-killed. Since that we have been grafting on wild cherry bird stock, and the results have been very gratifying indeed. These trees appear perfectly hardy, the fruit is perfectly good, and I think it would be well for any nurseryman to use this stock who proposes to ship to Europe or Quebec. We have trees bought in 1890 where the union is still perfectly good. The hardiest cherries we have found so far are :—Amarelle Hative, June Amarelle, Shadow Amarelle Heart-shaped Weichsel, Griotte du Nord, Orel, Cerise d'Ostheim, Brusseln Braun and Koslov Morello. This covers a season of about five weeks.

Mr. CASTON : There are several under the name of Orel ?

Prof. MACOUN : Yes. That is really Orel No. 25 that I speak of. We have been testing also a number of varieties of grapes at Ottawa ; we have now 175 kinds there. The grapes have proved perfectly hardy as far as both roots and wood are concerned ; we have no trouble from root killing. The system we adopt there is to cover the canes every autumn with earth, and then the snow comes and protects; but we cannot grow grapes there for commercial purposes unless it be the hardy varieties of wine grapes, which can be grown without going to the trouble of covering them with soil, which is very expensive and on that account is not practicable for use on a large scale. Of the varieties which are almost certain to ripen every year, and which are of fairly good quality, I might mention Moore's Early, Moyer, Peabody, Canada, Brant and Newmarket, and I think Campbell's Early may also be classed in this list. Then next are Wilder, Roger's No. 17 and Delaware. Then another class is Moore's Diamond and Brighton. Then in a class which do not always ripen early are Lindley, Agawam and Vergennes. These varieties do ripen some seasons at Ottawa, and we can get very fine samples of them indeed, but as a rule they do not ripen perfectly. That has been our experience with the large fruits, and I might also probably later on in the meeting give our experience with small fruits. I will be very glad to answer any questions.

Mr. MORRIS : How tall are the stems of your apple tree ?

Prof. MACOUN : From two to four feet. We try to train our trees freely.

Mr. MORRIS : They are perfectly shaded at the top. I don't see how the sun scald occurs.

Prof. MACOUN : Our prevailing winds are from the south-west, and it is on the south-west side of the tree the sun scald occurs, and the trees all get a little sweep to the north-east.

The PRESIDENT : Do you plant your trees upright ?

Prof. MACOUN : Yes.

Mr. MORRIS : We have the same trouble in the south here exactly in regard to that as they have. If a tree gets leaning to the north-east, that tree is going to die. It is very important to plant them leaning to the south-west, and see that they do not get over to the east, even if you have to stake them. The sun striking the stem when it is leaning that way is generally what kills them. Keep the tree leaning to the sun and it will not hurt them. Another thing is that many trees are ruined in planting out by cutting the tops off the first year. That exposes all the stems to the sun and the weather that year, and they are very much damaged even if they live through it.

A. H. PETTIT: Do you think the sun scald is caused in the summer time?

Mr. MORRIS: Yes.

Mr. PETTIT: I believe it is caused from the sap in the winter.

Mr. BOULTER: Do I understand you that it is objectionable to cut the tops of the trees off when you are planting them out the first year?

Mr. MORRIS: Yes.

Mr. BOULTER: You are selling trees, and we are buying them. Now, I put out 1,000 trees in 1878 and I cut the tops all off and I never lost one. I always thought if you had a trunk you could grow a top.

Mr. MORRIS: We are apt to cut off the tops to balance the root. Our forefathers always did it, our neighbors have done it, and everybody else has done it, and we think it the only proper way. But did you ever reason it out? The root can not grow unless there is a growth in the top, and the top cannot grow unless there is a root-growth. They both want to go together. When you cut off the top of a tree and leave a few stems near the stock, it requires a great effort of nature to push those buds. Those buds do not start readily like those on the upper part of the limb, and the consequence is, when the buds do not start the roots do not start, and the roots not starting those buds do not start. (Laughter). Leave the whole top on; that top answers other purposes besides growth. Those buds on the hundreds of these limbs, all grow a little; they will help the roots, and then the roots will help to put growth in the top as well.

Mr. CASTON: There is not very much root there to start, that is the trouble.

Mr. MORRIS: It does not matter how much root there is. Anyway, you get altogether a very much greater growth in the root, the tree becomes a very much better shape that first year by leaving the top on than by cutting it off.

Mr. BOULTER: Do you advise cutting it off the next year?

Mr. MORRIS: Yes, cut it off the second year just as you would the first year, and then it is ready to force those lateral buds and to become a good, strong, shapely tree next year. Now, there is another thing in connection with this. When you take the top all off you do not get a new top that year, you get a little growth, and that stem is exposed to the sun and it hurts that tree. Perhaps it will take years before it will recover the damage done that year. I am glad to say that I have induced one gentleman to adopt my plan last spring, and he reports to me so far that he can see it is a success, and I hope that he will come here and tell us at the end of two years how it has turned out.

A DELEGATE: Can you adopt that plan with the peach as well as with the apple?

Mr. MORRIS; Not with peach; I would say apple, pear and plum. I remember showing our president a few rows of trees in our nursery where the heads had been cut off, and a few rows along side of them where the heads had not been cut off, and the stems of those where the tops had been left on were double the size of those that the heads had been cut off. Do you remember that, Mr. Orr?

The PRESIDENT: Yes, I do.

Mr. MORRIS: That just carries out the truth of my theory.

Mr. HAROLD JONES: You would recommend to trim off some of the lower limbs to balance the top a little the first year?

Mr. MORRIS: I would not cut off any limbs the first year. If you cut that back three or four inches, leave the sap there and then cut that off the second year, and then the growth the second year will be strong enough to seal that over. When you cut it off the first year, that cut is exposed all the following winter and in apples often causes what is called the black heart.

The PRESIDENT: This is a very interesting subject indeed, and I am sorry that we cannot spend an hour at it. I have had considerable experience in planting trees, and I have no trouble with sun-scald, and I do not think the trees are killed by frost in the spring when the sap is in, I do not agree with Mr. Pettit in that. I have a thousand trees I planted, and in planting our trees we lean every tree to the west, so that a plumb line hanging from here (showing) would bring it out about 14 inches from the root. Just as soon as the foliage comes the trunk of the tree is sheltered. I have not a tree out of 8,000 or 9,000 that is sun-scalded where the top has protected the trunk, and scarcely a tree that is leaning over at all. About the fifth or the sixth year the tree, by the prevailing winds from the west, will be just about up straight, and then have suffi-

cient root to maintain it there. I think it a most important thing, as Mr. Morris suggests, to lean every tree, heading it to the prevailing wind. When it grows and brings foliage I do not think you need have much fear of sun-scald.

Dr. SAUNDERS: I think this subject is one of very great importance, and it is well that we should understand it thoroughly. As I understand the discussion as far as it has gone, and Mr. Morris' views, he would not have you get a tree all mutilated in the roots, leaving the whole of that top on because that would be an unfair tax on the root system, but to leave plenty of terminal buds in order to fully balance all the roots that were left, and have those start promptly in the spring so that they would encourage a rich growth, and start at the same time, and the growth would go evenly and be well-balanced. It seems to me that it is a very philosophical way of looking at the matter, and to adopt the extreme method of cutting off all the top would be unwise, while to adopt the other extreme of leaving all the top on would be equally unwise, and by judicious cutting back, not too much, and leaving plenty of terminal buds, which, as Mr. Morris says, start the earliest in the spring, to encourage the root growth, I think the greatest success would be achieved.

A. H. PETTIT: Just one word, Mr. Chairman, in regard to your criticism of my remarks on sun-scald. Where do we find sun-scald? We are finding it chiefly in the northern and eastern portions of the Province. Now, the sun shines there just as hot as it does in the southern part. I claim it is the frost in the winter that ruptures the sap cells in the body of the tree, and the effects come out in the summer. I do not think the sun-scald is caused by the summer heat at all; it is caused by the winter.

Mr. L. B. RICE: I would like to ask Prof. Macoun if in trying different varieties for grafting he had tried the Tallman Sweet and the Liscombe. Several years ago one of our people made an exhaustive experiment extending through some fifteen years and different varieties, and his reports showed that the Tallman Sweet, which is a very strong root grower and the Liscombe were two of the strongest stock trees he could use for grafting tender varieties on. We have a great deal of experience with sun-scald, because we cannot set out a tree that is not scalded, and you will find the scald will show itself in trees planted in the fall or early in the spring. I set a good cedar post in the ground and set the tree on the northeast side of it and have no sun-scald. My theory is that in the coldest weather that we have, when it freezes so very hard, about three o'clock in the afternoon the sun shines out just enough to start the frost out on that southeast side and then it freezes again the next night and that kills the tree.

Mr. HUNTER: I must protest against the statement that it is in the winter that the trees are sun-scalded. I have a good deal of experience in both planting trees and assisting others, and I find that trees planted in the spring were sun-scalded during that summer quite frequently. I mentioned that at a meeting of this Association in Brantford some years ago, and stood alone on that question about leaving the top on the tree. I have set out seven acres this spring, and I have not a sun-scald in one of them, and I have the top on every one of them. That sun-scald is local. Up in the dry plain here we are subject to that kind of thing, and if we cannot get well rooted trees, and well protected from the sun during the summer, we cannot get them started at all. I have had experience in planting trees in Delaware, where we can get them started without any root at all. Even our maples do not stand the sun-scald in the summer here.

Mr. OASTON: I heartily agree with Mr. Pettit. I believe the injury occurs from this cause. It is about the time that the maple sap is running, and we have a very warm sun for two or three hours in the middle of the day, and on the southwest side of that tree, especially if we have a southern exposure, we have a special condition set up—heat in the middle of the day and winter temperature at night—and that repeated day after day is the cause of the black streak from the head of the tree down. You will find that where they are planted on a western or northwestern exposure they do not suffer so much, because generally there is a cool breeze from the west at that time, and where that occurs we do not have so much sun-scald, which is the cause of great loss to trees in this Province, and far worse in some localities than others.

Mr. MCKINNON: I have about two hundred pear trees planted in this way—the roots almost entirely cut off, the stems cut down to about eighteen inches, and it is the most beautiful lot of pears that I have, and I scarcely lost one, certainly not one in a hundred. It is a very easy way to plant and very satisfactory.

Mr. E. D. Smith : It strikes me that this thing has proved itself in regard to the time of the year the tree is injured. It is admitted that in the Niagara District we may not be troubled with it, but they are troubled with it here and at Ottawa. Well now, the sun is certainly as hot if not hotter in summer in our district than in any place in Ontario ; therefore it is fair to assume that it is caused in the winter. Every nurseryman in Canada and the States sends out instructions to his customers all over the country to cut their tops back when they plant the tree, and urge as a reason for that that when such a large portion of the roots is cut off an equal proportion of the top must be cut off to balance the tree ; when the first buds that are started in the tree are started from the sap that is contained in the tree, and if a large number of buds were left on the top the sap is exhausted from the tree and it becomes unable before new roots are formed to furnish further sap. That, it seems to me, is the theory whether it is right or wrong. If it is wrong it is an exceedingly important matter that the whole country who are buying trees should be rightly instructed about this matter.

The President : I believe in the northern section where you get 20 to 30 degrees of frost your trees may be injured in the winter. It is usually on the west and north-west side of the tree that the damage is done. I believe in our section if a tree is properly planted and the trunk is covered by the top that we will have no sun scald. That has been my experience.

CANADIAN FRUITS AT THE PARIS EXPOSITION AND IN THE BRITISH MARKETS.

By Dr. Wm. Saunders, Director Dominion Experimental Farms, Ottawa.

It affords me great pleasure to come before you to-day to give you some little account of the way our Canadian fruits have been received across the water at the great Paris Exposition and also to explain about the character of that exhibit. I may say that, standing by the exhibit as I did from day to day for a considerable period, scarcely half an hour would pass at any time but some one or group of individuals would pass by and look at these fruits all marked from Canada. It was the greatest surprise to those people that such fruits would grow in such a cold country ; they could not understand it, and they would ask for explanations and when they were satisfied they were bona fide Canadian fruits then they thought there was something in the glass that magnified them, or something in the fluids, and this they also had to be satisfied about by extensive explanation, and then they would pass on—" Ah, wonderful ! "—they could not understand it. And this sort of thing was going on all day long with foreigners from all parts of the world, and I do not think Canadian fruits and Canadian climate and its character received so great an advertisement as has been given to the Canadian fruits this summer in Paris. Now let me explain to you, in a few words, the way in which this exhibition was got up and of what the exhibition consisted. At the outset it was decided by the Minister of Agriculture that this exhibit should be of such a character as to have representation of all our choice Canadian fruits from every important fruit growing centre in the Dominion, from the Atlantic to the Pacific, so that the visiting world there would be impressed, first of all, with the idea of the fine quality and character of our Canadian fruits, and secondly with the vast area over which those fruits could be grown, thus demonstrating to the world that Canada has practically inexhaustible resources in her growing and producing capacities.

To accomplish this we endeavored to enlist the services of prominent fruit growers and men who were interested in fruit in all parts of the Dominion. Beginning with the west, we got the local Government interested there. They employed the Deputy Minister of Agriculture to go through different parts of British Columbia, through the drier sections of the country in the interior and through the different parts of the coast climate. The superintendent of the Experimental Farm there was instructed to devote all the time necessary to gathering fruits in his part of the coast climate, and also to send a very good representative collection, which he did, from the Experimental Farm at British Columbia, where we have the largest number of varieties of fruits gathered together that is to be found anywhere, I think, in the world. With these two sources to draw from,

and the assistance of a few isolated fruit growers, such as Lord Aberdeen, at Coldstream, who sent an excellent collection, and Mr. Thomas Earl, in the upper district at Lytton, we got together an extraordinary collection of fruits from British Columbia, that astonished everyone who examined them. In Manitoba and the Northwest the superintendents of Experimental Farms collected together all the collections of small fruits that were obtained, raspberries, strawberries, gooseberries, etc., and preserved these. It was decided to divide the exhibit into two parts. In one part we would have all the perishable fruits—beginning with the strawberries and extending to the early ripening pears and apples—we would have all those preserved in bottles in antiseptic fluids. While this would not preserve them in a fit condition to be tested as to quality—while they could not be eaten—yet it would give the visitor a good idea of their size, and form, and beauty, and general aspect. The Experimental Farm did the bottling work for British Columbia; and for the centre fruit was collected by the parties as I have explained. In Ontario a noble work was rendered by the Ontario Government, through Prof. Hutt, in collecting and putting into suitable jars a very large collection of Ontario products. I think there were about six or seven hundred bottles put up at Guelph in this way, and thus all the early perishable fruits were represented from the western part of Ontario. Mr. A. McD. Allan undertook the collection of fresh fruits and through him a number of people became interested in the matter. Our Secretary here deserves special mention for the attention he gave to the matter. Mr. A. H. Pettit also, and I think Mr. Murray Pettit, and a number of other people in the Niagara district, interested themselves in the matter, and we had a very excellent display from this section of the country. In the East Mr. Harold Jones furnished us with some very fine specimens. Mr. Whyte also furnished us with quite a number of small fruits of his own growing at Ottawa, and Mr. Macoun took a great deal of interest in the matter, and put up a very large collection of the fruits grown at the Experimental Farm, so that both the Eastern and Western parts of Ontario were well represented in this grand display which was brought together. In Nova Scotia Mr. Bigelow, the President of the Fruit Growers' Association, took the matter in hand and with the help of another gentleman, Mr. Chas. A. Patriquin, a large collection was made of the softer fruits and a very good display of the late keeping apples brought together. Mr. Thos. Peters, Deputy Minister of Agriculture for New Brunswick, worked among the New Brunswick people and got a good collection of fruit, and Mr. Jeremiah Clark from Prince Edward Island, whom I see here to-day, did good work in bringing together all the varieties they could show. With the help of this machinery there were brought together about 1,500 jars of preserved fruit kept in antiseptic fluid, which, up to the present time, shows very naturally in most instances, their natural color and appearance and size, and were of great value to us in completing our exhibit by representing the sections of our fruits which could not have been shown in any other way. Besides that we had nearly 600 bushel boxes of fruit which were put in the cold storage in Montreal late in the autumn and early in winter, to carry on these exhibits of fresh fruit, which have been a surprise to all the visitors at the Paris Exposition and have done such credit to the country. These fruits were put in the Union Cold Storage Co.'s warehouse, and were kept at a temperature of as near 32°F. as we could keep them during the winter.

It was contemplated to send these over to France in March or early in April so as to get them to Liverpool before the hot weather would come, because we knew that there were no means of transporting them from Liverpool to Paris in cold storage—they would have to perform that end of the journey in the ordinary way. But there were delays in connection with the Exhibition Buildings; they were not nearly completed by the time they were promised, and there were delays also in our Canadian Building, in completing the cold storage facilities, and it was the middle of May before we could send those fresh fruits from Montreal to Liverpool, and it was about the middle of June before we could get them from Liverpool over to Paris. They were, however, kept in cold storage all the time except during the journey from Liverpool to Paris. It was in the middle of June, when the weather was hot, and they were nine days after they started from Liverpool, though sent by the quickest route that could be had, regardless of what they would cost in reaching Paris. It seemed a matter of surprise to me that, after going through such a perilous journey, they came out as well as they did, but it did affect some of the softer apples, such as the McIntosh Red and the Fameuse and

two or three other varieties of that class. They did not show as well as they would have done if they had had a fair chance, but all the later keeping varieties of winter apples were practically perfect when they arrived in Paris. They were then put into our own cold storage under the Canadian Building, which was fitted up with shelves all around so that the fruit could be unpacked and every imperfect specimen discarded, and we thus had perfect specimens kept there at about a freezing temperature, and they remained there with various accessions to the quantity, and, drawing from them continually, we were repeating our exhibit of these late-keeping fruits until the close of the Exhibition in November. We did not ship all the fruits at once. 150 boxes were sent from Liverpool the first shipment. The next shipment of 100 boxes was made some time during August, and they got over in six days, and the third shipment got over in five days, and the fourth shipment was made after I had left to come home and I have not heard yet how many days that took to get over, but I suppose it would not exceed that length of time, so that we improved in the way of rapidity of transit after we got into the way of handling the thing better, and these later shipments of fruit reached Paris under still more favorable conditions than the earlier ones. The bottled fruit had rather rough usage. It got to Paris before the buildings were completed; it was sent over in good time but, amidst the mass of material that was accumulated, they were shoved around from one point to another, and though the boxes were all marked strictly "this side up," yet our manager tells me that they were almost always found that side down whenever they were found (laughter). There was no regard whatever to the way in which these packages were left when they were left to themselves, and as these stoppered bottles, when they are jolted about, are liable to start the stoppers, we found when we came to open the packages that a great many bottles had leaked out more than one half of the fluid, and then, when the cases were turned over, of course it would jam up the fruit in a soft condition and destroy it. The stoppers were tied down with a piece of cotton, but in some cases the cotton had not been wet before tying, which should have been done, and the little play that was allowed was enough to start the stoppers the least bit, and then when it was once started that little bit the fluid would gradually ooze and drop out, and, when left for a week or two with the cases turned over the wrong side up, you can understand that the stoppers, which were imperfectly ground, would be almost sure to leak more or less. However, when I reached Paris on the 6th of June, I found there were about in all 1,200 bottles of fruit, preserved in fluids, out of the original 1,500 which had been put up, that were in very good condition. We had between 900 or 1,000 of those in the Horticultural Pavilion where the great display of fruit was made, and then we had about 250 bottles in the Canadian building, where they were used to lighten up and decorate the other parts of the exhibit, more particularly the grain exhibit, and also being put there for the purpose of showing those visitors who might happen to go there and not see the Canadian fruit elsewhere, to give them some idea of the fine quality and character of the fruit we were growing here. The cold storage facilities provided at Paris were very good. But for this we could not have made the showing we did, nor secure the number of awards. It would have been impossible to have carried on the exhibit for any length of time. It was a little late in being completed, but when finished it served its purpose admirably. Now, many people have been surprised at the number of awards that were made to the fruit. In proportion to the exhibits, the awards to the fruits were much larger than they were with regard to any other class of exhibits that were made, and I want to give you the reason for that. Where all those perishable exhibits such as fruits and flowers and vegetables were concerned the judges were required to meet every three weeks. Sometimes the limit of time was not much more than two weeks, but the average was three weeks during the entire exhibition so as to judge all the fresh material that was brought together. The larger part of the Horticultural display, that is the flowers and vegetables, were only shown for four or five days every three weeks. After that interval everything was carted away; the ground, where the flowers had been, was dug up and fertilized, got ready for the next display, so that, when the people were ready to bring together their next display of flowers and vegetables, the place was all clean and orderly and ready to receive them again. Now, this concourse of the judges, as it was called, which occurred every three weeks, gave us good opportunities to get a renewal of our premiums. We had an abundant supply of fruit in the cellars of the cold storage warehouse all arranged on shelves. Every day

our collection was gone over by those in attendance, and if there was an imperfect specimen it was removed and a perfect one brought up and put in its place; but when the judges were about to appear on the scene again the whole collection was put away and an entirely new one brought out of the cold storage chambers, so that the judges did not have to judge the same material; they judged on an entirely new collection, and our 500 boxes of apples gave us room to make a fine display every two or three weeks during the entire exhibit, and never show to the judges any fruit the second time. In that way we got awards first of all for the Dominion and the different Provinces; we got awards for the Honourable Ministers of the different Provinces; we got awards for the Fruit Growers' Association of Ontario and Quebec, for Nova Scotia and Prince Edward Island and British Columbia, and we got towards the last a few awards for some individuals, including gold medals for our worthy Secretary who had done a large amount of work in connection with the exhibition. Besides getting these awards we have two or three times got the Grand Prix, which is an award higher than anything represented by medals, whether they be bronze or gold or silver. On the 4th October I was in Paris awaiting the arrival of the first consignment of fresh fruit which was sent over from here some time in September. I believe it was about three weeks from the time it left Canada until it reached Paris, and I have all the details here in connection with every box of fruit that was opened as to how everything came out, and in the majority of cases the fruit came out in a most satisfactory condition. The peaches were the only exception—the only instances where there were any considerable number of the fruits decayed—and, as those were the most difficult subjects to carry, I give you the particulars of the two or three packages of peaches that were opened in my presence. There was one case of Elberta peaches, which were wrapped first of all in waxed paper, then with soft manilla. Thirty-five of that hundred were perfectly sound and were displayed, and astonished the visitors at their size and magnificence; twenty were more or less spotted with decay, forty-five were wholly or partially decayed.

Mr. McKINNON: Those had been five days without cold storage.

Dr. SAUNDERS: At least that. They had been sent to Liverpool, and then transhipped from Liverpool to Paris. There were 25 Lord Palmerston peaches sent in a case with some other material; they were wrapped in double brown manilla paper; 18 peaches out of 25 were in perfect condition, 7 were more or less spotted, and those that were in good condition were tasted by the judges and the fruit found to be in fine condition and very high in flavor. The other one contained 100 specimens of late Crawford. Of these 31 were perfect, 14 were a little bruised, 55 were partly or wholly decayed. I think, considering the soft texture and easily injured character of this particular class of fruit, it is astonishing that we got so many specimens in perfect condition, considering the long journey they had to make, and the long time occupied in making it, and that part of the journey was made without cold storage.

Mr. McKINNON: Do you know how long it was, after they were packed until these were unpacked in Paris?

Dr. SAUNDERS: I could not say. I have no particulars of the time they were packed. I think I could find you the exact number of days from the shipment in Montreal, but the Secretary could tell perhaps whether those were delayed at all after they were packed.

The SECRETARY: They were a few days in ice storage at Grimsby and two days from Grimsby to Montreal on refrigerator car.

Dr. SAUNDERS: I will give you a duplicate list of some of the varieties of fruit which are not supposed to keep very well. Take for instance the Chenango Strawberry apple. There were 25 specimens sent in one case, packed in soft manilla paper and the spaces filled with excelsior. The specimens were sound but most of them were slightly bruised and this variety seemed to show these very slight bruises in rather a characteristic way, which led those of us who were there to pronounce this apple as not a profitable one for shipping to Europe. The Alexander apple of medium to large size, well colored, came out all quite sound where the packing was well done. There was a case, No. 31, of Mr. Woolverton's, every sample of which was sound. There was another case sent from Quebec which was put in a box without any packing at all and not very tightly packed, nearly all of which were bruised as you might expect; but, whenever care was

taken, even apples of that texture came through in the most wonderfully good condition. Flemish Beauty pears came through in excellent condition. Duchess apples from New Brunswick came through perfect. Apples from Montreal such as Fameuse, Gravensteins and Red Gravensteins from Nova Scotia and from Ontario, and a number of other varieties of that same character came through in perfect condition. There was a case of Souvenir de Congres pears that came from Grimsby. The case was lined with excelsior, with moss for packing, the fruit was wrapped in waxed paper, the outside wrapper being plain tissue paper. The specimens were large to very large, and they were all in perfect condition. That variety of pear, I should judge, is not easy to ship.

The same testimony was had with regard to the Bartletts and other pears having that character, and I think the fruit growers and all those interested in that subject may be very much encouraged by the state in which that first shipment of fruit reached Paris. All the varieties of apples, which we know as our good apples, came through, without exception, without a bruise, and they were carefully packed. Excelsior was used in packing them, which you know is an elastic material and which I think should be used much more in packing fruit in the future than it has been in the past. When going through the markets in London and examining the condition of our barreled fruits as they were opened from Ontario and Nova Scotia, it was lamentable to see the number of bruised specimens which presented themselves whenever a barrel was opened. The ordinary practice of filling a barrel up and then pressing it down by means of a lever by sheer force, is a practice which must necessarily be associated with the large number of bruised specimens. I had a good opportunity of seeing, in the American exhibit, the results of using excelsior. Ellwanger & Barry sent a selection of pears in half barrels. There was a wad of excelsior at the bottom and one at the top, and out of eight or nine specimens of pears, four or five of each, there was scarcely a bruise on any one of them, with the exception of a few that were over ripe. I believe it would pay shippers to Europe to test that thoroughly, by puting three or four inches of excelsior in the bottom of their barrels and instead of pressing them down with a lever or a hay-press—that hard wood coming in contact with the apples—to have a good thick layer of excelsior between the fruit and the cover, which would be elastic enough, I think, to keep the fruit perfectly tight until it was unpacked. The English buyer would very much rather have one or two layers of apples left out of a barrel and have them all sound than have 25 per cent. added to the weight of the fruit and have it come out in a bruised and unsightly condition. Now the second shipment of fruit reached Paris about the end of October. By that time I had returned to this country and Mr. Allan was in charge. He says, "I enclose list of results of last shipment of fruit, which was evidently satisfactory and we have been able to carry everything before us. I feel particularly proud of the Grand Prix which we have taken for Export Fruit." At this last exhibit at the close of the fair, Mr. Allan arranged the fruit in a different way from what it had arranged before, by packing it in all the different forms of packages which are used in Canada, commercial packages, both of the old fruit and the new fruit and putting it up in baskets of various sizes, some of them fancy baskets and some of them plain, so as to show an excellent commercial exhibit, and for this commercial exhibit, right at the close, we took another Grand Prix, which was very gratifying. He says, "I feel particularly proud of the Grand Prix for Export Fruit, which included the cold storage apples from 1899 and apples packed in all the kinds of boxes we use, also barrels, the whole forming a display that would even astonish any of us, the effect was so fine. I had also baskets of every size neatly packed with kinds to suit the various sizes. I am still after the Jury to try to get other prizes for our Fruit Growers' Associations and large growers. I have made very large sales and am afraid to make more, as I have to deliver from the various British ports, and it will take time and will require my personal attention. I have succeeded also in making some important contracts which is very gratifying to me. I can see such connections can be followed up with great results to Canada, even in the far distant lands. I have made two important sales of apples in Alexandria, Egypt, which I have to pack and despatch from London." He also speaks of other business transactions, which he has made in connection with the fruits of this country, showing that there are large avenues still open for all the fruits we can grow. From what I have been able to see, I firmly believe that with first class packing first of all, and selection, and suitable arrangements made on the other side, there

would be an outlet for ten times as much fruit as Canada is able to produce at present, and that the fruit would then reach some considerable portion of the people, whereas there is scarcely one in ten, of all the people I have met with, who have ever heard of or seen Canadian apples. We send, I suppose, 500,000 barrels of apples to Liverpool, but the seem to disappear. I was dining with a friend, a prominent scientific man of Liverpool, and he said to me, "Can you tell me where I can buy Canadian apples? I have inquired, and I never can find any in the market; I would like to get some, but do not know where to look for them." This is in the very city where we send the bulk of our apples. I suppose they disappear and go into the surrounding district. I didn't have time to inquire into that, but in London I inquired from different dealers what they thought of Ontario apples. "Oh," they said, "we don't often get any Canadian apples, all the apples we get are from Nova Scotia." (Laughter.) All the apples I saw in the market were from Nova Scotia and they did not recognize that as part of Canada. The Nova Scotians have captured that market, and from what I have been able to learn they make much better prices the season through for their apples shipped to London than the Ontario shippers do with their apples shipped to Liverpool. The opening of the Manchester market by the canal seems to have given quite an impetus to Canadian fruit. You would think that Manchester, only 30 miles from Liverpool, would get a large part of our apples, but they never seem to. If one of our shipments go to one of the large cities it never seems to find its way more than a few miles out of that city. I do not think any fruits that go to Liverpool find their way to London, or Bristol, or Glasgow, or any of those large places where fruit is consumed. And it seems to me that the fruit exports of Canada ought to be divided so as not to have them in such vast quantities in the one place, and I believe in that way better prices would be realized, because when there is a very large glut in any one market there are parties always ready to take advantage of that glut and try to run the prices down, so that they become unremunerative to our growers here. There was one thing that struck me in the Covent Garden market, of the lack of what we would call intelligent handling of fruit. I will give you an example. In looking over the stock there for sale I found a number of baskets of Vicar of Wakefield pears. To eat a Vicar of Wakefield pear in the summer time is quite an undertaking. I don't suppose any of you would attempt it—(laughter)—but everything that goes in that market has to be sold the same day. It is sold to a dealer, who sells it the next day to a customer, and the consumer buys it to cook or eat, and he cooks or eats it the next day: he has no chance to store it away waiting for it to ripen, that has never occurred to him, and all the intelligence that is required to get fruit into the market at the proper time must be exercised at this end of the undertaking, no trust being put in the intelligence of people, in that respect, at the other end. I have no doubt that the man, who bought those Vicar of Wakefield pears, would conclude that the pears that came from that country, whether Canada or anywhere else, were not worth eating, because he would have quite a task I am sure to masticate that pear, if he tried. I was also impressed with what I heard about the Keiffer pears, which I mentioned a while ago, and I believe it is injudicious for us to undertake to send to the British market, or any foreign market where we want our trade to enlarge, fruit of inferior quality, even if you can sell it for a time at a fair price. This impresses so many people with the idea that that is the best Canada can produce and we don't want that impression to go abroad, and then in a little while it is attended with bad effect on the general trade of the country. This dealer told me candidly "They are nice looking pears, but they don't seem to command the same attention, or bring any way near the same figure, that they did some time ago" I told him I thought the reason was very obvious—that people were tired of eating that kind of stuff, they were poor in quality and a person buying them once would not care to buy them again. These Vicar of Wakefield pears were sold from 3 shillings to 3s. 6d. a basket, whereas the French Duchess and King apple sold for 8 and 9 shillings at the same time. Fine Gravensteins from Nova Scotia, of which there is hardly a higher flavored apple to be had in the world, were selling from 12 to 16 shillings a barrel At the same time selected Fameuse sent over from Montreal by Mr. Sheppard, for the Army and Navy stores, were being sold at a guinea a bushel, every apple perfect, every apple of the same size, every apple without blemish and packed in bushel boxes. The day before I was in the Covent Garden Market one of the dealers told me, "Yesterday Ribstons sold here, selected apples, just such as Mr. Sheppard puts up

for the English market of his Fameuse, selected Ribstons and selected Cox, Orange Pippins sold at 30 shillings a bushel in the Covent Garden Market." There are plenty of people who are ready to give any reasonable price for nice fruit, but if they open a barrel of apples and find perhaps 15 or 20 good looking specimens and five or six twisted, knotty and a few spots on them they won't give within four or five shillings a barrel for such apples, or 10 shillings a barrel in some cases, as they will where the specimens are all selected. Then another thing that is important in connection with the market in London is to have the fruits all the same size. If you open a barrel of Spys or Kings and find some specimens one third larger than the others, the smaller ones may be called big enough to be called first-class specimens, yet the impression given to the purchaser is that the large ones are the best of the fully developed specimens and all the smaller ones are culls and imperfect. If there are different sizes to be sent, by all means send them separately. The larger ones will always get full price, more than the medium sizes as a rule, but the medium sizes, if they are not mixed with the larger ones, will command two or three shillings a barrel more when they are opened, if they are nicely sized, than they will if you put them in all different sizes. It is only necessary for us to understand these things to have our fruit growers take hold of that, but I hope that some of those who are packing for Europe will try that method of packing with excelsior, which I believe is about 1½ cents a pound. It gives no flavor to the apple; it is made of hard wood generally.

The PRESIDENT: It can be got for $17 a ton in Toronto.

Mr. CASTON: Could there not be a cheaper packing?

The PRESIDENT: There is nothing cheaper than that.

Dr. SAUNDERS: It is elastic and springy and there is a give and take to it, and if we can have our fruit opened up there, nice, even-sized selected specimens, sound and free from blemish, you will be surprised at the prices such fruit will bring, provided they don't get into the hands of a commission man who has got some end to serve and who will attempt simply to sell some other person's fruit that is not so good.

Mr. RICE: Do you place the fruit directly on the excelsior?

Dr. SAUNDERS: Yes, that is the way Ellwanger & Barry packed those pears. The idea of using the excelsior is to relieve the apples from the hard pressure that is given them from the hard cover of the barrel when they are screwed down, to retain them.

Mr. RICE: Would not the excelsior tend to affect the flavor of the apple unless it was wrapped with something to keep it away?

Dr. SAUNDERS: We could not find any evidence in any instance of the fresh fruit that was exhibited at Paris, of any flavor having been given to it where excelsior was used, which was I suppose in two-thirds of the packages that we got over in such perfect condition. That is why all of us who were there were so much impressed, in seeing our own fruit and seeing how the United States fruit came out where this material was used as a packing, with the importance of trying this on a still larger scale so that we might get the full benefit of it

Mr. KcKINNON: How do Canadian pears compare in size, flavor and juiciness with French pears?

Dr. SAUNDERS: The Canadian pears are equal in my opinion, as far as I could judge, to the French pears, but they are not superior. I do not think they are superior in point of flavor. The market was full in France of such pears as Duchess and Buerre de Clairgeau and Louise Bonne de Jersey; these are the three varieties that are mostly grown in France. There were also samples of Buerre de Hardy, which were fine, and some other sorts we had a chance of testing, and while our Canadian fruit was fully equal to anything we saw there, I could not say it was any better.

Mr. CARPENTER: Are the Duchess grown in France of the same quality and flavor as Duchess grown here?

Dr. SAUNDERS: As far as I could judge.

Mr. McKINNON: I had a letter from my son in Paris saying that the French fruit exhibited at the Paris Exhibition was not to be compared with our Grimsby fruit for a moment, in either size or flavor.

Dr. SAUNDERS: Well, I believe in people being loyal to their country, and saying all they can for it, but I cannot go any further than I have gone (laughter), and Mr.

Hamilton is an exceedingly good judge, who was there with me, and Mr. Allan, we all concluded that our fruit had nothing to lose by comparing it with French fruit; but you know the French pears are very high in quality, and you could not persuade a Frenchman that we had anything that was equal to the French pears, but I don't think they were quite as open to conviction as we were, and we had opportunities of seeing some very fine exhibits. What probably gave your son such an idea as that was this, that the French fruit was not in evidence all the time, as our Canadian fruit was. Their fruit was shown with flowers three or four or five days every three weeks, between the periods of judging, and then they were removed and nothing seen of them until the next exhibit. Our fruits were there all the time, and handled every day by the great mass of people that went there, and we had a much greater opportunity of making favorable impressions than the French people had themselves. They had, however, one exhibit, the 26th of September, which was quite a surprise to me. Up to that time I had reached the conclusion that the size and quality of the French fruit had been somewhat exaggerated, but they got together the most magnificent collection of pears I ever saw in my life anywhere. There were about two hundred varieties and they were very large and very choice, and there were quite a number of them that were new to me, and some of them, I should think, should make very fine shipping pears to Europe, and I made arrangements to get scions, or new trees, of most of those sorts while I was there, so as to have some of them tested at our Experimental farms. Some single exhibitors showed as much as 200 varieties of pears, and they didn't go in for any, or very few of the smaller sorts. they were nearly all large sorts. I have a list here, covering three pages of my notes of the varieties that I saw, and later on, when we have had these tested at Agassiz—which is the only place where we can grow these pears successfully—to make them available so that they may be tried in other parts of Canada—I hope to report on these.

Mr. McKinnon: Will your report be published?

Dr. Saunders: The report of the Exhibition will be published. I shall very probably incorporate this in the Exhibition report. Now, to show what can be done with even very soft fruits, the New York Experimental Station sent over to Col. Bracket, who was in charge of the United States fruits, a collection of about 50 varieties of pears, and among these, there were, I think, about 12 or 14 varieties of American plums. Those are among the softest fruits that we have to handle; while the skin is a little thick the plum is so juicy and soft that I had no idea they could be carried that distance and still be shown presentable. Among those fifty varieties, however, there were about two-thirds of them came out in good condition. I will give you the names of some of those that I saw that were practically perfect: Wyant, Hawkeye, Fall Pride, Loomis, Nonsuch, Archbishop, Duke, Moyer—these are mixed-up American and European varieties—Golden Beauty, Copper, Belle de Septembre, Lafayette, Diamond, Yellow Egg, Jefferson, Aitken, Prince of Wales, etc. There were about forty of those varieties on exhibition for nearly a week, before they began to give way, so that I think the evidence we have accumulated in connection with the Paris Exhibition is such as to show that even the softest fruits by taking great care in packing and in handling can be carried a long journey like that and still come out in good condition; and if that be the case, who can say that such apples as the Duchess cannot be sent over, and other fruits that we can grow in great quantity, which are infinitely harder in texture than these fruits that we have been speaking of? Gentlemen, there is no practical difficulty in the way.

Mr. E. D. Smith: Do you know what part of the States these were from?

Dr. Saunders: From the Experimental Station at Geneva, in New York State. I do not know whose apples Mr. Allan was handling, but he told me he had sold 4,000 boxes of Duchess in Liverpool before he came on to Paris at very good figures; and if one man can get over 4,000 and sell them to advantage there is no reason why others should not do the same thing. I believe there is a great market for our summer apples there. I was surprised in going through the large cities in England, during the month of August, to find that they had not anything there practically in the way of fruit except a few oranges. There was the greatest scarcity of fruit, and the early apples, miserable little things not very much bigger than Transcendent Crabs, a home growth, were being cried up in the streets as wonderful samples that everyone was invited to buy, and they were such apples as we would not think of doing anything with except making cider of

them ; and at that season our early apples would I am sure bring good returns to the senders if they were well put up and proper arrangements made for ventilating the ship, or giving them cold storage on the way over.

Mr. McKINNON : What is your idea of the export of peaches ; is it likely to prove a success ?

Dr. SAUNDERS : I do not think peaches are likely to prove sufficiently remunerative taking one lot with another to warrant their being sent over in quantities. I have not really investigated the matter very largely, and I am giving only my personal opinion, but there was a good display made in Liverpool from the last lot that was sent over in cold storage. I think they were sent over under the auspices of the Ontario Government. It is well worth a trial that we should send them over, and they fetch such good prices that even if you get half of them there in a sound state, that might probably pay very well ; but what I would certainly wish to hold up as a branch of trade that might be developed with great profit, is the shipping more generally of the early summer apples such as will carry fairly well, and such apples as we have in great abundance and do not know what to do with I believe they will bring remunerative prices there, and I do not think that our fruit growers or our people anywhere will have any reason to advocate the cessation of further planting of fruit trees for fear that the market will be over-stocked. I do not think there is in England at the present time one person in five who has ever tasted Canadian apples, yet they would be very glad to get them if they only knew how to proceed to do so. There is a great prejudice in England in favor of Canadian goods, and it is one of those conditions of mind which we ought to make the very best use of that we possibly can and get our end of the business worked in with all the energy and force that we can command. (Hear, hear) !

Mr. MURRAY PETTIT : Do I understand you to say that these Cox Orange Pippins that were sold for 30 shillings were grown near Montreal ?

Dr. SAUNDERS : They were grown in England, and these were a select lot which had been shown at some exhibition, I think in London, and they were offered for sale and they promptly sold for 30 shillings a bushel. The Army and Navy stores are selling Fameuse at a guinea, that is 21 shillings a bushel. I fancy more of them would have been taken at the price, if they had been available.

Mr. SHUTTLEWORTH : It is a very limited demand when you get to those high prices; I have been there ; when you get beyond a certain quantity the consumption drops right off.

Dr. SAUNDERS : Have you ever seen any perfect samples of apples offered for sale, well sized, even in color, and in perfect condition, such as those Ribstons, and those Cox's Orange Pippins were, and did you ever see any of those sold at a low price ?

Mr. SHUTTLEWORTH : Yes I have seen them sold in the Cochran case even. There is one thing I would like to mention and take issue with. The knowledge of Canadian apples is much more widespread than one would gather from Dr. Saunders' remarks. I am inclined to think the Doctor's friend is an astronomer.

Dr. SAUNDERS : No, sir, he is a zoologist, (laughter), and there is no part of the world he has not hunted over for animals, but he is not a pomologist.

Mr. SHUTTLEWORTH : A great many Canadian apples have been sold heretofore as American apples, but it is not so now—Canadian fruit is being sold all over.

Dr. SAUNDERS : I said I did not think there was one person out of five that had tasted Canadian apples. Well, there are six millions of people in London alone, and if a million and a half had been consumed that would have been probably all we have sent over. There was another matter I was going to mention, and that was the importance of having our apples branded. In going through Covent Garden Market my friend would say in looking at the Nova Scotia apples : "Now, here is such a man, there is no need of opening his barrel, nobody wants to have the head taken of, we can sell them at a higher price than that of these people who are not so well known." He mentioned several lines where the character of the brand was sufficient guarantee of the quality of the fruit, and when that was once established in the market there was no difficulty in selling any quantity of that brand. Mr. Allan told me his great trouble was in supplying these orders. If he went into the market and took hold of three or four thousand barrels of apples, and they were sent over by ordinary packers, he would have to over-haul them all, and there would

probably not be half of them that would stand the test of examination. I presume there are quite a number here in the Niagara district, gentlemen, who have been established a long time, whose brands are well known, and I have been told that their experience is much the same, that their brands will generally sell their apples at a little higher than the ruling price for fruit at that particular time, showing how important it is that we should try and sell such fruit as we can over there, on which it will be self-evident from the brand that the fruit is of the character it claims to be. There has been too much fraud practised ; I say fraud, I do not think it is characterizing it too strongly—(A voice, "Not a bit.")—in marking a barrel first class when you find in the middle of it perhaps half a barrel of third-rate apples ; and when people have been two or three times misled by buying such apples it is very apt to discredit the fruit to a very large extent. We cannot be too careful about the quality of the fruit, and about the sizing of it and about packing it well, and if we do our duty at this end of the line, I feel certain we will reap our reward.

The PRESIDENT : Is there a possibility or a probability of the production of the Blenheim Orange apple being largely increased in England ?

Dr. SAUNDERS : No, I do not think it. The English people are moving very slowly in the improvement of their orchards. I was through Kent and Devon, and some other counties where fruit is grown largely, and I saw very little good fruit. The nurserymen are all growing good varieties of apples, and in the exhibits they were showing plenty of good apples very well grown, fine specimens ; but you go through the country and I believe that fully one-half the specimens are seedlings ; they are poor in quality and in many districts they are grown for cider ; and what astonished me more than all was in going through France. I went down in Normandy where apples are grown very largely, and there is quite a considerable portion of the land given up to apples there, all grown on trees that begin to branch at about eight feet high, so that the cattle can get around underneath and the horses plow the land, and the cattle pasture on it without any danger of injuring the fruit, but I scarcely saw a good variety of apple in the whole country—they are nearly all cider apples. In discussing with the pomologists there who claim to understand what is desirable for fruit in their country, they claim in the first place there is no cider in the world equal to the Normandy cider, and the Normandy cider, to be first quality must be made from these miserable little crab-like specimens, some of which are sour, some are bitter, some are acid, some awfully astringent. I tried a number of them on the trees, but these intelligent men, arguing with me, said, "This is the natural way to make good cider, we have proven it." I said, "Do you take any definite proportions of any of these apples ?—Here is an apple that is sour, here is another that is intensely sour, another one bitter ; what proportions do you use ?" They said, "Oh, we do not consider that question at all ; we have to have a mixture, and it is when we have the mixture we can make the very best cider that the world can procure." I must say I could not drink the cider. (Laughter and applause).

A. H. PETTIT : I want to express my great pleasure in hearing and gaining so much information from Dr. Saunders' remarks in regard to our fruit in the British market. I have no doubt there is a good deal of ignorance among the masses of the people at least in regard to the quality and the capabilities of our country in the production of fruit. In regard to packing fruit in excelsior, I fear we may get in the position I got in this year in shipping apples to the British market. Last winter I had the pleasure of being present at the annual meeting of the Nova Scotia Fruit Growers' Association, and there the discussion of the apple barrel came up. I was very much taken with the shape and form of the Nova Scotian apple barrel, being a little bit shorter, and not so wide in the bilge, so I came home with the intention of having such barrels made to ship in myself this year. I will show you the difference between our barrel and theirs. (Placing one barrel on top of the other). Now, the teetering and jarring from this part of the country to the British market would be such that every apple in that barrel must be bruised, but the Nova Scotian barrel will lie so that the quarter hoops rest one on the other, and the bilge scarcely touches it. Therefore it will preserve the fruit from bruising. Now, the quantity contained in those barrels is not so important as the condition in which we land them in that market. If we can land them there in prime condition we are all satisfied we will get a reasonable price, if not a good price. I think there is nothing

better than excelsior to use in packing our fruit. I believe we can land peaches in the British market in prime condition—(Hear, hear)—if we will only take the pains in packing and can secure accommodation, and this we as growers cannot secure ourselves. We are not sure of our fall crop every season, far from it. We have our light crops and our full crops. Our steamship companies say, "Providing you take the whole space, then we will give you the temperature you require, if you fill the space." We cannot take the whole space and keep it, but if through the Government's assistance they will secure for us cold storage at proper temperature, we will place any of our summer fruits in the British market in good condition. I do not think there will be any trouble in that respect, but one or two things have to be guarded against. With the Hanrahan system we would get a circulation and pure air. If you get those two conditions, and then get the space, I am satisfied the fruit growers of this country will have no trouble in filling the space, but they cannot do it under the conditions that have existed in the past; one shipment will arrive in good condition, and another will not. It shows faulty atmospheric conditions in the compartment. Last winter I had the pleasure of talking to a gentleman, who though he did not know much about the fruit business, had built in the steamships of this country pretty nearly all the cold storage compartments, and I asked him what he thought about our fruit shipments in cold storage. He said, "You will never succeed in landing fruit in the British market under the present system of compartments upon your steamships; they are not suitable for the fruit business; they are capital institutions and right for anything like butter and cheese and one or two other products, but if you put the fruit in those compartments it will not succeed." Now, I don't believe we will have the least difficulty in landing the most tender varieties if we will only use care in packing and picking from the tree and placing in cold storage under this system with a current of air which throws off the impurities as they arise, the ice giving you a cool and pure atmosphere. Let there be no delays. When the ripening process is commenced you cannot stop it. It is like decay in meat; if the decay commences at the bone you cannot prevent it afterwards. I am very thankful and pleased to hear Dr. Saunders' remarks in regard to wants of the British public in the way of fruits. We are probably as ignorant of their wants as they are of the existing conditions in our country. In regard to the Vicar of Wakefield pear, I have always understood and have frequently been told by men who ought to know, that in England they rent these out to place upon the table as ornaments—they are not supposed to be eaten. (Laughter). I supposed that was the reason our people had been shipping those Keifer pears; they would be good keepers, and they were very nice looking.

Mr. CASTON: The great trouble in the old country shipments is the slacks, and the object of the pressure of the barrel in packing tightly is to avoid slacks. There is something in the shape of the barrel as Mr. Pettit pointed out.

REPORT OF COMMITTEE ON GRADING AND INSPECTION OF FRUIT.

The President called for the report of the Committee on Grading and Inspection of Fruit.

A. H. PETTIT: We do not wish to submit a report that cannot be passed, therefore I think we should carefully consider this matter before we discuss it and ask for any amendments or additions to the present Act. Both sides of the House were opposed to this Bill when it was before the House. I would suggest that you appoint a committee covering the whole Province as near as you can to discuss carefully the ins and outs of this Inspection Act, and, if you can improve or in any way assist the Government to get a measure through that will fill our requirements, I would urge you most strongly to do so.

The PRESIDENT: You will remember that a committee was appointed last year to carry out the wishes of this Association in regard to grading and inspecting. That committee has met during the year and has done some work, and they have prepared a Bill which has been sent before the Minister of Agriculture for the Dominion, and, as you know, presented to the House. Now this Association has never heard that Bill,

unless it has been read privately, and I think it would be well if the chairman of that committee, Mr. Pettit, would present that Bill for the consideration of this meeting, so that we may debate it and hear the opinions of the gentlemen present in regard to it, and at the close of that discussion appoint a committee to embody the particulars that are brought out by that discussion.

Hon. Mr. DRYDEN: Is any one able to say whence the opposition to this Bill came? Your public men are but the exponents of public opinion. They will drift wherever the public opinion is likely to go. The opposition Mr. Pettit speaks of, which was seen in the House of Commons, was originated somewhere. Now I do not think it originated from such men as we have here. Where did the opposition come from? What was the underlying thought in it? My impression is that it came from the dealers. (Hear, hear.) You see they are a different class of people from what you have generally represented here. You had better ascertain that, and then ascertain why, and get at the bottom of the difficulty. If there is any real objection, then you gentlemen ought to know it and ought to try to meet it, because you cannot expect legislators to carry out what they believe is not in accord with public opinion. They will bring politics into it. They see it is not politic to do it.

E. D. SMITH: I read the discussion that took place in the House, and I do not take it that you can strictly say that those gentlemen were, many of them, opposed to the Bill; they were rather criticising it and seeking to get it into shape. Almost every member of the House agreed that something should be done, and that an Inspection Act of some kind or other should be put on the statute book; but as was perfectly right, men on both sides of the House met with criticisms in regard to various features of the Bill. I believe that if the Bill had been pressed it would have been passed in some shape. A year's experience in packing and handling apples, since that time, has brought to the attention of apple packers particularly, many features of the Bill which were not thought of at the time; and I think that discussion in this meeting by the best men in the fruit industry in the country would bring out points that would enable a committee to be appointed which would perhaps suggest some improvements on the Bill as it was brought before the House.

The PRESIDENT: I will ask that the Bill be read, and then we will hear from a gentleman representing the Apple Packers' Association of Ontario.

The SECRETARY read the Bill.

Mr. EBEN JAMES, representing Woodhall & Co., Liverpool: The question has been asked where the opposition came from to that Bill, and I beg to say that one of my clients who exports some 10,000 barrels in a year, wrote very strongly to the Government protesting on the ground that while he might handle any quantity of apples in a year it was impossible for him personally to see to the packing of the fruit, and while his intentions might be of the very best, in many cases packers were not reliable, and where he was responsible for from 1,000 to 10,000 barrels he might ship, he might incur a terrible penalty on himself and it would be very unfair because he could not guard against it.

A. H. PETTIT: Our committee should represent the fruit industry all over the country as widely as possible. If we can, without injuring the Bill, meet the wishes of its opponents, let us do so, and put it in a shape that it will be carried. If we make it arbitrary and contrary to the wishes of the public it will be difficult to enforce it, therefore, let us give it careful consideration before we ask for any changes in the matter. I seriously think a report read at this meeting before we had discussed this matter fully would be the worst step to take in regard to the amendment or the further urging of the passing of that Act.

The PRESIDENT: I will ask Mr. Shuttleworth to speak.

J. M. SHUTTLEWORTH: I may say that I do not represent the Apple Shippers' Association, but if I may preface my remarks by a few words I should like to say that last week at a meeting where between 200 and 300 apple shippers met, this Bill was condemned in its entirety. I did not agree with that condemnation. There are some points in this Bill that I think will be of great advantage to the export industry. The position that I have taken is this: Why make this Bill applicable only to apples and pears for export? Why not make it applicable to everything? (Hear, hear). Why make fish of one and fowl of another? There are just as many fraudulently packed packages in peaches and grapes and plums as there are apples. I have sometimes been ashamed even to own

the Canadian apples that were shown in Liverpool—ashamed almost that I was a Canadian, from fraud in the packing, and that is why I will support with all my influence and energy a Bill which is brought forward to punish fraud in the packing of fruit, (hear, hear); but I want it applicable not only to apples and pears for export, but to everything. There should be no difference. If fraud has been perpetrated upon a purchaser or consumer of fruit in Great Britain, if you are going to punish him, why not punish the perpetrator of fraud upon a consumer here in Canada? (Hear, hear) I think you will all agree on that, and I do not see that there should be any objections to that. The main object I have in regard to the inspection of fruit is this, if this export fruit trade is worth a rap it should be nursed in every way, shape and form. While I am not an extensive grower—although I do grow some apples—I am interested in the export fruit trade possibly as much as any one here. I have been in the export fruit trade for the last 24 years; I have been at both ends of it; I have had my ups and downs with it, and I have seen some of the difficulties, and have been fighting every year since I started for honest packing, and almost fighting single handed in a great many ways. Now we know that in shipping there is nothing we have so much trouble with as in getting despatch. You have had this trouble with perishable fruits, as Dr. Saunders has mentioned. That is almost as important with apples as it is with other fruits. If these apples must be inspected where are we going to inspect them? We cannot send an army of inspectors through the country to do it; it is impossible. We cannot inspect them at the station, because we would have to have an army there. If you are going to inspect them at Montreal it will kill the trade, because we cannot get the fruit away quick enough now. It will delay shipments sometimes a week or two weeks.

Hon. Mr. DRYDEN: Is that the idea of the Bill?

Mr. SHUTTLEWORTH: I think so.

The SECRETARY: A barrel of apples is subject to inspection, that is all.

Mr. SHUTTLEWORTH: A barrel of apples that has been once inspected can never be put back in the same shape that it was before, and that means that the shipper has got to lose it; the Government will pay for it. I would certainly not pay freight on it.

Hon. Mr. DRYDEN: That is not my understanding of what was proposed. I did not understand that anyone proposed that you were going to inspect every barrel that went across for export or anything like it, but I thought that they were declaring a law against fraudulent packing, and that they were appointing certain persons who would have a right to inspect, but who might not inspect probably any of yours for some time, but once and a while, if they had any suspicion, they would have the power. You would know that and try to protect yourself. Now I think that is the way the idea was intended to work out. We have a law on our Ontario Statutes in the same way in reference to these small fruits. Persons packing strawberries or raspberries in little boxes are liable to get into trouble under that law, but there is very little of it done; the very fact that the people know that that is the law and that they are liable to that trouble, makes them take pains to pack their fruit right. I understood that was the thought of this Bill.

The SECRETARY: Yes, that is it.

Mr. SHUTTLEWORTH: That may be, but the point is this: suppose I make a shipment to Montreal, the Inspector goes and he opens up one or two barrels of apples that I am shipping; those one or two barrels I might as well throw away here and not pay freight on them

Mr. DRYDEN: You could sell them.

Mr. SHUTTLEWORTH: What would we sell them for?

Hon. Mr. DRYDEN: I do not think you would lose so very much that way, but I do not think that is the right place to inspect; I think the inspection ought to be done some place nearer home if you are going to have any inspection.

Mr. SHUTTLEWORTH: But the trouble is it will take almost an army of men to do that.

Hon. Mr. DRYDEN: You are quite right, if you are going to have any inspection at all it must be along the other line; somebody must have the power to inspect without compelling them to inspect, because if you compel them to inspect you cannot carry on your business.

Mr. SHUTTLEWORTH: That is what I say; you cannot carry on the business if the inspection is compulsory. My objection is first, that we ought not to make one branch

of the trade a scapegoat; another is that you cannot inspect them at the port of export; and a third is, why compel me to have my fruit inspected? If you are suspicious that bad work is done, then I grant that you have the right. Because every barrel that has been inspected I have to lose upon, there is no compensation. If there was compensation I would say, all right, inspect them, because that very safeguard would be a safeguard to myself. The great trouble has been in the past, any fault in the packing has been largely the result of buying what we call in the trade "lumping orchards." (Hear, hear.) The men who buy those apples are very often sent out to do that work. They will underestimate the crop and then endeavor as far as possible to gain the confidence of their employer by making numbers of barrels so as to make the deal look well. I can confirm that.

Mr. CASTON: That is true.

Mr. SHUTTLEWORTH: If I buy apples, as a rule I buy them at a price for first-class fruit, and I am paying for first-class fruit. Generally speaking the fraudulent packing is not done by the buyer who operates himself, and who under this bill would be punished for the offence of another.

Mr. MCKINNON: Would not the results of this bill be to prevent the buying of whole orchards and to cause buying by the number of barrels of really No. 1 as they happen to be in the orchard?

Mr. SHUTTLEWORTH: It might help it, but I don't think you can compel a man. You must not interfere with trade.

Mr. MCKINNON: If he refused to buy in that way would it not be fair that he should lose by employing incompetent packers?

Mr. SHUTTLEWORTH: He usually does lose, because when these apples are turned out the fraudulent packing is known more by the people who buy the fruit than it would be by the inspectors. When the fruit is shown in London, or Liverpool, or Glasgow, one barrel is turned out in a large basket and it comes up in a hydraulic hoist, and you see whether it is properly packed or not. I think the Government has taken the right step in sending a competent man over there and getting the names of the shipper and the packer of the fraudulent barrels and exposing them here; and, if there is any thought that this fraud is being operated continuously, such a packer's apples should be inspected here. I think that is very fair.

Hon. Mr. DRYDEN: Would not the ideal system of packing these apples be that the man who produces them should pack them? It does not make any difference who does it, if they are required by law to be packed in a certain way, the man who puts the mark on them is responsible. Would not that be an ideal system instead of your sending an army of men around the country, a sort of professionals? For instance, I have a little orchard, ought not I to be the man who should be responsible for the packing of those apples, then let the inspector come along and fine me if I am doing wrong; then you who are the dealer would feel that you were guarded. You say, "This man has picked those apples, he has marked them so and so, he is responsible, and if I find that there is anything wrong I will see that he is punished." How would that work out?

Mr. SHUTTLEWORTH: I do not think there is one grower in fifty who knows how to pack apples.

Hon. Mr. DRYDEN: They would learn.

Mr. SHUTTLEWORTH: They would learn, but during that education who would pay for the losses?

Mr. CARPENTER: Is it necessary that the apples should be inspected as they are inspected in the Old Country, or is it enough to take the head out of the barrel and look into it and pack it up as good as it was before without any injury to the fruit?

Mr. SHUTTLEWORTH: He can't do it.

Mr. CARPENTER: He can do it so as to tell you whether they are good or bad.

Mr. SHUTTLEWORTH: I have seen a barrel of apples packed so scientifically that until you got into them you could not tell where the robbery was. It was there all right, but the bad ones were inside.

Mr. CARPENTER: I venture to say that in 99 cases out of 100 he would be caught if the inspector took one stave out of the barrel.

Mr. SHUTTLEWORTH: I know some packers that I will defy you to catch them.

The SECRETARY : What would be good sizes for the variety named ?

Mr. SHUTTLEWORTH : Take Spy this year, may be three inch apple would be a fair size. In another year or another district, two and a half.

The SECRETARY : Why not mark two and a half inches on the barrel ?

Mr. SHUTTLEWORTH : The trouble in doing that is that it is almost impossible to grade them straight in that way. You could not get over the ground.

Mr. TWEDDLE : Use a grader.

Mr. SHUTTLEWORTH : I do not think it would be possible to use a grader, the time will not allow, I will give you my reasons as stated in my letter to Hon. Mr. Fisher. (Letter of May 15th, 1900, read.) I do not know that I have anything more to say in the matter. I shall be very glad to do what I can. I am as much interested in this fruit trade as anyone possibly can be. I have been at it a long time, I understand thoroughly the great many difficulties we have to contend with now, and I have been ashamed of the fraudulent packing as it has turned out in Liverpool, Glasgow, and London market, and particularly in 1899 the fraudulent packing was very prevalent, and was a disgrace to the country.

A DELEGATE : Is that in the fault of the apples or the slacks ?

Mr. SHUTTLEWORTH : No, sir, it was the fraud of the packing. An Englishman knows when he sees it turned out whether it is a fraudulent packing. He knows where the fraud is, and if he pays for fruit he will have to get the best price he can for it.

Mr. MCNEILL : What is the cause of that fraudulent packing ?

Mr. SHUTTLEWORTH : A great many operators bought orchards and erred in judgment in sizing up the quantities on them, and they wanted to hold their credit with their employer, and they made barrels, it didn't matter what they were made of.

Mr. BOULTER : They ought to have gone to an evaporator.

Mr. SHEPPARD : Yes ; a good many ought not even to have gone to the evaporator.

Mr. MCNEILL : It was not, then, the fault of the grower, but of the employee ?

Mr. SHUTTLEWORTH : Yes, more than anything else. There were no doubt orders given in some cases to make as many barrels as they could out of the orchard.

Mr. BOULTER : That is not so prevalent this year ?

Mr. SHUTTLEWORTH : No, I think the fear of this Bill has had something to do with it ; it has been a deterrent.

Mr. BOULTER : Do you not think the loss of the money to the shippers themselves has had something to do with it ?

Mr. SHUTTLEWORTH : Yes, and the fruit was better than it was last year.

Mr. EBEN JAMES : I think it is rather a hard matter to examine the stuff in Liverpool, for the simple reason that the season is very short and the probabilities are that when you have packed your apples it will be fourteen or fifteen days before they are sold in Liverpool, and if that fraudulent packing is just discovered, unless a man cabled at very great expense it would be another ten days before a letter would return, and in the meantime this man has several thousand more on the way. While the apples would sustain some little damage in being examined at the port of shipment, I think it is the only place they can be examined and I think the benefit to the trade generally would accrue by taking out a barrel now and again, providing the best care was taken to replace the apples and have only experienced packers to replace them. The loss would not be very great, and the benefit would be so much that it would more than overbalance. We cannot wait for one month to have the returns in from Liverpool to know how these men are shipping, and, as stated, it would be impossible to keep agents at every station to examine the goods as they go through. Cheese is bored in the same way. A man might argue that because a cheese is bored it is damaged. Well, it is damaged to a certain extent, but what dealer in cheese objects to the small percentage of the carload being examined that the whole may be classed ? I think the same thing applies to the apples. It would be less expensive and it would be beneficial to the shipper himself, because he is informed himself of the fact that such a car that he shipped has not turned out right, and he is telegraphed to and he can find out what packer it is that is not doing his work right. He may have twenty-five different packers all over the country, and if he has some slight countermark on the barrels he can spot the man at once, and it is for his benefit as well as that of the buyer in England.

Mr. ASHTON, representing the Exporter's Association : I should say that the best way to get over the difficulty would be for the fruit-growers to have their local associa-

tions to pack their own fruits and have an inspector there to look after it, as they do in California. That would get over the fraudulent packing of the fruit.

The SECRETARY: I hope that the apple exporters will fall in line with us by and by. Some of us in Grimsby have been trying this method of sizing our apples, something after the manner that was suggested by Dr. Saunders in his address, putting a uniform size in a package and labelling on the outside the minimum size in that package. Our apples, for example, were labelled on the outside, diameter 2½ inches, then the next size was 2¾, the next 3 inches, etc., so that, when the buyer bought that package, he knew there was nothing in that barrel less than 2½ inches, etc. He knew exactly the sizes he was buying. We found that to be a very fortunate undertaking, a very wise course. Through that means I have secured a customer in England, who has ordered by size, and when he orders apples he says, "I want so many 2½ inch and so many 2¾." and he pays accordingly He is willing to pay for graded fruit accordingly. Not only that, but I got another order from Newcastle in the same way; and I am confident that we could get double the money for our fruit put up in that shape, if we could establish the confidence of the English buyer so that he knew exactly what he was buying, and he would not need to wait to see the apples to know what they were; we would not then have to ship on consignment because the buyers in England would simply order from us so many apples of such a size; and I believe it would solve a great difficulty, and Mr. Shuttleworth would find by and by that it would work out to his advantage as well as to ours. Perhaps he might not ship on quite such a large scale—a single shipper might not be able to handle so many and get them all graded—but he would get more out of them. Allow me to show this package. (Package with printing on outside, "Variety, diameter, shipper's mark.")

Mr. SHUTTLEWORTH: I do not raise any objection to the sizing of the apple, but to the compulsory inspection where the loss would be sustained by the shipper; another thing is that it cannot be very well done on this side or at the port of export. I object also that the export fruit trade alone should be made the scapegoat.

Mr. ELMER LICK (Osbawa): I think that for some time it would be impossible that any Act for the compulsory inspection of all apples could possibly be put through, or carried into effect even if it were adopted. We have not the machinery to do it; we don't know what would be needed. But is it not possible to establish under Government supervision and inspection some grades which shall be carefully inspected? I do not think that the inspection of three or four barrels out of a carload would be a serious injury to those apples, if carefully done; a few more barrels could be provided to put in, or an extra head to tighten them up all right. I think the only place to inspect them is at the shipping port—(Hear, hear.)—because you have no full control of them in any other place. The only place is at Montreal or the other port of shipment, allowing shippers to use a brand and prohibiting anyone else from using it, and if the apples do not come up to the grade on inspection, then remove the brand and substitute something else. Every man must put his name on that packs apples. (Hear, hear.) Some men are packing apples in Oshawa at present, and what are they doing? They are putting up 100 barrels of No. 1 apples in good shape; there would be perhaps 40 or 50 barrels of seconds. Do they put their own name on the seconds? Not a bit of it. Do they put on any definite name or brand on the whole? No; they put a brand on about 15 or 20 of a certain name, and then put another one on 15 or 20 more—trying to create the impression that it is the farmers that are dishonest and send over those small lots, and they are all bunched up in the carload. (Hear, hear.) I do not want to be forced to give away this information, but I happen to have been appointed one of those employees. An apple buyer came into my orchard last year, and he bought apples and offered every cent they were worth, and more, I thought, and we sold them. What did he do? He took 100 barrels of stuff out of that orchard that never ought to have gone into barrels, only to the evaporator, and he sent them to the English market under some such roguish brand as I have indicated. Now, we have got to stop that sort of thing. (Hear, hear.) How are we to do it? Go right straight at it, and ask the Government to give us something that we can all unite on. I do not think it is very hard; I think it can be done easily. I believe Mr Shuttleworth and every man here will agree that we can put the minimum size of our apples on the barrel. In time we can work up to fruit that will be a greater advantage to us than the firsts and seconds. I have been like others—when seconds would bring a good price I have shipped them. I think we would have

made more money if none of us had shipped seconds over to the English market; but if we are going to do it, always put our name on and insist on everyone doing it. I hope before another year comes round the Act will be passed, and will be put on a working basis that will help us to maintain the name in the English market for our apples, which, I am sorry to say, is not as good just now as it ought to be. (Applause.)

Mr. McKINNON: Let me call attention to one statement of Mr. Shuttleworth's—that it would be impossible for large packers having gangs out all over the country to see to the proper, honest packing of all the fruit that they export. It seems to me there is a fallacy in the assumption upon which that statement is based. Is it at all necessary that Mr. Shuttleworth or anybody else should ship 10,000 barrels of apples? Is it not better that he should ship only 1,000 barrels of apples and do it right, and let nine other men ship the other 9,000, than that Mr. Shuttleworth should ship so many apples that he finds it impossible to grade properly? To use a vulgar phrase, some apple packers bite off more than they can chew properly. Let us have more packers that can attend to their business more closely, and hold them strictly responsible, and let them grade their apples so that there will be no doubt about it, and that they will not be afraid of inspection. During Mr. Shuttleworth's remarks on inspection I was reminded of the saying of a very wise man of old, "The wicked flee when no man pursueth." (Laughter.)

Mr. SHUTTLEWORTH: I do not want you to infer that I am standing here and denouncing that Bill altogether. What I want to get at is the man who fraudulently packs apples or any other fruit, because in doing that I am being protected, and that is what I want to be.

Mr. McKINNON: We do not want to protect you; we want to catch you.

Mr. SHUTTLEWORTH: I would infer that you mean that we fraudulently pack, or other men fraudulently pack. I say no, shippers do not; it is not to their interests.

Mr. McKINNON: They allow others to do it that they may build up a big trade.

Mr. SHUTTLEWORTH: That is not so. How many apples would you say this country would have sold this year if it had not been for the operators?

Mr. McKINNON: What we want is small operators who can attend to their business.

Mr. SHUTTLEWORTH: I quite agree that a great many more men would make more money out of a thousand barrels than out of 10,000 barrels under present conditions. To punish the men who fraudulently pack is what we would like to have done, and I think those one or two clauses are all I object to.

Mr. McKINNON: Those one or two clauses are what just fit.

MR. LICK: A man may come into our section and buy 6,000 or 7,000 barrels of apples; do you mean that man, or the man who does the work?

Mr. SHUTTLEWORTH: The man that does the work.

Mr. LICK: In one case we sold our orchard by contract, and the men were to put those apples in, and they said, "We don't want to do it," but the man who bought the orchard said, "Yes, everything has to go in"—and they shoved the dirty and the wormy apples in the barrels.

Mr. SHUTTLEWORTH: He is a fraudulent man.

Mr. LICK: According to your argument the man that put them up would be punished, and not the man that really was to blame.

Mr. SHUTTLEWORTH I think the law would get hold of him as well as the other, so that if he gave instructions for his employees to do that he would be punished.

Mr. LICK: Is it the employees of the fraudulent man or the fraudulent man who gave instructions? From what I have seen in many years I think that it is the buyers.

Mr. L. B. RICE (Port Huron, Mich.): I am an outsider and ought not to say anything, but I think that this whole thing is class legislation. Last night I attended our Merchants' and Manufacturers' Union Association, and we had a long discussion about butter, and after spending the whole evening we concluded it was class legislation and unconstitutional entirely, and that we were on the wrong track. As with butter, so with apples. If an apple man can have special legislation in his favor, next the potato man comes up and he must have special legislation in his favor, and next the butter man and next the cheese man and next the lumber man, and all the men in the country, every man must have special legislation. What kind of lawyers are you going to get that can carry all this thing in their heads, so that they can carry a law suit through? What kind of a judge can you get that can give you any kind of a decision? Now, make a law

that any man who commits a fraud in any way in putting up any sort of a package, or material, is a criminal one, and when you get that man see that he is prosecuted. (Hear, hear.) Let your apples and your potatoes and your butter and everything else go, but make general legislation, so that you will hit the whole thing, and then you can't be accused of class legislation, and you won't have other men coming in and asking for legislation for themselves.

Mr. BOULTER : Any man who puts goods up or offers them for sale should have his name on them. Fifteen years ago we had a statute passed at Ottawa that is very short ; it just means that, if I put a can of goods up and do not put my name on it, I am liable to $2 fine on that can, $24 on a whole case. We investigated a case in Montreal and the fine on that one car of goods was $12,000, but the whole thing was reduced to a nominal fine. Another case was withdrawn from Toronto and the goods sent to Montreal and re-labelled. I think if you insist on the name of the packer being on the barrel of apples you are going a long way in remedying the evil. In our country last year the buyers went wild, and men were ruined up to $30,000, $40,000 and $50,000, and the bank would not advance them a dollar this year to buy apples. Last year they bought orchards, and instructions were given that something must be made out of them, and apples were packed that should have been ground into cider. I saw apples in Liverpool and London that I was ashamed of. A man handling 1,000 barrels would probably handle them more particularly, but if Mr. Shuttleworth gives proper instructions to his men he can properly handle 10,000, but he should put the packer's name on them.

Hon. Mr DRYDEN : Who is the packer?

Mr. BOULTER : If I am in the business and go out to buy apples in this country I should be responsible for what I do. Mr. Shuttleworth should be responsible for the men that he sends out to buy apples. Let him instruct those men, and if he hasn't a man that is good enough, discharge him and give $1 a day more and get a man that will do what he tells him to do. His duty is to send a man around once and a while and see that these men are doing their duty. You can soon remedy this evil if the Government insists on making the man who handles the stuff responsible. I am responsible for the stuff that I put up. Mr. Shuttleworth should be responsible for sending out men that are proper and right, and then Mr. Shuttleworth must put his name on the packages.

Mr. SHUTTLEWORTH : I want to do that.

Mr. BOULTER : Discharge the man that doesn't do the right thing. Mr. Dryden's idea, was something like the inspection of our cheese factory. A man soon gets caught that leaves his milk can out in a rain storm. (Laughter). A man does not like to be caught red-handed in it. You would not have to inspect a whole car. Inspect one or two barrels, and if one or two or three barrels of that car turn out bad, dump the whole car, and you will stop this fraud in a little while.

Mr. RACE : The purpose and spirit of this Bill is all right, but it seems to me that you are aiming at removing the evil in too short a time. Why should not a bill be drafted to operate in this connection the same as bills are in connection with other evils that we have? Take the License Act for example. If this Bill was drawn up with all those provisions, with the penalties attached, then appoint an inspector for a county, or a group of counties, and give that inspector similar powers to a license inspector. It is not supposed that a license inspector is going to drop on to a hotel keeper and make an inspection of every class of liquor he sells or of the trade he does, but that hotel keeper is liable to be dropped upon at any time. Now, if you had three or four inspectors for the Province of Ontario under the provisions of this bill, every man that was packing apples would feel that he was liable to be dropped upon, and after a year or two this thing would correct itself ; but you can't correct it in a year. I have had some experience in drafting legislation, and I think I could draft a bill with the penalties attached and with alert inspectors so that it would impress the fact on every man that was packing apples that he was liable to be dropped upon. An inspector should have power to drop on those barrels of apples in the orchard, or at the point where they were being shipped, or in transit, or at the port of shipment and, if the people knew that they were liable to be dropped upon any time by an inspector, this thing would soon correct itself.

Mr. EBEN JAMES : The apple business only runs from September, and by the end of November everything is in store, and to go and appoint inspectors all over Ontario at remunerative salaries would entail a great deal of unnecessary expense. I think one or

two inspectors at the port of shipment would be all that is necessary, The system of buying up the orchards is acknowledged on all sides to be a bad one. I may safely say the instances given by Mr. Lick are an exception to the rule, and there is no one so interested in having good apples packed as the man that buys apples by the barrel from the farmer.

Mr. CASTON : But they are not buying them that way, that is the trouble.

Mr. JAMES : Yes, but they will buy them that way. This year they have been bought more by the barrel than they have for two years.

HON. Mr. DRYDEN : This year is an exception. This year the price is away down.

A. H. PETTIT : The matter has been pretty well discussed, and I think the growers as a body are in favor of the Bill. Who is opposed? Is it the buyers? I understand Mr. Shuttleworth to say that the National Association of Buyers condemned the Bill in toto.

Mr. SHUTTLEWORTH : No, no ; the meeting the other night condemned it because they did not quite understand the Bill ; they wanted it to cover everything, and there were some clauses in it that they wanted eliminated.

A. H. PETTIT : If the shippers of Ontario are opposed to this Bill, I would suggest that a large committee of this Association representing all parts of the Province ought to invite all shippers to join us and discuss it together—(hear, hear)—and if we can amend it in any way to suit all, let us do it.

The Secretary then moved, seconded by Mr. H. J. Snelgrove, (Cobourg), that this matter be left in the hands for committee to report to-morrow, at the first convenient opportunity after conferring with the apple shippers present. After some discussion and suggestions, the following committee was appointed : A. H. Pettit, G. C. Caston, W. H. Bunting, E. D. Smith, T. H. Race, T. H. P. Carpenter, E. J. Palmer, H. J. Snelgrove, D. J. MacKinnon, Elmer Lick, J. M. Shuttleworth, R. H. Ashton. Carried.

Mayor Cockshutt then extended to the members a cordial and hearty welcome to the city.

PRESIDENT'S ANNUAL ADDRESS.

BY W. M. ORR, FRUITLAND, ONT.

It is a pleasure for me, as presiding officer of this Association, to welcome you all to our annual meeting.

For forty-one years this Association has been holding these conventions in the different cities and towns of the Province, and, as a result of its missionary work, very many horticultural societies have sprung up in its wake, which are fostering and developing the latent fondness for gardening which exists in almost every breast. Our forefather, Adam, was a gardener, and if the human race has inherited a predisposition to sin, just as surely has it inherited a love for gardening. There is a truer pleasure in occupations and amusements which brings one in touch with nature, than in any other occupation or form of amusement. I do not believe there could exist a really good man who did not in a more or less degree admire the natural beauties of garden, orchard and forest. The poets, the interpreters of our passions and indefinable yearnings, are pronounced on this point. Says Whittier :

" This day, two hundred years ago,
The wild grape by the river side
And tasteless ground-nut trailing low
The table of the woods supplied.

" Unknown the apple's red and gold,
The blushing tint of peach and pear ;
The mirror of the Powow told
No tale of orchards, ripe and rare.

" Wild as the fruits he scorned to till,
These vales the native Indian trod :
Nor knew the glad Creator's skill,—
The joy of him who toils with God.

" O painter of the fruits and flowers !
We thank Thee for Thy wise design
Whereby these human hands of ours
In nature's garden work with Thine.

" And thanks that from our daily need
The joy of simple faith is born ;
That he who smites the summer weed ;
May trust Thee for the autumn corn.

" Give fools their gold and knaves their power ;
Let fortune's bubbles rise and fall ;
Who sows a field, or trains a flower,
Or plants a tree, is more than all.

" For he who blesses most is blest ;
And God and man shall own his worth
Who toils to leave as his bequest
An added beauty to the earth,

" And soon or late to all that sow
The time of harvest shall be given :
The flower shall bloom, the fruit shall grow,
If not on earth at last in Heaven."

There is material in these thoughts of the influence of this occupation on its followers for a long address, but I must refrain.

During the season of 1900 we have suffered the usual attacks from insect enemies, but by a persistent and timely use of the spray pump, we are now able to successfully combat most of them. If we are to continue in the fruit growing business, we must make up our minds to fight these insects for ourselves. Our natural allies, the birds, have been so decimated through the wantonness of sportsmen and unthinking boys, that we have now more than our fair share of the fight to wage. We are now reaping our just reward for the destruction of our feathered allies. True, we have an Act for the protection of insectivorous birds, but who enforces it? It appears to be no one's special business and so is neglected. In the meantime the small boy and hungry pot-hunter from the towns roam at will over our fields and orchards and shoot everything they see. Even the little songsters do not escape. By this wholesale slaughter the horticulturist and agriculturists lose heavily. In justice to ourselves we should prohibit shooting over our farms. These people should be warned against trespassing, and heavily fined when caught. A little united effort is required, but it appears this is just what the good-natured farmer will not consent to put forth.

After the excitement caused by the appearance of the San José scale we have had a comparative calm. However, many think it is the calm before the storm. At the *demand* of the fruit growers in badly infested localities the Provincial Government has abandoned its original plan of destroying infested plants, but is enforcing fumigation of nursery stock, and an effort has been made to induce the fruit growers to apply the whale-oil soap treatment for orchards. Large quantities of caustic potash whale-oil soap were imported by the Department of Agriculture and sold to growers at a low price to induce them to experiment with it. You will hear this subject fully discussed during the meeting.

The Provincial Government has granted us legislation in the matter of bandaging trees for the destruction of the codling moth under the Noxious Insect Act. This is a local option act and, although only approved of May 24th, 1900, it has been adopted in our own Township of Saltfleet, and I am very sanguine of its successful operation. This Act is a great boom to fruit growers and should be generally adopted. Men who will continue to breed noxious insects, without a reasonable effort to control them, should and can now be forced to destroy them, or submit to penalty.

The fruit crop of 1900 has been a splendid one in the Niagara Peninsula, and fairly good over the Province generally. Fruit growers have shared in the general prosperity of the country. The demand for our produce has been greater and prices decidedly firmer. The prospects for next year's crop are good. The trees and vines have made and matured an abundance of excellent wood, and the fruit buds are plentiful and in good condition.

During the year just closed, Canadian fruit has won high encomiums and golden opinions at the Paris Exposition, a full account of which has been given you by Dr. Saunders. During the coming year we will have the opportunity of exhibiting our produce at the Glasgow Exhibition, and at the Pan-American Exposition, in reference to which latter exposition Prof. VanDeman was expected to be present and give us an address. This subject will come before us for discussion.

The experimental shipments of fruit to Great Britain, undertaken by the Department of Agriculture for Canada, have been continued and shipments on somewhat similar lines have been conducted by the Ontario Department of Agriculture. This subject will be fully reported upon by Mr. Woolverton. We hope that the Department of Agriculture for Ontario will make such provision for the encouragement of our export trade in tender fruits as shall enable a company of fruit growers in any locality, wishing to make regular shipments of at least one carload each week during the fruit season, to have such conveniences of local storage and refrigerator car transportation to seaboard, and steamship space furnished them, as shall enable them to carry out their wishes.

We have tried to attract the attention of the British public with pictures of snow scenes, ice palaces, etc., until Kipling, the uncrowned laureate of the Empire, gives us the sobriquet of "Our Lady of the Snows." Now we have turned right about face. Let us have no more winter scenes. When Joshua would know of The Promised Land, he commanded the spies to "bring of the fruits of the land." We have, I believe, at last adopted the proper plan to represent our country in its proper light in the motherland,

and at the same time open an almost unlimited market for our surplus production of tender fruits. Our object now as fruit growers should be to produce perfect fruit. It is not quantity but quality that pays. It is the high grade fruit which alone can be relied upon to give us a high standing in either the home or foreign markets, and with such fruit we need never fear a glut. To accomplish this we must cultivate thoroughly, feed liberally, prune closely and thin severely. There is a great lack of knowledge along these lines, notwithstanding all that this and other societies have done. The experimental fruit stations throughout the province are doing valuable work, but their work is necessarily limited. In this way the best results cannot be secured. Fruit growers will never be satisfied until a central experimental fruit farm is established in one of the best fruit districts of Ontario.

The Ontario Fruit Growers' Association, together with the affiliated horticultural societies, is the largest horticultural association in the world. Through its membership and affiliated societies, it aims to be in touch with every fruit grower in Ontario. There are now forty-eight of these affiliated societies, and every year the number is being increased through the agency of Mr. Thos. Beall, our organizing director of affiliated societies. Only during the past month six new societies have been formed in affiliation with us, viz., at Ingersoll, Markham, Waterdown, Cayuga, Perth and Almonte, and the names will be added to our list for 1901.

An important feature of our work, and one that costs us more money each year, is the sending of lecturers to address the societies upon flower or fruit topics. The following lecturers have been sent out during the past year, and by their work the whole forty-eight societies were visited and thus kept in close touch with us, viz., Prof. Macoun and Prof. Fletcher of Ottawa, Wm. Bacon of Orillia, M. Burrell of St. Catharines, and T. H. Race of Mitchell, the first two without cost to us. The engaging of lecturers, the details of making up their engagements with the various societies, arranging the routes of travel and advertising their coming to each society, is a great increase of work for the office of our secretary, while the expense for paying the lecturer for his time and his travelling expenses is now becoming a large item in our yearly expenditure.

If this work of sending our horticultural experts to lecture before our societies is to be continued we must certainly approach the Legislature with a request for an increased grant, a request which we are confident would be viewed most favorably by the Minister of Agriculture.

The Canadian Horticulturist, our official organ, once a small sixteen-page monthly, is now a forty-eight-page magazine, ably edited, splendidly printed and elegantly illustrated. It is distributed monthly to each of our 5,000 members. It is being quite extensively quoted by British and other foreign horticultural journals, and in some cases whole page articles have been reproduced.

The development of the past decade in fruit growing, the largely increased consumption of fruit in our own country and the opening up of foreign markets show us that the possibilities of future development are practically unlimited.

It is our sad duty to record the death of Mr. Charles E Woolverton, father of our secretary, and one of our constituent members, who died at his home in Grimsby on the 16th of September at the advanced age of eighty years. He was always a regular attendant of our meetings in the early days of Arnold, Leslie, Burnett, Mills, Holton and others; and in his later years of quiet home life and constant reading, he was always in close touch with nature and with nature's God.

Only two of the gentlemen who assisted to organize this Association in 1859 still remain, viz, Mr. D. W. Beadle, of Toronto, and Mr. A. M. Smith, of St. Catharines. I would recommend that these two gentlemen, who have been so intimately associated with the whole history of our Association, be made honorary members of our association.

As the new century draws on us we stand upon its threshold full of faith, hope and confidence in our country, in our Association, and in our work as fruit growers.

Mr. E. D SMITH: Mr. President, I am sure we have all been delighted and pleased with your practical address. There is one suggestion on which we should take action, that is in regard to the experiment station in the fruit district. It was brought to my mind by the discussion that occurred to-day in regard to what is being done at the Central Experimental Farm at Ottawa. It was very interesting, indeed, to nurserymen to know what kind of fruits are hardy at Ottawa and the northern section of the Prov-

ince, and it is no doubt equally interesting to apple growers in the northern sections of the Dominion; but for the great bulk of the fruit growers of Ontario, who produce almost all the fruit, tender fruits especially, the experiments conducted at Ottawa are necessarily of little use in regard to the varieties of fruits that are successfully grown there, so that it seems to me that we as an association ought to press strongly upon the Dominion Government the necessity of having a large experimental fruit farm in the fruit district of the Province of Ontario.

The SECRETARY: There is another point in the address which should not be passed over, I think, without being voted upon, and that was the recommendation that this association confer honorary life membership on the two now living constituent members of this association, viz., D. W. Beadle, Toronto, and A. M. Smith, St. Catharines—(Hear, hear)—and I would now move that we elect them to that position.

The motion was carried unanimously amid applause.

A. M. SMITH: I am sure I am very grateful for this action that has just been taken, and when I look back upon the early days of the association, and remember the trials and difficulties that we had in the beginning, and look around again at the present, and see the work that we have accomplished, it gives me still greater satisfaction to think that I have been even a humble instrument in forwarding this great industry, and I am sure as long as I live I shall ever take an interest in the work of the association, and I thank you very cordially for the vote giving me a life membership. (Applause.)

Mr. MORDEN (Welland): I attended those early meetings of the association, not the first one, however, and those names that have been given to-night of the early members are very familiar ones to me.

REPORT ON THE EXPORT OF TENDER FRUITS.

By L. WOOLVERTON, GRIMSBY, ONT.

This object has been before the Ontario Fruit Growers' Association for some years past, and the writer, being secretary of this association and of the fruit experiment stations of Ontario, has been asked to act in this particular for the extension of our fruit markets. On referring the matter to the Minister of Agriculture for Ontario, he expressed his willingness to aid us in every way possible. The export of peaches, pears and grapes being more vital to Ontario than to any other Province, it was natural that our Province should now exert herself in her own interests, and carry to a successful issue the work so well begun in an experimental way by the Dominion.

Last year the writer was commissioned by the Hon. John Dryden to forward a few hundred cases of Ontario grown grapes to Manchester, to test the English market for our best varieties. The varieties selected were the Red Rogers. They were packed in five pound veneer baskets, four in a case. As reported in our Fruit Experiment Station report, they were received in Manchester with great suspicion, and at first no one would purchase them at any price, but by and by the costers bought them gingerly and began selling them on the streets. Then they came and paid double the price for the remainder of the stock, and our consignees, Messrs. B. W. Potter & Co., said that, if we could have continued the shipments regularly with each succeeding steamer, they could soon work up a trade for Canadian grapes at a probable paying price.

This season Mr. Dryden extended the experiment to include other fruits, and fitted up the "Trader" of the Manchester Line with a cold storage compartment especially adapted for carrying fruits; he also fitted up a refrigerator car, after Hanrahan's patent, for the especial purpose of carrying fruit in perfect condition from the point of shipment to the steamer.

The first Trader shipment made was chiefly Red Astracan and Duchess apples, and was forwarded on the 25th of August. The following fruit growers united in making up the shipment, at their own risk, viz.: L. Woolverton, A. H. Pettit, E. J. Woolverton, W. H. Nelles, C. W. Van Duzer and S. M. Culp. In order to secure the cold storage space of 1600 cubic feet, it was necessary for us to combine and agree to fill it every time the Trader sailed. The apples were graded to uniform sizes and packed in half

bushel cases. They arrived in Manchester in fine condition which proves how complete a success Hanrahan's system of refrigeration is, for the Astracan ripens in ordinary conditions a few days after it is picked. Owing to the great crop of early apples in Great Britain, these perishable apples sold at 60 cents a case.

There were also some bushel cases of apples which sold for $1.40 each, and some Wilson cases with fillers which sold for 96 cents each. One Wilson case containing one hundred Hales peaches sold for $1.46.

The following is a summary of account sales of fruit export shipments, 1900.

First Shipment, "Trader," August 25.

1 case peaches	6s.	$ 1 46
67 half-bushel cases of pears	4s.	65 26
413 " " apples	2s. 6d.	251 41
10 bushel cases apples	6s.	14 61
109 Wilson cases apples	4s.	106 17
		$438 91
Expenses		290 01
Net proceeds		$148 90

Second Shipment, "Commerce," September 15.

1 case tomatoes	$ 0 61
496 cases Bartlett pears, averaging 74c—$1.95	464 13
56 cases apples, averaging 97c—$1.25	62 82
5 cases peaches	13 39
A. H. P. :	
65 cases pears	59 13
25 cases apples	14 32
11 cases peaches	22 40
E. J. W. :	
118 cases pears	122 74
B. B. :	
110 cases pears	93 50
	$853 04
Charges	365 39
Net proceeds	$487 65

This shipment was in the nick of time for Bartlett pears, and gave most satisfactory returns. The "Commerce" was fitted up with an adaptation of Hanrahan's system, and the temperature kept within certain specified limits of temperature.

These were all sent at the risk of the growers.

Third Shipment, "Trader," October 5.

757 cases pears	$718 69
44 cases apples	68 20
133 cases and crates grapes	104 77
32 cases peaches	24 00
	$915 66
Charges	461 24
Net proceeds	$454 42

The pears and apples in this shipment were sent forward at the expense of the growers, but since there was almost a certainty that grapes would not bring any profit, the growers could not reasonably be asked to risk them. The Department therefore purchased 133 cases and crates of grapes and assumed the risk of loss.

Fourth Shipment, "Trader," November 20.

		£	s.	d.
4	Cochrane cases apples	1	10	
17	Wilson cases apples	3	8	
366	Bushel cases apples	101	2	2
296	half bushel cases Keiffer pears	23	9	6
74	" " Quinces	4	19	
64	" " Grapes	13	14	
164	" " Grapes	5	4	6
		153	7	2
	Charges	107		3
	Net proceeds	46	6	11

This last sailing of the Trader was too late in the season, and the risk was too great to ask shippers to assume upon grapes and pears. Therefore, the Department undertook these fruits, and sent forward 266 cases of Keiffer pears and 228 cases of grapes, upon which latter loss is almost certain until the fruit becomes better known in the British markets. Unfortunately the temperature at Montreal was very low about the 18th of October, at the time of loading and, in the transfer from car to steamer, the grapes and peaches were much damaged by frost. On this account their sale was for a much lower price than it would be otherwise, and the Department had therefore, to lose not only the cost of the fruit and cases, but also a portion of the freight.

The following letter is from Mr. P. Byrne, Government Agent at Liverpool, on this shipment :

"I duly received your letter of the 8th ult. with reference to the fruit shipments. It is certainly very disappointing that the grapes have sold so poorly, but I believe they will eventually do reasonably well, if they can be delivered in good order.

The public here are slow to take up with anything new, but a good step has been taken in impressing them favorably with our grapes. I have had three exhibits of them in Liverpool and a great many people have tasted them and pronounced them excellent. But the important thing is to have them delivered in good condition, and to this end quicker transit seems essential, if not indispensable.

The last shipment by the "Trader," which left Quebec on the 19th November, was discharged on the dock at Manchester on the afternoon of the 5th inst. I inspected it immediately on being landed and found the apples, pears and quinces all sound. But the grapes, though fairly dry and sound generally, were in several instances wet and decayed. Since then I learn that they rapidly deteriorated after being landed and I fear a heavy loss on them is inevitable. The cold storage arrangements seem to have been all right, but the fruit must have been too long picked at the time of shipment."

If we could have the "Trader" with its excellent system of refrigeration sail on the 15th of August, 15th of September and the 15th of October, it could be filled with fruits just in their prime, first with Astracan and Duchess apples, second with Bartlett pears and peaches, and third with fancy Duchess and Anjou pears and Rogers grapes, and that without risk of any loss.

The total proceeds of the first shipment was $438.91, a satisfactory amount were it not or the unusually heavy charges which are advanced this season about double the usual amount owing to the South African war. The following is a detailed list of charges :— Freight paid Manchester liners, $227.51 ; Manchester ship canal tolls and wharfage, $13.96 ; cartage and porterage at docks and re-delivering, $5 74 ; sampling and taring and clearing, $2.48 ; marine insurance, $2.52 ; market porterage, $11.86 ; brokerage at 5 per cent., $21.94 ; cable, $3.90, amounting in all to $290.01. This left only $148.90 net, or a little less than we could have got for the same goods at home. However, we had the satisfaction of having our fruit reach the market in the very best condition, and of establishing a reputation for our fruit that will be worth millions to our fruit growers in the immediate future.

The following extracts from letters from the consignees, Messrs. B. W. Potter & Co., Manchester, regarding this shipment will be of general interest :

Manchester, 12th Sept., 1900.

Sir,—The shipment ex Trader landed in capital condition and, if it had not been an extraordinary year, you would have had a very good return ; as it is we have been getting good prices compared to English fruit which has been almost given away. We have not completed ales yet, but hope to wire you directly with the next result. Now we have pleasure to report

on packing. Apples will do very well indeed with wax paper *only*, no moss or shavings, and packed only in bushel cases—half bushel cases will not pay you so well. Pears in paper shavings and packed in halves are best. They took much better than the apples, and we could have disposed of more. The case of peaches arrived in splendid condition, but would not keep, and was sold at once, realizing $1.46. Buyers do not like packages which they have to return. Some of the cases were packed too tightly and the fruit accordingly bruised. This is a mistake which, we think, might be avoided.

The marking on the cases leaves room for improvement. Everything is done in such a hurry in our market that it is a distinct disadvantage having to examine a case carefully to find out the variety of grade and contents. We would suggest that you use the plain end of the case for mark, variety and grade, simply putting in bold type say

L. W. KING
87 A No. 1

leaving off all other lettering. You might use different colored ink for pears and apples.

Manchester, 17th Sept., 1900.

Sir,—We cabled you to-day as follows : "Thirty-six Net. pears 97c, Bushels $1.46, halves 61c, Wilsons 97c, average gross proceeds," which we meant you to understand as thirty-six pounds net balance (the pears bringing 97c, bushel boxes apples $1.46, half bushel apples 61c, and Wilson patent cases 97c (with box $1.22) average price. It is a very disappointing return we must admit, but considering the state of the market the price is a good one. We send you the "Shipping Gazette" of the 15th inst., and draw your attention to page 10, from which you will see American apples have been fetching from $1.22 to $2.44 per barrel.

The writer was present whilst the steamer "Trader" unloaded, and entered the cold chamber, finding it *perfectly dry*, and he considers that the fruit *could not have been carried better, the new arrangement of the brine pipes being a splendid improvement.*

In nine years out of ten the return for the fruit would have been splendid, and it is most unfortunate that you should have fallen across the tenth year.

Your own fruit, on the whole, carried best, and we think you must have picked it in better condition, especially the pears."

The second shipment was made by the steamer "Commerce," leaving Montreal September 15th, just in the nick of time for Bartlett pears, but too early for Elberta peaches. The fruit was kept in cold storage while the carload was being made up, and carried by the Hanrahan automatic refrigerator car to Montreal, and thence transferred to the cold storage chamber of the "Commerce," which was fitted up with the ordinary cold storage chamber, under the direction of Prof. J. W. Robertson, Dairy Commissioner. There were in all 882 packages, and the total net returns were $487.67.

Mr. Peter Byrne, Ontario Government Agent at Liverpool, writes concerning this shipment, October 5th, 1900.

Sir,—The Hon. John Dryden having informed me that you would like to hear from me regarding the condition of your shipment of fruit on the S.S. "Commerce", I am glad to inform you that I found it very good indeed. The fruit was very cold and some of it very "sweaty" when opened, but otherwise it was all right, every case inspected being sound."

The Elberta peaches were rather green and immature looking, and consequently less attractive than the "Crawfords" sent by Messrs. Pettit & Son. Some of these had probably been a little too ripe when picked, as a good many of them were in various stages of decay when opened. Whether the wool used in packing had anything to do with it I could not say. But the majority of Crawfords were in perfect condition and have been much admired for their beautiful and attractive color.

Your case of tomatoes turned out sound but very tender in the skin, and soft. It is well you did not send any considerable quantity, as the market is glutted with "foreigners."

The pears sent by E. J. W. all turned out well. Those shipped by D. J. McK. were to a considerable extent damaged having perhaps been packed over ripe. Messrs. Pettit & Son's lot (two grades) were in about the same condition, a good many in some of the cases being bad, and others being all right. Part were packed with wool and paper and part with paper and shavings. I am inclined to think the wool packing is of doubtful benefit.

I find that some experienced fruit dealers here have no fault to find with the present modes of packing and would suggest no alteration whatever.

Mr. Potter secured the temporary use of a fine show window in Manchester for a display of the fruit ; and I have done the same here. I brought from Manchester a Wilson case with carefully selected of pears, apples and peaches, but, finding these were too few to be effective, I got four half cases from Mr. Shuttleworth in Liverpool, who is the consignee of the other shipment ex "Commerce," and with their aid I got a good and effective exhibit for the show window of the C. P. R. offices. It is attracting an immense deal of attention. I invited all the

Press of the city to come and inspect and taste the peaches which, being a great novelty here, form the most attractive part of the display. The great mass of people here actually think that they are grown under glass and are astonished, if not incredulous, when they learn that they grow in the open like pears, apples, etc.

One of the wholesale salesmen in Manchester entrusted with the disposal of your fruit, told me that he had sold 20 cases of pears in an hour and every one of them was opened and found in prime condition. The price was $1.22 per half bushel case.

This is a very abundant fruit year in this country and glutted markets have kept the prices low. I will send you papers containing press notices of our exhibit. If you are sending any grapes with the next shipment, I intend to make a public display of them also and will urge Potter to do the same in Manchester.

The following letter from Messrs. B. W. Potter & Co., the consignees, is also of interest. It is dated Manchester, October, 1900.

SIR,—The major portion of your "Commerce" shipment has been sold, the Bartlett pears fetching from 97c. to $1.22 a case, with some wasty one 49c., and a few absolutely worthless. These latter we think must have been against the brine pipes and the temperature has been too cold.

Tomatoes will not pay for sending ; they are too cheap here. Your box fetched 61c. The sixteen cases of peaches have sold for $1.46 to $3.17 a case, but a very large proportion of the fruit was bad. Details of all marks to follow. The bushel cases of pears are too large and don't sell well.

Peat moss will not do for packing. It does not keep the fruit well and certainly looks badly when cases are opened. Keep to the fine shavings and paper. We enclose sample of paper the Californian pears are wrapped in and they carry splendidly. The wax paper also does well and is good looking.

The peaches seem best packed without wadding. The Elbertas are soundest, but the Crawfords take much better ; they are so showy. Some fruit has been picked too green to ripen.

The apples of course came splendidly. Please send in future full details of marks, grade, variety and size of package. We had great difficulty in sorting out on quay. A good consignment arriving a couple of weeks before Xmas would do splendidly we feel sure.

Under date of October 10th, Messrs. Potter & Co. write.

SIR,—" We cabled you to-day, 'Net 105.' This is the approximate net proceeds of the 882 packages landed. The charges have not all come in yet, but we do not think the actual result will vary much from this figure.

We are sorry the result does not equal the 97c. You wanted to make the shipment pay, but you have certainly made more by this fruit than any other people in the market. More than this, you have given the fruit a good standing and the public like it and will ask for it again, so that the result cannot be measured merely by the cash return."

The following is from the *Journal of Commerce*, Liverpool, dated October 8, 1900 :

"The enterprise of our Canadian cousins has for many years been a factor of considerable importance in regard to the trade of this country, for Canada has year by year been sending supplies of various kinds in ever-increasing quantities. For some years past attempts have been made by Canadian fruit growers to find a market for their surplus produce on this side of the Atlantic, their efforts meeting with varying success, but at last there is reasons to think the time has come when Canadian grown fruit will compete on exceedingly favorable terms with the home grown article, and this not only in the hardier class, but also in fruits of the most delicate description. When the earlier shipments of fruit were made a few years ago the result was almost sufficient to give the project a death-blow, for the conditions under which the produce was carried were not at all such as to improve the fruit during its passage across the Atlantic. The butter man of Montreal required a temperature of twenty-two degrees for his produce, the beef exporter wanted twenty-eight degrees, the fruit could not do with anything under thirty-six degrees nor much above forty degrees. Consequently, when all these classes of goods were placed in the same cold chamber on board the steamer, some portion of the consignments had to suffer, and the fruit fared the worst of the lot, for when it was opened on this side and exposed to the warm air of this country, the tissues of the fruit burst and it wasted away within twenty-four hours. the experiment thus ending in failure. The matter was reported to the Canadian authorities, and after some further experiments, through the efforts of the Hon. Sydney Fisher, the Dominion Minister of Agriculture, shipments were made in steamers which provided the temperature requisite for the proper carrying of fruit, the produce being carried in a special chamber cooled by the Linde system. The improvements have. of course, been gradual, and success came very slowly, but it is thought now that the general principles under which fruit can be carried to the best advantage are pretty well known, and that only in minor details can the system be improved. One of the important points connected with the carriage of this class of produce is the necessity for keeping it at a temperature which, while sufficiently low, is not

allowed to vary to any extent. Considerable difficulty has been experienced on this point, for the best-meaning engineer may temporarily neglect this portion of his charge, and the mischief is done, in most cases beyond repair. A thermograph or self-registering thermometer, is now provided for each chamber fitted for the carriage of fruit, and this provided a record of the actual changes of temperature during the voyage: thus it can be seen at a glance whether the fruit has been carried under proper conditions or not.

A recent shipment of fruit by the Manchester Commerce arrived in this country in the pink of condition, and samples have for the past week been exhibited at the office of Canadian Pacific Railway, James st. There passers-by were astonished to read that all the fruit exhibited, which included some of the finest peaches imaginable, was grown in the open air. One fancies the Canadian climate to be more or less like a severe Christmas in this country, but during the summer season the land is a veritable garden, where flowers and fruit which it is only possible to produce in hothouses in this country are to be found in every garden. The fruit sent by the Manchester Commerce is grown at Grimsby, Niagara District, Ontario, a place famous for its orchards and vineyards; and here every description of fruit, including the finest Williams and other varieties of pears, and many kinds of peaches, are grown in the open air. Those on view at the offices of the C. P. R. in James street were a continual source of attraction to passers-by, and some were so carried away by the exceptional appearance of the fruit as to be induced to enter and attempt to purchase what were only exhibited as samples. In Canada the fruit is carefully picked, the peaches when almost ripe the pears and apples somewhat earlier, and as carefully packed, being forwarded by rail to the port of shipment in refrigerator cars. These cars are specially fitted for the purpose, and, being properly attended to, the fruit is carried through to the steamer in excellent condition. Of late, owing to the splendid arrangements made on most of the newer boats crossing the Atlantic, the carriage to the this country has been perfect satisfactory, and the result is that the Canadian growers have been able to put their fruit in the English market in perfect condition. It has been well in demand wherever offered, and has been sold at prices which equal, when they do not exceed those paid for the more hardy, but less juicy and delicious, fruit from California. Orders have already been received for large quantities of Canadian fruit, which is only being shipped. This includes some consignments of Canadain grapes, which will be put on the market in the course of next two or three weeks."

Shipment No. 3 was by the steamer "Trader" again, sailing October, 5th, but this was too late a date for peaches or Bartlett pears, both of which were in season for the previous shipment of September 15th. Added to this the ice at the Grimsby storage gave out, and the weather came exceedingly warm while we were packing. Under these unfavorable conditions we thought best to send forward only about sixty cases of peaches, which arrived in Manchester quite over ripe, and the same was the case with the few Bartlett pears, but the principal part of the shipment consisted of fall apples, such as Ribston, Fall Pippin, Blenheim and King, which sold at from $1.50 to $1.75 per bushel box; and of such pears as Duchess, Louise, and Sheldon which also arrived in fine condition and sold well.

There were also some red and black Rogers grapes, about two tons, sent forward in the storage chamber. These arrived in fine condition, but, as usual, failed to bring paying prices.

Mr. P. Byrne, Ontario Government Agent, writes to the Department of Agriculture at Toronto, on the 24th of October, as follows:

"The grapes, speaking generally, were in very good condition. An occasional sample was slightly wet or mouldy, but on the whole, they looked attractive and sound.

The pears were generally good also; I assisted in preparing and arranging an exhibit of the fruit at Manchester and brought with me selected samples for a display in Liverpool similar to the one which was so successful in connection with the shipment brought by the Manchester Commerce. The samples I am showing consist of a tray of 25 very fine Elberta peaches, also two cases of red and black Rogers grapes, two cases of pears and one case of apples. They make a very handsome and affective disp'ay and consitute a most valuable object lesson as to what our Province is capable of producing. I sent notices to the press annoucing the exhibit, and the consequence is continuous crowds as before inspecting and admiring the fruit."

Messrs. B. W. Potter & Co., the consignees, write on the 27th of October, as follows concerning this third shipment:

"We have now the pleasure to report upon shipment per Manchester Trader of grapes, pears, apples and peaches,. The latter were nearly all spoiled, and we should say that they were packed to ripe. Besides this we see the Wilson cases are not ventilated at all. Kindly examine them and you will see that this is correct. It must have a serious affect upon the fruit.

The Duchess pears have carried splendidly and taken much the best with buyers, prices varying from 75c to $1.40 per case. The Louise turned out very wasty, but the White Doyenne

and Anjou were mostly sound. The Bartletts were almost wholly rotten and we should judge had been picked at the wrong time, or stood before being placed in store. The prices will give you a good idea of the public taste.

All the apples were in excellent condition, the Ribstons fetching the best price, $1.71 ; with Blenheims and Kings, $1.58, and Fall Pippins, $1.46. We could have disposed of any quantity of these fruits.

The grapes arrived in very much better condition than last year, there being hardly a bad case. We think the boxes with four baskets of five pounds each is the better package, and, as we have said before, the black Rogers will always sell the best. With a little perseverance these grapes should be a success, but we want a steady supply for the few weeks the season lasts."

Whether our grapes will ever become popular enough in England to make it profitable to export them, seems a question. At first the dealers would not buy them at all, and our consignees had to persuade the costers to take them out on the streets for sale, but by and bye they commanded a small price, which is slowly creeping upwards. But, even yet, the price is not equal to the value of these grapes in Ottawa or Montreal. A report of the sale of 3,360 four pound baskets of red and black Rogers carried over in a ventilated compartment, and sold in Manchester the 23rd of October, shows that they sold at about five and six cents for a four-pound package, the beautiful little baskets with covers and wire handles, costing without the fruit about three cents each ; the price, therefore, leaves only about one cent per pound for our very best Rogers grapes, which are worth from two to three cents a pound in our own vineyards

We would think from this shipment on the "Commerce" that we would never be able to export our grapes with profit. A shipment, however, of thirty-nine 50 lb. crates, each containing twelve little 4 lb. baskets of Rogers, either red or black, and ninety-four 20 lb. cases, each containing four 5 lb. baskets, as shown in our illustration, and forwarded October 5th in Mr. Dryden's compartment on the "Trader," to Messrs. B W. Potter & Co., Manchester, brought much more encouraging results, and our consignees write that, if we could continue regular shipments weekly, and not too many at one time, they think they could gradually work up the price to a paying basis.

The following is our account sales of grapes in the third shipment. The varieties were mostly Lindley and Wilder, and were grown by N. Keep, Winona, J. A. Pettit and L. Woolverton, Grimsby.

7 cases at 1/10	$ 3 12		
54 " 2/	26 30		
11 " 2/3	6 02		
9 " 3/3	7 12		
13 " 3/3	10 29		
24 crates 5/	29 22		
13 " 5/6	17 41		
2 " 10/	4 87		
		$104 35	

CHARGES

Freight	72 10	
Manchester Canal tolls and quay charges	3 33	
Carriage, porterage, warehousing, sampling and taring, clearing and forwarding, warehouse rent, fire insurance	10 00	
Brokerage at 5 per cent	5 21	
		90 64
		$13 71

The following is a general summary of gross sales and charges for the whole cargo, the latter of which are altogether too high and must be reduced in future, if the trade is to prosper :—

757 cases pears	$718 69	
41 " apples	68 30	
133 " and crates grapes	104 36	
52 " peaches	24 77	
		$916 12

CHARGES.

Freight	351 73	
Manchester Canal tolls, quay charges	35 50	
Cartage and porterage at docks and warehousing	12 97	
Clearing and forwarding, sampling and taring	3 81	
Warehouse rent	5 66	
Fire insurance, Marine	7 51	
Porterage at market	11 51	
Printing	6 02	
Brokerage at 5 per cent	45 80	
Cable	73	
		461 24
		$454 88

The graded apples sold remarkably well, Ribston Pippins bringing $1.75, King and Blenheims $1.58, and Fall Pippins $1.46.

The pears also did splendidly, except Bartletts, which were a little out of season for the shipment. Duchess sold at from 97c to $1.40, Bartlett at from 36c to $1 22, Louise Bonne at from 24c to 91c, White Doyenne at from 85c to 97c, Anjou at from 73c to $1.15, Howell at 85c, Sheldon at from 61c to 85c, Beurre Clairgeau at from 73c to 85c, Lawrence at 97c, Peerless at from 85c to $1.09.

The peaches were also past season on October 5th, and had to be kept in ice storage a couple of weeks before sailing, consequently they did not carry as well as those sent in the previous shipment. The varieties were Late Crawford, Smock, Willett, Elberta, and they did not pay freight charges. We have confidence, however, in peaches that, if picked firm and sent forward immediately, we can land them in perfect condition, and realize long prices; and the same is true with regard to our tender Bartlett pears.

CONCLUSIONS. On the whole we conclude from this season's experience that, with certain limits of temperature guaranteed to us on shipboard as has been arranged for us this season by the Hon. Sidney Fisher, and with Hanrahan's system of circulation of air we may export pears, summer apples, and even peaches in perfect condition and with perfect confidence. We have already established a fine reputation for our goods in Manchester and, if this trade can be pushed forward, there is no question that a new day of better things will dawn for Canadian fruit growers.

Our pears are especially admired and appreciated in England and we may send forward as many as we like if only properly graded and packed. In evidence of this we quote the following from the "Fruit Grower," of London, England, under date October 4th :—

"The samples of pears were unusually large and fine. The Williams were grand and it is clear that no competitor on the market from any outside centre can touch them, for as far as quality, size, flavor and color are concerned they are as perfect as a market Williams can be. The other varieties are also of prime quality. It is thus evident that at least the whole export business has been put upon a proper basis and that Canadian growers and shippers may rest satisfied with the situation as far as methods of transit are concerned."

And again under date of October 11th :—

"It is worth noting that best pears have met a fairly good sale through the week and that the supplies have, thanks to the Canadian shippers, been well up to the mark. The Canadian Williams (Bartlett) has attracted a good deal of attention in fruit trade circles. Some large specimens have been put on sale and as the skins of the fruit were clean and delicate they met a good reception from buyers in the best fruit shops. We learn that a large quantity of pears are to come across and that in future years the competition in this branch of trade will be very keen. As a matter of fact the pear trade from October till February is excellent and good samples put upon our markets during the former months can always be depended upon to secure good prices. The one difficulty so far as Canada is concerned has been overcome. Now they are in a position to put their fruit on our markets in perfect condition and this is a consideration. So long as the fruit sent is large, of good quality and well graded it will pay. It has taken the colony time to master the initial difficulties that beset its path at the start and it is hoped now that it will be able to develop a profitable business with this country.

The following extract is from the "Liverpool Mercury," in October :—

"Since mechanical refrigeration was inaugurated on steamers running from Canada to British ports in 1897, many improvements have been made in the grading and packing of fruit until to-day Canadian grown peaches, pears and apples can be landed in this country and placed on the market in as perfect condition as if picked a day or two ago instead of a month. This has been illustrated by a consignment recently received in Manchester. The Hon. John Dryden, Minister of Agriculture for the province of Ontario, is co-operating with the growers in the matter and the Canadian Government are now providing for each chamber fitted for the carriage of fruit, a thermograph, or self-registering thermometer, which shows whether the fruit has been carried under proper conditions or not."

Messrs. W. B. Potter & Co., writing on the 3rd of November regarding the third shipment, say :—

"The grapes have not realized much but the apples and pears should satisfy you, we think. It is unfortunate we had nothing from you by the 'Manchester City' in this week, as prices have been still better and all our friends were anxious for further supplies The quantity of French pears on the market was much smaller during the week and this helped prices. You will find it to the advantage of all concerned to send regular shipments and not one occasionally.

The Duchess pears have been quite the most successful of any variety. They have carried exceedingly well and stood up afterwards. This is a great advantage and gives buyers confidence to take a quantity. We do not know whether the Bartletts could be picked at the right moment to keep better, but it certainly is their weak point. You will notice the number spoiled this time.

Would it be possible to send a consignment of fruit in cases to land here about ten days before Xmas? We are confident good prices would be realized. The cases would be handy for presents."

Now since the Province of Ontario is more deeply interested than other provinces, in the development of this fruit export trade, we think our Association should urge upon our Provincial Government the great importance of vigorously prosecuting this enterprise until we see public confidence in it established; until the days of glutted home markets for fruit are passed away forever, at least for fruits of the higher grades, and until the prices of these goods at home are established by their advanced export value, instead of their being sacrificed as now on overloaded home markets Why should our pears, that are worth from 75c. a basket for export, and our peaches that are worth from $1.00 to $1.50 for that purpose, be sold here at from 15 to 30 cents? Why, with such possibilities just within our reach should the thing be dropped, and our growers left to struggle along in an industry that, though once profitable, is now becoming unprofitable?

The Dominion Government has kindly opened the door for us, and the Provincial Government has begun to take an interest in us, let us now strongly petition our own province to help us still further to pursue this enterprise, and not to drop it until it is as firmly established as any of our industries.

I think the wisdom of the committee is needed to consider details, but, in general, I would move that we extend a vote of thanks first to the Minister of Agriculture for the Dominion for his work in providing cold storage on shipboard with guaranteed limits of temperature, and for carrying out our wishes regarding better storage of apples on shipboard; and to the Minister of Agriculture for Ontario for taking so much interest in the fruit industry of our province as to fit up the steamer "Trader" with Hanrahan's patent cold storage, and fitting up one car to connect with the same, and for the experimental shipments sent forward during 1900; at the same time expressing the hope that he will continue to interest himself in this work until it has been established on a trade basis.

I would urge that this trade be developed in all fruit centres by some scheme which would provide for the building of local storage houses at any fruit growing centre where there is a company of fruit growers who would agree to make up a car load each week for export, and meet the required conditions of the cold storage building; that a car be fitted up with Hanrahan's patent to run weekly between each cold storage and the shipboard, and that cold storage space on shipboard be always reserved to meet the requirements of such shippers.

Mr. Rice: Did you wrap the apples up in the Wilson case?

The Secretary: We did, but probably the cold air would work better if they were not wrapped, so long as the little compartments were properly filled.

A Delegate: What is the cost of the cases?

The SECRETARY: This case has been costing 30 cents complete; I have a letter from the firm saying they expect to be able to furnish them next year for 20 cents. It is proposed to make them a little larger and to hold 144 apples. I think for peaches it is the best package we can adopt, whether it is the best for apples is another question. I bought a whole carload of that peat moss thinking it was the best material for packing and certainly it was the cheapest, but you see the reports upon it are not favourable. The excelsior seems to be more pleasing to the English buyers.

Mr. McKINNON: Was the peat moss quite dry when it was used?

The SECRETARY: Some of it was and some of it was not perfectly dry.

Hon. JOHN DRYDEN: It was dirty.

The SECRETARY: It does not open up clean like the excelsior, and I think that is one of the objections to it.

Hon. Mr. DRYDEN: I heard some complaint against the packing of the boxes in the compartment; I think some attention must be paid in future to that.

The report was received with applause.

ADDRESS BY HON. JOHN DRYDEN,

MINISTER OF AGRICULTURE FOR ONTARIO.

I think I am warranted in saying that among all the branches of agriculture in this Province, there is none of greater interest to our people or of greater importance than the one which this Association represents. We have discovered in recent years that we can hold our ground in any country with our exhibit of fruit. We went to Chicago. Our friends to the south never expected much from Canada in this direction, and I think I am right in saying that we astonished them not only by the exhibit there presented but by the number of prizes which we won in open competition with them on that occasion. You have heard from Dr. Saunders the result of our exhibit in Paris. You have heard of the special prizes won there, and I believe that if we have a fairly good season in 1901 we shall do equally well in the exhibit we are attempting to put up in Buffalo. We have discovered also that it is not merely in a few places in the Province that we can grow fruit. Some of us used to think it was so. I had my eyes opened some years ago when I was a member of what was called the Agricultural Commission, and when we discovered that all along these lakes, covering the major portion of our territory in the Province of Ontario, we had a splendid fruit district. But then as we have come along during these years we have had a good many things to learn. I am speaking now not of the experts that I see here before me, but I am speaking of the fruit growers generally, because our farmers all over the country are more or less fruit growers. We have had to learn, shall I say, the impossibility of handling the fruit tree as you would handle the forest tree. I know farmers who seemed to think that if they planted the fruit tree and got it started it would develop for itself, and not only so but that on the same ground they could produce a continuous crop year after year, and all that they got out of the tree was so much extra. Now, all that has passed away, and I apprehend that there are not very many men in the country now who do not understand that that is practically an impossibility —that you cannot take out of the soil what is necessary to produce good apples in an orchard and try to take out a crop every year, and keep at that without giving back to the soil something of what you have taken out, without something coming to a dead failure. I have seen, and you have seen, instances of just such failure as that. Then we have had to learn the necessity of paying constant and continued attention to the fruit tree from the beginning—attention so far as pruning is concerned, latterly attention as far as spraying is concerned. I remember a few years ago a great many of our farmers thought that some of us were providing ways and means to induce them to spend their money over some new fad when we suggested that it was necessary, if they would do the best for themselves, that they should commence to spray their trees. Now we have got past that stage, and all our people are practically admitting

now that if they will do the best for themselves they must attend to these things. Then we have discovered that fruits suitable for one section of the country may not be equally suitable for another section, and in order to help us in that matter, the Government has established those experimental stations of which you have heard We have 10 of them now. We have not reaped much result as yet ; no one expected we should ; but those who come after, who years hence will look at the record that is made, will I think have something which may be tolerably certain, indicating what will suit best for the particular district which these experimental stations represent. Then another thing we have learned is that we are being attacked year after year by new enemies which are making their appearance, and those enemies in the way of insect pests must be fought intelligently and unitedly. It is very little use for me or for one or two of you gentlemen to try to fight these pests with everybody else paying no attention to them, because they don't stop in the orchard where they start. They come over to see you as well, and therefore it becomes necessary that we should present an unbroken front if we are to the best for ourselves in this regard. Now, in reference to these pests you need law. You gentlemen have not hesitated to ask me as head of the Department of Agriculture to give you law. Will you let me suggest that I think at the present day there are some of us who place too much importance on the fact that you have law. I have seen temperance reformers and other kinds of reformers who seem to have one single idea, and that was, "Let us get some law on the Statute book, and then we can go home and go to sleep quietly, everything will be all right." (Laughter.) Now, law is necessary, but I point out to you that law is not all ; that law is only enforced when it has back of it a public opinion ; and that if you work to put a law on the statute book and your people are not in accord with it, and they resent it, then I undertake to say to you that your law is of very little use. When a man comes to me and says, "All I want is law ; give me a statute that I can read once in a while, and I will be content," that man does not understand the situation. Now, you cannot drive people generally, and you cannot drive farmers especially. (Hear, hear and laughter.) I do not know a worse body of human beings anywhere in the world to undertake to drive or force to go in a certain direction than the people we call farmers in this country. They live in their isolation and in their independence on their farms, they whistle when they like, they yell when they like, they run when they like, they are not under control like our city brethren. I would be a very strange thing to see me start down Yonge Street on a full run ; everybody would wonder what would happen, and I would have a policeman after me ; but you gentlemen on your farms are used to this sort of independence, and you do not like criticism ; you resent it more than anybody else. When I was down in the Maritime Provinces we were talking about swine, and I suggested that perhaps some of them had undertaken to drive a herd of swine into a pea-field in order that they might be fed, and because they were just a little bit anxious to hurry them through, there arose a little commotion and they whirled around and, instead of going the right way, they went the wrong way, and the chances are they did some injury to your limbs. Now, if you could have pulled a few vines through below the gate and let them get a sight of it and a scent of it, and let them take the trouble to reach through and get some, you would have coaxed them through without any trouble. I am not going to say that men are like swine—(laughter)—but there is some little resemblance. Let a farmer get a scent of the advantage that will come to him by any certain course and he will walk in himself. When I started the travelling dairy, which had for its intention two things—the education of our farmers and our farmers' wives in their homes as to the manufacture of butter, and the increased interest which we expected would come because of the agitation which the travelling dairy would bring to the people, which would finally lead them to the place we wanted them—it was suggested to me that in that we were leading them in the wrong direction, that what was wanted was that our farmers should club together in a factory. My answer was, "This is the road to the factory." The first point was to have the farmer's wife see that she secured an advantage by producing a better article at home. The very next step is that they will get together and see that if they club together in a factory they will get a still further advantage, and the direct result of it was just that, and there never was a time in the history of our country when our factories increased so much as they did just immediately after the education given by the travelling dairy. So you see if you just show the way, even if there is

a gate there that they have to unhinge, they will get it off and they will follow you; but if you undertake to say, "I will make you go, and I will take the lash and drive you," you will never get them at all. Now, that is perfectly true, I think, so that while some law is necessary, law is not enough of itself, and we must form public opinion as to the necessity of the law. Now, one of the worst insect pests you have ever had in this country is this San José scale, of which mention has been made here to-night. Being at the head of this Department, I was compelled to study in connection with it, and I think possibly I know more about it, and I think I feel stronger about it, than most of you do. I shall not live ten years longer—I shall not live five longer probably—before I find those people who were resenting, shall I say, our compulsion of law, I shall hear them saying, "He was right, and I was wrong."

A Voice: They are saying it to-day.

Hon. John Dryden: I do not take back one single thing that I suggested in connection with that scale. I believe that it is a terrible pest, and I believe that it will spread and spread unless we get something more than we have had yet, until it will do incalculable injury to this country. These reporters know that for a year or so I kept them quiet, and said, "Do not say anything about the scale, do not get them in the reports for fear the report will get abroad and our English friends will say, 'They have got the scale in Canada and we will not let them come in.'" That is the one thing that troubled me more than anything else. I said, "It is sensational, but you can wait a while," and they did, and they acted like gentlemen, and had nothing to say about it. But, of course, it is now an open secret, and we cannot hide it. Now, I took rather a bold stand. I undertook to spend a lot of the public money, and the thought was that by spending that money, $100,000, it might be, we would quite stamp it out. I tell you I should be the proudest man in the country to day if I had succeeded in stamping it out with even twice that sum. (Hear, hear!) But of course our Legislature is divided into parties, and you cannot hinder partisans from taking advantage even of the course you take in a matter like this, and so we had all sorts of criticisms,—people standing up in the Legislature and saying, "The Minister of Agriculture does not know what he is talking about, he is afraid of a little scale; he cannot see it; you can hardly find it with a microscope; it has been here for years, it has not done any harm, it is not likely to do any harm," and all that kind of thing. And the result was that the public opinion in the part of the country where we were laboring rose so strong that you know what happened—deputation after deputation came down to the Government with the complaint that they did, because their property was being destroyed, and said, "This must stop." We did not stop it until we discovered that the scale was perhaps spreading faster than our inspectors were, and found it still beyond and still beyond and still beyond. I said to my inspectors, "Where is the outside limit of this? Find out for me now the next three months where the outside limit is till I know where I stand;" and so we put on more men and tried to circle it round, and I found in that time in that one district it would probably cost $300,000 at the rate we were going, and even then I would not know that I had it stamped out. The Legislature would not vote that money with public opinion as it was, and the result was we had to drop it, reluctantly drop it, and where the scale now is it is likely to exist for some time. The only thing now that we could suggest was we should try to keep it in the section where it then existed, that is to say, do what we could to prevent it spreading. It is fair for me to say, however, that the money we voted and that we spent was not all lost. Would you believe me if I were to say that we absolutely destroyed the scale in at least one hundred places in this country? Now, the greatest danger so far as the scale is concerned is that it gets into the nurseries and from the nurseries it is transported into the different portions of the Province and planted here and there, and you see how quickly in that way it will spread over the whole country. Now, if we could keep it out of the nurseries, at all events, prevent nurseries from spreading it about the country, we may hold it where we have it to-day, and undertake to check it as best we can by the sort of treatment which we have recommended. I must say that our chief nurserymen have stood at the back of the Department in a noble way. I have had the greatest amount of encouragement and help from our chief nurserymen, but there are some small nurserymen who do just as I have said a little while ago, and who say, "You want to compel us to fumigate our stock; we do not believe there is anything in your fumigation; it is a great humbug and a great cost and a great

hindrance to us in our work, and therefore we do not want to do it." Now I have insisted as head of the Department that the law in that matter shall be carried out. I believe I will be backed up by the highest nurserymen and by this association, to get public opinion roused sufficiently so that any of those people who think they are imposed upon will cease their objection and will heartily carry out the law so far as they are concerned. Now the effort to keep it in check is by treatment. My thought is this, that no treatment yet in any country has absolutely killed the scale. The gentlemen who are making the pumps have provided us with machinery which is pretty near perfection, I fancy, for the purpose that we want, and we will probably be able to use these ; but the difficulty is in the actual performance itself. A man must be mighty careful if he can cover every inch on a tree, and if he leaves one square inch, if he leaves one scale there, the little creature is so productive that it will set going a few more broods in a year and away you go again. You see that is the difficulty. However, I do not see any other way that we can meet the difficulty than continue our operations in that way. I shall be very glad before the association adjourns to hear what you gentlemen have to say in reference to it. Now, let me say that the possibilities of this industry in this country, in this Province of ours, are simply immense. There is not a country that could not in a few years double its product. (Hear, Hear !) You heard what Dr. Saunders told us this afternoon, that there is room in the Old Land for ten times the amount that we are producing in this country. But then you say, "That market is so far away, thousands of miles away across the sea;" and I want to say right here that the individual producer is absolutely helpless under these circumstances, and I defy any of you gentlemen to undertake to work out your own salvation in reference to this transportation unless you get help. It cannot be done. (Applause). So that this is one of those positions in which it becomes necessary for the gentlemen who are in control in our country to come to our rescue and relief. There is need of better transportation facilities. The product is perishable, and it must be handled at once at the right time, and so it becomes necessary that special provisions should be made for getting it across this great ocean. Now the only thing we have discovered yet is this cold storage about which so much has been said, and you gentlemen who are fruit growers ought to understand two things : First its importance in connection with this industry. One of my colleagues will be here to-morrow and talk to you a little more about this cold storage and its principles, but its importance cannot be over estimated. You cannot get on, you cannot make progress, you cannot double up your product as you ought to do in this country without this cold storage, therefore it is one of the important things that we have got to deal with. Then secondly you want to understand its principles. Now, we think there are two principles in connection with cold storage. Possibly the Ontario Government has done a little by conference with the Dominion Government in this regard, because the cold storage compartment that we have placed upon the Steamship Trader has an additional principle—the necessity of a lower temperature than would ordinarily be found on the ship, but in addition to that there should be a constant circulation of air and not an absolute stagnation. Let me just in a word explain what I mean. You all known that if the air is warmer here than it is outside, and you let down that window at the top, cold air will come in at the top of the window and come right down to the floor and begin to move off in the room. You can try that any time and find that is the case. Now we use that principle, and we put the pipes in such a place in the compartment as to start the air going down, which of course begins a circulation of warm air taking its place, and therefore the air being circulated that way coming from the fruit, bringing away the dampness, the gases and so on, it is brought around in contact with the refrigerator pipe again and purified and kept dry. The moisture is taken on the pipes, just the same as the moisture would be taken on a glass of cold water on a hot summer day. Now, you heard what Mr. Woolverton said about the two shipments, but possibly you would not have observed it as closely as I did, because I am watching the effect of this principle. On the Manchester Commerce, where this Hanrahan system of circulation was not as perfect as it was on the Trader, you heard the report, which read, "A good deal of the fruit was cold and sweaty," whereas the report regarding the Trader said, "The fruit came out of it in a perfectly dry condition." That is exactly what I would expect ; and if any one of you gentlemen have a cold storage plant or a refrigerator of any kind on your premises where everything is all damp and moist all the time, your refrigerator is not working right and

you had better send for Mr. Hanrahan or somebody else to put it in order. We have had two or three of these refrigerator systems in connection with our institutions this very summer put in order, and the change is marvellous. At the Parliament Buildings we have one of those paper wind-mills that the children use, showing the circulating system, and you would be surprised to see the circulation buzzing around at a great rate as though there was a wind storm. That is the principle we should carry out if we are going to convey the fruit across the ocean in a proper condition. We have labored under a great many difficulties with our experiments this season, because we only had one what we considered proper compartment. We had absolute control of the one Mr. Woolverton has been speaking about, but the difficulty that we have experienced is that the fruit required to be held too long before we started. Now, if you are going to do your best, so far as cold storage is concerned, you must understand this, that you have got to have a cold storage building at the beginning, and you must not let your fruit, which is to be shipped to the old country, stand around the stations, or your own barns or buildings and bring it into the cold storage and expect it is going to go all right If it has begun to decay no cold storage on earth will put in condition again; so that to think that cold storage will make unsound fruit sound is a mistake. The moment you take it from the vine or tree let it be placed in a building, and let it get out of that building into a cold storage car, and out of that into a cold storage compartment, and when it gets to the other side into another cold storage compartment, and keep it in if you are going to make a success of it. We have had considerable experience, and so far as I am personally concerned I confess to you I have had an exceedingly large amount of labor and anxiety all summer, and if I had known in the beginning that I was to meet with so many difficulties and obstacles I am afraid that none of the officers nor anybody else would have induced me to tackle it; but I understand that Prof. Robertson had declared that in his judgement grapes could not be taken over profitably nor peaches—they had never gone over successfully and the people did not seem to want them, and they would therefore drop it. On that account I said to Mr. Woolverton—of course he was pressing his case, as you have heard to-night—"If that is the case I am willing to help you if I can." My theory is this; if you can hold your fruit in cold storage on the land you can hold it on the sea if you have the proper appliances. Now, I may be all wrong in that, but I do not believe I am. I think I am right, and therefore I say that somebody in this country ought to provide for the fruit growers of this country cold storage on the sea just as we have it on the land, and when you have got that, you have got something that is definite and certain, and so on that account we undertook it. A gentleman will ask, "Can our peaches be taken over?" I think our experience this year proves that peaches can be taken over in perfectly good condition. I think Dr. Saunders will bear me out in that. I want to say in Dr. Saunders' presence that we have not had a fair trial of it yet. We do not want cold storage just in one boat sailing every three weeks or four; we want cold storage boats leaving every week.—(hear, hear.)—so that when fruit is ready we know where to put it in. That was my intention. I intended to ask that we should be allowed to partition off a part of the cold storage compartments in each of those ships under the control of the Dominion Government, so that we could put in a carload at all events and try it under this system where we had a circulation of air, because every system had failed to some extent in the past, and we thought we could succeed in that way. But I found I could not succeed; I could not get the compartments. The compartment was in use; it was occupied. The steamship people fought me, and other people fought me whose names I need not mention here. I am not accustomed to be beat—(laughter); when I see my end to work for I am inclined to go ahead if I think I am right, and it does not make any difference where the opposition comes from. So I astonished Mr. Hanrahan by working out a scheme which enabled us to build at our own expense a compartment on the steamship Trader, and we have that compartment under our control, only we are trying to arrange with the steamship company to give us part of the money back again that it cost, and leave the compartment on the ship, which I have no doubt they will do. We have that, but it only comes once in three or four weeks, therefore peaches that ought to be sent at the right time are held here for two or three weeks, and as you heard from Mr. Woolverton, the ice gave out, and the cold storage up there, just in the heaviest season, was *nil*, and the peaches were starting to rot, and yet we were trying to make a success of it on this compartment that

we built. Now you see these things must be remedied; we must not have cold storage simply half the distance and let the fruit spoil the other half. If you get your stuff on that Hanrahan car, let the railway keep it for a week until you get a steamship with a cold storage compartment; but we must have it continuous from beginning to end. That is not a big job, not a wonderful thing to do; it can be done, and if you fruit growers want it it will be done and must be done. (Hear, hear, and applause.) Then I think we have proved that we shall have in a few years in the old land an unlimited market for the grapes which you grow in this country. (Hear, hear.) They say the Englishman will not eat the grapes. Neither would I once. I had to learn to eat them. I didn't like them, but it didn't take me long, and it did not take most of our people long. I did not like tomatoes once; I like them now. Lots of things we have to learn. A boy takes a long time to learn to chew tobacco; but he gets there if he keeps at it—(laughter)—especially if he sees his neighbors continue in the same wicked practice. You will see Englishmen on the streets in London begin to bite these grapes and nibble at them, and some other fellow will say, "What is that fruit! I would like a taste of them"; and it won't be long before they will say "That is better than I thought it was." That is what will occur; that is what has occurred. Grapes can be sent, and they can be sold, and three years from now if we can get a continuous shipment, you would get a good market for our grapes. If I can do that, how much would it be worth to this Province? What would you say if I spent $2,000 or $3,000 a year for the next two or three years working this thing out? Would it pay? (Voices, "Yes.") A hundred time over, a thousand times, of course it would. (Hear, hear.) That is one of the legitimate objects, then, that those in authority ought to have before them; so that I think that we have proved at all events these two things: that our peaches and our grapes can be taken over there, and that both of them can be sold at a profit. The Government of Ontario has recognized the importance of all this, and we have sought to encourage the erection of cold storage buildings, and any of you gentlemen can get, up to a certain limit, an amount of money from the Ontario Government to help you work the cold storage plan. We think we have gone far enough in that direction. I don't believe in spoon-feeding; you must help yourselves. (Hear, hear.) We do a little to encourage you, but if you will not help yourselves you must give it up. Then we have built at the Government's expense this railway car, which will be here for your inspection, and anybody who looks into that car and understands the principle will say that is what it ought to be, a proper cold storage car. I guarantee that it will carry your goods in a safe condition.

Mr. MORDEN: Is it the Hanrahan system?

Hon. Mr. DRYDEN: Yes, it is the system that Sir Charles Tupper referred to in his address on cold storage. Those cars in South Africa referred to by him in that address were built on the Hanrahan system. Perhaps Sir Charles did not himself know that, but that is perfectly true all the same. We have also just built a sample for a farmers' cold storage plant—ice-house you would call it—at the Agricultural College, and any of you gentlemen who go there next summer will find it in operation and see how it works. Very few of you will be able to erect one like that; but what I am seeking for is that our people generally will become interested in it. I have asked my Farmers' Institute speakers to do what they can to study out the principles of cold storage and give it to the people as they go about the country, with a view of making an impression, because I can conceive of nothing that is more important at this juncture—more important for help, more important for prosperity in your business. So that I suggest to you that you study out the principles as we have brought them to you. Now our experimental shipments have proved just what Mr. Woolverton has said, that only the best of our fruits ought to be sent there, because as you understand that creates a proper impression and works out the market; the other way you work it down hill. That best fruit must be properly packed. Let us listen to what they say on the other side, even though we don't believe in their theories. The Englishman is a very off-hand kind of a fellow, he will have his way. Give him his way. He does not want this moss, he says it is dirty. Do not send it, that's all. Do not try to instruct him, for the first thing you know he will shy off and will not bother with it; but send your fruit properly packed in continuous shipments, and I guarantee now if you do not succeed you can blame John Dryden. You can succeed. I guarantee success along these lines, if you only pay attention to these

things. I heard some friend here—excuse me for referring to him—speak about the fruit growers being one class in the community, and he did not like class legislation. Now, I don't want him to say anything more about that—(A voice—"No"); I'll tell you why. If I had adopted that theory I would never have done anything for you. The gentlemen who are interested in this fruit industry are possibly not interested in many other branches of agriculture. Certainly you are not very much interested in live stock, and I have been with the Live Stock Associations up at Guelph last week. They are another important class. I am helping them, and I am helping you; on what principle? Because you and they are interwoven with all our people and you cannot be separated, that is the reason (hear, hear) and there is not a banker, there is not a merchant, and there is not a laboring man that is not interested in your success and your prosperity (hear, hear). The banker makes his money because of the increase of the volume of trade, and when I am able to do anything that will help the fruit grower to produce more I am helping the banker, and he knows it, and I have got more friends among the bankers than I have in some places among the farmers. Some of those men down in Toronto have said—and the message has been brought to me; "There is a man up there in the Parliament buildings that is doing more than a dozen or two other politicians." Why? Because we are working them on these lines leading to practical results of increased production and better production. The banker is interested, the merchant is interested, because when you make a little more money and a little more profit you buy considerably more goods than you did before, and he makes a little money; and the laboring man knows when you are prosperous he always has something to do, and so it goes. And what I want to say is that although you belong to one class, and although you may not belong to my class, we are all tied up together, and whether we live in the east or the west, I am glad to say in these latter days we are bringing our east and west together and recognizing that we stand and fall together, for we are all Canadians and we cannot separate ourselves to any extent at all. Now I want to say just one thing and I will stop. Be careful and let this Association continue to be a live Association. (Hear, hear, and applause). I find some fault with these Associations, and they have thanked me for finding fault with them. I am not finding fault with yours; but do not let this Association ever be attacked by the yellows (laughter) or the scab, or the dry rot (laughter) or the scale, or the blight, none of these things. These terms are applicable; you appreciate what I say. Now I say that this association ought to be so alive that it would have power and influence in this country. You represent one of the greatest of our industries, one concerning which there are the greatest possibilities in the future; and therefore do not run around in a circle making a road from which you cannot extricate yourselves. I can tell you of associations in this country which seem to get into a little circle, and have kept going around and around every year. Of course they had a convention; I never could see any use of it. They elected a few officers; they may have had an exhibition and carried away a few prizes, but as for any impression of the country, or any help to the poor man that was outside the ring, I could not find it. I have tried to spur them up, and those associations are alive to-day, and they are going to do from this time on a very much better work than they have ever done before. Now let me suggest that this association should never get into that position. Always remember that when you are helping yourselves and the class to which you particularly belong, you are helping me and and you are helping all the country. (Loud and prolonged applause).

The PRESIDENT: Gentlemen, I certainly think that the outlook for fruit growers and fruit growing at the close of the 19th century is just about all that we can desire. Everything is looking very favorable for us. I think the one thing perhaps that we have to dread, and that hangs like the shadow of a great calamity over us, is the San Jose scale. From what has been said this morning I shall be very glad to hear from some of you gentlemen in reference to this matter; let us hear what you think about it and what you think ought to be done. We are glad to know that at headquarters they are willing to do for us whatever we may ask, I think.

REPORT OF THE COMMITTEE ON SAN JOSÉ SCALE.

By Murray Pettit, Winona, Ont.

I must first apologize for not having my report prepared, as I did not expect to be called upon until Friday morning. I have some notes which I intended to put in shape before that time. However, I will give you a few facts that I found by travelling through the infested districts for that purpose. It was thought advisable by your Executive that I should do so before this meeting in order that we might have an unbiased opinion of the condition of affairs which I found very much worse than was expected. The scale has increased and multiplied in those districts to an alarming extent. I first visited an apple orchard that was inspected in 1898 and considered free from scale. This fall at picking time the owner found that every tree in the orchard was infested, some of them so bad that the fruit was worthless. This was an orchard of about 400 trees 25 years old, a fine healthy orchard, and it is his intention to take out a portion if not the whole of it this season. The next orchard I visited was one of 300 trees, an apple orchard. In 1898-99 all the scale that was found in that orchard was taken out. At the present time there is not a single tree there that is not infested. On the same farm there is a peach orchard of 800 trees that was inspected in 1898 ; four trees were found infested and taken out. At the present time there is not a single tree in that orchard that is not infested, and many of them so bad that the fruit was worthless. Another orchard I visited was a pear orchard inspected in 1898 and considered free from scale. That is now so completely coated with it that from the road you can see that the trees are covered with scale ; even into the orchard a rod or two it shows and the same in another orchard of 800 or 1000 peach trees about 100 of which were taken out under the conditions of the Act in 1898. At the present time every tree in that orchard is infested. I could go on and enumerate many more, but this is just about a sample of the condition of things in those infested districts. While talking with some growers in those infested districts, one who has had considerable to do with inspecting the orchards and has watched it closely said there was a section there of about twelve square miles where he did not think there was an orchard that was not infested, and in a good many of them not a single tree in the orchard but was infested with scale. In talking with another intelligent grower there I asked him what he thought could be done or what the outcome would be. He said to rid that locality of the scale every fruit tree and shrub would have to be destroyed, and then he thought it would not be safe to plant for a few years.

Hon. Mr. Dryden : Did you get any information as to what this gentleman thought better be done under the circumstances? That is what I am specially anxious to hear.

Mr. Murray Pettit : Well, I found that public opinion had changed very much since 1898, and many people who then thought it was a mistake to go and destroy orchards, hearing and believing that this scale was not really as dangerous as a good many supposed, have changed their minds very much, and I think would now be very glad to have that same Act enforced as it was then.

Mr. Morden : Did you examine the forest adjacent to the orchard?

Mr. Murray Pettit : I did not, but there is one place in that section where the forest trees have been chopped off and there is a new growth come up, where the conditions would be very good for the scale if it would attack forest trees, and I am told the inspectors have spent a great deal of time there and they have not in one single instance found scale on forest trees.

Hon. Mr. Dryden : We have never been able to find it.

Mr. Murray Pettit : They offered a dollar to any person who would bring them a piece of forest tree wood with scale on it, and they had a good many specimens sent them but none of them was San José scale.

Mr. Morden : Take wild rose bushes in the forest ; would they have it?

Mr. Murray Pettit : I could not tell you that. One very successful grower where scale existed said that if he were furnished first-class trees and paid $1 each to plant them and take care of them until they died he would not take them—which does not seem a very encouraging outlook for fruit growing in those sections. I also visited different orchards where spraying had been done under the Commissioner, and where different brands of whale oil soap had been used and also petroleum. The trees sprayed with

whale oil soap from Ohio were cleaner than those sprayed by other soaps. But where petroleum had been used the trees were much cleaner than where whale oil soap had been.

Hon. JOHN DRYDEN: They used all sorts of mixtures. I think crude petroleum is used, and then the ordinary refined oil mixed with water in different percentages. I have never seen any actual report of the effect of these different treatments, but on general principles I think that what Mr. Pettit is saying now is correct, that the crude petroleum is perhaps the best, but they tell me there is a difference in the petroleum coming from one place and another; that one is better than another.

Mr. MURRAY PETTIT: They register different degrees of strength, I think. One grower who had used three tons of soap had absolute faith in the soap keeping the scale in check. The inspectors had different marks which indicated bad, medium and slightly infested, and where these experiments were tried on those trees in these different conditions you could arrive pretty closely at the results, but it was decidedly in favour of petroleum. It is a very important question with us as to what can be done. It looks like a terrible undertaking now to stamp it out, but it seems to me that in localities that are free from it we should undertake to do something. Even in municipalities that are free, or nearly so, it would be well if we had legislation similar to the Act in force respecting the Codling Moth, to be adopted by municipalities, obliging every grower to inspect his trees once or twice each year, and to certify before a commissioner that he has done so and also whether he has found any infested trees or not. Then under the San José Scale Act as it now exists these trees could be ordered destroyed; a great many sections could fight the scale for some years and possibly keep certain sections free from it. The municipalities bordering on the lake shore where one side would be protected in that way would be an advantage.

Hon. JOHN DRYDEN: Do you think municipalities would themselves consent to pay something towards the cost of destruction?

Mr. MURRAY PETTIT: I think some municipalities would.

A DELEGATE: Does it require a very strong glass to discover the scale?

Mr. MURRAY PETTIT: No, just an ordinary little lens, in fact where the tree is badly infested you can see it with the naked eye, in just walking through the orchard.

Hon. JOHN DRYDEN: This gentleman if he is not accustomed to it probably would not, as he does not know what to look for. The inspectors who have an educated eye can tell by the peculiar appearance without a microscope.

A DELEGATE: Does it affect the leaves—change the color or appearance?

Hon. JOHN DRYDEN: Yes.

Mr. A. H. PETTIT: Did you find any instance where the trees had been injured in that way from the use of whale oil soap?

Mr. MURRAY PETTIT: No, not from soap; but I found where they had been injured from the use of petroleum.

Prof. SAUNDERS: Were the trees killed in that case?

Mr. MURRAY PETTIT: There were one or two trees killed and others were injured. I believe they scraped it off, and seemed to make a start again where they were scraped off.

Mr. JEREMIAH CLARK (P.E.I.): Did they spray the oil with water in it at all times?

Mr. MURRAY PETTIT: I think the strongest was about 40 per cent.

Mr. CLARK: I understood that in spraying in bright sunshine they could put on the pure oil.

Mr. MURRAY PETTIT: Yes. On damp days or in damp localities or in water I am told there cannot be as much oil used as there can in dry localities.

Mr. E. D. SMITH: There is a clause in the San Jose Scale Act that provides that the inspectors for the Yellows and Black Knot also inspect for the San Jose Scale. I would like to ask Mr. Dryden who is supposed to pay these inspectors.

Hon. JOHN DRYDEN: Those inspectors are appointed and paid by the municipality, I understand, but Mr. Smith will excuse me if I say I am a poor man to ask what the meaning of that law is. We never know when we make laws just what the meaning is till some Court or Judge tells us: so I do not exactly know how that is.

The SECRETARY: The cold storage car to which reference has been made by the Minister of Agriculture is at the Grand Trunk Station, Market street. I suggest that we go down to visit it at 9 o'clock to-morrow morning.

Mr. A. H. Pettit: The principle is just as simple as can be. Mr. Hanrahan's principle is nothing but the natural current of air, a perfect circulation, and in this manner: The fruit is put in; it being warm, the warm air rises. The moment it does that the cold air from the ice in the center of the car follows it and the circulation thus created is simply like two wheels running around in the car. As the warm air passes over the ice it deposits the impurities of the atmosphere and they run off in a liquid, while the air comes back in a perfectly pure condition. Before Mr. Hanrahan explained this to us in Grimsby we had instances of pretty nearly the same thing to prove it. Some of our shippers who were shipping in cold storage had placed some of their peaches in unloading in the north side of a large barn or packing-house, where it was in the coldest possible place and pure air. This is really not cold storage, it is only cooling the atmosphere and purifying it. It is one of the simplest things in cold storage that a man can imagine and when you see the car I think you will say it is perfect in every condition.

Hon. John Dryden: The difference between this and the ordinary G. T. R. car is that the ice in this Hanrahan car is in the center, while in the ordinary car it is in both ends. The same principle works in an ordinary G. T. R. car, but you see then you have a current of air starting at each end coming against it, each working against the other. It operates something like two streams of water that you set running along the floor here; there is a portion in the center where there is a stagnation. These two currents of air naturally fight against each other and there is really no continuous circulation in the car when you have the ice at both ends, but when you put it in the middle you have two compartments in the car, one at each end, and the ice cools the air and it runs around in this way.

Mr. A. H. Pettit: As there are eight or ten gentlemen in the room who have been shipping through the season and shipping in this car three or four times, I think everyone will express his delight and pleasure at seeing a system that seems so thoroughly perfect in carrying our fruit in cold storage.

Prof. Saunders: I may say that this system was adopted in 1886, when we sent over to London a display that astonished London at that time, and we showed about 5,000 plates of fruit at one great exhibition of the Horticultural Society. Mr. Hanrahan fitted that cold storage chamber up as a temporary thing in one of the Allan vessels, and the fruit all reached there in perfect order. Mr. Dempsey's father was one of the men there at the time, and Mr. Starr of Nova Scotia, and Mr. McD. Allan, and Sir Charles Tupper also mentioned in his report of the exhibition the wonderful success that had attended this exhibit of fruit which reached London in this fine order in a similar compartment on the same principle to what has been spoken of lately. I have listened with the greatest attention to the speech of the Hon. Mr. Dryden to-night, and am very glad indeed to find that any man occupying the position that he does has been willing to give the time and attention to such a subject, to master it so thoroughly as he seems to have done. It is so seldom that busy men, especially men occupying high positions politically, can find the time to go into these details, however much they may have the will; but he seems to have devoted all the time that is necessary for a thorough knowledge of the subject, and I have the greatest faith in the future under such circumstances that any obstacle arising will be overcome as long as we have a man like him at the head to direct.

VOTE OF THANKS TO HON. JOHN DRYDEN.

The Secretary moved, seconded by Mr. Harold Jones: Resolved, that the thanks of the Fruit Growers' Association of Ontario be hereby tendered to the Hon. John Dryden for his excellent and encouraging address and for the efforts made by him to check the spread of the San Josè scale; and further that we hereby extend to him our sincere thanks for the successful work accomplished during the past season in the experimental export of tender fruits and that we hereby express the hope that he will continue to interest himself in furthering this business until it has become established on a trade basis." The motion was carried unanimously. This motion was seconded in several places.

Mr. Morris: I would like to ask if there is any probability or chance of the government resuming the plan of destroying the trees for the San José scale, even with the

help of the Dominion Government. The two Governments could work together. As I understand now it would be impossible financially for the local Government to undertake it, but if the Dominion Government took it in hand as well as it could be done, and I think under the representations of Prof. Saunders they would assist.

Prof. SAUNDERS: The Dominion Government is spending a great deal of money now in fumigation chambers.

Mr. MORRIS: I think the feeling of the country is that that is the best plan yet, and if the money was only forthcoming that that will be the cheapest way in the end.

Hon. JOHN DRYDEN: I do not think any answer can be given to that I cannot answer for one Government let alone two. (Laughter.) I am afraid that you will have difficulty in getting any Legislature or any of our Legislative bodies to agree to such expenditure of money. The trouble is that in this matter no living man can tell now hew much it will cost, and I want to tell you further that if you are going to destroy a man's trees you have got to give him a little more that we have been giving him under our present Act, or he comes out with a shotgun and an axe or two and drives you off the premises, and I do not know that I can blame him very much. The individual is sacrificed for the benefit of the whole, that was our theory, but nobody dreamed that we were going to cut out the whole orchard; we thought we were only going to have two or three spots, but men rebelled, and that was the difficulty.

Mr. MCKINNON: Although I cannot express an opinion as to whether it would be expedient to go on with the destruction of trees infested with the scale or not, I would say that if it is necessary, in my opinion the Dominion Government much more than the Provincial Government should be the one to saddle with the expenditure, for the reason that when fruit growers asked the Dominion Government to prohibit importation of nursery stock from the infested States some years ago they refused to do it. If they had done it I believe we should have had no such enemy to fight. (Hear, hear.) Then it was not within the power of the Provincial Government to prevent the importation, it was within the power of the Dominion Government. It was on the advice of their professors I believe—I do not know whether it was Prof. Saunders or Prof. Fletcher, or who it was—but on the advice of their official advisors they declined to do it, on the ground that there was no danger whatever of the scale making headway in such a cold climate as that of Canada. Now, if they are responsible for all the evil that has come upon us, are not they rather than the Provincial Government the parties who should put their hands in their pockets and try to rid us of this evil if it can be done at all? (Hear, hear.)

Prof. SAUNDERS: I think I must try to correct Mr. McKinnon's facts, because I know something about the history of this business. I know that the Hon. Mr. Fisher took the very promptest action possible as soon as it was brought under his notice, that it was desirable to take this action, and by so doing he prevented that year the scale going to every part of Canada, as it would have done by the sale of diseased trees from different parts of the United States in every part of the country. The action of the Dominion Government was so prompt that it shut off all probability of the scale going any further, and it was done just as soon as the information was presented to the Minister. I do not think there is on record any action of the Government taken at any time in connection with any law affecting the welfare of the people that was done in such a short time as that was done, and they were most prompt and energetic in carrying out the law.

Mr. MCKINNON: It was before Sydney Fisher had anything to do with the Department of Agriculture for Canada that this happened. (Hear, hear, and applause.)

Mr. MCNEILL: There is another aspect of this affair. Whether the Provincial Government or the Dominion Government do anything for us or not, the trouble is upon us and the trees are going to be destroyed. It appears to me that we have just got to look this condition of affairs in the face, and now that the scale is being recognized as being here, and every intelligent fruit grower is supposed to know something about it, that we will simply have to bear the expense ourselves individually, and that it will come in exactly on the same basis as any other noxious disease or pest, and that it will take its place just beside those. Now, we get no compensation when we have scarlet fever at our house, and have to shut up shop, and have considerable difficulty with our business, and have to fumigate, and all that. I believe we have just got to face the difficulty in exactly the

same way with the San Jose Scale ; that as no man is allowed to keep a mad dog on his place, so no man will be allowed to keep San Jose Scale on his place—(Hear, hear)—and that he himself will have to be responsible for ridding his orchard of that pest. The thing has got to that pass that we may just as well face the music. I feel that I am speaking this in the presence of the Minister of Agriculture, from whom of course we take everything we can get. At the same time he shows himself to be a man of common sense, a man of ability, a man for the hour, and he will not misunderstand this when speaking to fruit growers. While I am on my feet I may say this, that I never listened to a more matter of fact and encouraging address than we have had to-night from the Minister of Agriculture in connection with this transportation and cold storage question, that if we as fruit growers just live up to our standard of the present time and show them we are alive I believe we shall begin the new century under very auspicious circumstances notwithstanding the scale.

Mr. MORDEN : It strikes me in this way. Imagine for a moment this scale infests my orchard. What is the result if we have no legislation, no action ? My orchard is doomed ; it will be of no value ; and if I face the whole situation I am no worse than if nothing whatever was done, and if the Government does as they have done, give 25 per cent. of the value of that tree, they have done something that we may call generous. Taking the view of course that this is in the public interest, I do not consider that it is wrong in the Government to do it, but I fail to see where .the individual can grumble because his orchard is doomed. If it is a contagious and infectious disease and 25 per cent. of the value is paid I think the arrangement is very liberal indeed under the peculiar circumstances, as the trees are of no value.

Hon. Mr. DRYDEN : Mr. Morden does not quite appreciate the position of the men whose trees are attacked. When the attack comes first his orchard is not destroyed ; it takes a good many years. The man looks at it in this way ; he asks, what is that orchard worth to me next year, and the year following, and the year following that, before the scale gets a real foot-hold ? Now when he goes to the court, the court will not give him damages for what the orchard is worth in the future, and we have acted on that basis. The inspectors say, these trees are diseased ; they are doomed. They say they are not worth so much as they were when they were healthy, and they knock off a little percentage from that. I confess to you when they get off the percentages and only 25 per cent. is left it is a mighty small sum, and the man will not stand it. We have absolute rebellion in some places—men out with axes and shot-guns and saying, " You dare chop down that tree and I will chop you down ; " and you have got to face that. It is a sacrifice of the individual for the whole, and while I believe what Mr. Morden says, and while if I have scale in my place to-morrow I would cut the whole blessed thing down and burn it, yet men do not take that position and the legislators will not face it.

E. D. SMITH : What is the position of the man who has got the scale, and the other man has not ?

Hon. JOHN DRYDEN : He ought to be protected.

E. D. SMITH : By the report Mr. Pettit gave this is spreading to a most alarming extent, and unless some stringent measures are taken at once the man who has not got it now will be overtaken by it in a few years. I think we should take immediate action to have some law by which the man who has not got the scale could be protected. (Hear, hear.)

The PRESIDENT : Do you think it possible to have anything better than what we started out with in the first place ?

E. D. SMITH : That is the cutting down with 25 per cent. compensation ? No, I don't think so.

The PRESIDENT : Didn't we start out on the right lines exactly ?

E. D. SMITH : Certainly, I always thought so. I thought the amount given was most generous, and I always thought it was a tremendous mistake that those men refused to bow to that law.

Hon. JOHN DRYDEN : What happened ? Somebody up there in the County of Lincoln sent down men to represent the fruit districts of this country in the Legislature, and they stood up there and fired their shots at me, and said, " This man does not know what he is talking about. I tell you it is all nonsense ; the scale won't hurt anybody. You can't find it ; it doesn't exist," and all stuff like that. What am I to do ? I

have not got you people down there to back me up, that is the difficulty, and I was reluctantly forced and compelled by force of public opinion to stop the operation of the law. I believe we were on the right track, there is no doubt about that; if we could have spent a few hundred thousand dollars more, if need be, and have cut it out altogether, it would be a great blessing, but there was the trouble—public opinion was not with us.

E. D. SMITH: I do not think the Government now would be justified in paying that amount when the people who were most interested refused to accept the situation as it was then, and generous as it was then, now that it has spread perhaps over ten times greater area, and will cost nearly fifty times as much money to stamp it out. It seems to me that Mr. McNeill's suggestion is on the right track, that we have got to face the situation now as we have had with other diseases, the yellows and black knot, where a man was caused to cut them down and suffer the loss himself, and a statute more stringent even than The Black-knot and Yellows Act ought to be on our books at once.

A. W. SMITH: About a week ago I listened in a meeting to some of those very same men who made this protest, and they candidly and publicly acknowledged that Mr. Dryden was right, and they were wrong—(Hear, heer)—and if the thing had gone on as he started it, it would have been the best thing that could have been done for the country.

Mr. BUNTING: The gentleman who was strongest in opposition in the House about the scale, only on last Saturday was obliged to admit his mistake, and to agree to support almost any measure that the fruit growers of the Niagara district would bring up and send to him for representation in the House. This only shows that we are to be congratulated on the ability Mr. Dryden has shown in listening to the views of the fruit growers and endeavoring to carry them out.

Hon. Mr. DRYDEN: I am delighted to hear that. It is only an illustration of what I was saying a little while ago—the force of public opinion has had its effect on that gentleman you see. Public opinion is now working in that direction, and he is going to fall in with it. It only shows that you gentlemen have only got to stand behind and form your public opinion and you can get any law you want.

Mr. MURRAY PETTIT: But the great trouble was our hands were tied. This Association and our journal and all those who were willing and anxious to see the Act enforced, were quiet for the same reason that Mr. Dryden referred to in regard to the reporters; we did not want it to go into the press and all over the country that we were being overrun with San Jose Scale. We were not trying to rouse public opinion, while those who were opposed to it were doing all they could. It is just the difficulty.

Hon. Mr. DRYDEN: I should be very glad if, after having talked it over, this Association would express themselves in some resolution as to what is the proper course to pursue. I shall receive with all the importance it deserves whatever conclusion you gentlemen come to. I do not say what we shall do or can do; I am not prepared to say at the present time: but it is going to be a difficult matter to carry on our old operation I think.

The PRESIDENT: There have never been two opinions expressed by this Association or any member of it, so far as I know on this matter, We have never faltered. (Hear, hear.) We want destruction at any cost. The question will come up again.

The Secretary suggested that, as the minutes of the last annual meeting had been printed, they be adopted as printed. This suggestion was carried.

REPORT OF FINANCE COMMITTEE.

The Secretary read the report of the Finance Committee, which on motion of the Secretary was adopted.

We, your Finance Committee, beg to report that we have examined the accounts for expenditure made by the Executive and we find that they were made in the best interests of the Association.

We are pleased to report also that we found the accounts in perfect order for inspection.

W. M. ORR,
M. PETTIT,
A. M. SMITH.

Grimsby, Nov. 23, 1900.

Treasurer's Report.

The Secretary read the Treasurer's report for 1899-00, which on motion of Mr. Scarff was received and adopted, as was also the report of the Auditors.

Receipts.		Expenditures.	
Balance on hand Dec. 1, 1899	$ 635 51	Canadian Horticulturist	$2,554 95
Membership fees	4,435 35	Salary of Secretary—Treasurer—Editor	1,200 00
Advertisements	355 53	Commissions	673 35
Samples, etc	16 00	Premiums	533 79
Binding volumes	31 35	Illustrations	439 34
Government grant	1800 00	Printing and stationery	250 93
		Bookkeeper	240 00
		Annual meeting expenses	230 40
		Affiliated societies (lecture course)	211 55
		Postage, telephone and telegrams	172 66
		Reporting	124 10
		Affiliated societies (organization)	103 67
		Committees and delegations	87 00
		Express and freight	46 36
		Collection and interest	43 69
		Book binding	39 15
		Auditing	21 00
		Miscellaneous	11 64
		Advertising	9 00
		Balance on hand Dec. 3, 1900	281 17
	$7,273 75		$7,273 75

The Secretary laid on the table the first printed report of this Association, held in 1861. The Association was then called the "Fruit Growers' Association of Upper Canada."

REPORT OF THE NOMINATING COMMITTEE.

Murray Pettit read the report of the Nominating Committee, and moved, seconded by Mr. Harold Jones, that the report be adopted as read.

T. H. Race: It is the privilege of every member of this Association to bring in an amendment to that report, and I am a member of that committee and would like that understood, because there are suggestions made sometimes that this is a close union and a self-appointing society. These nominations are simply made to be submitted to the Association for their acceptance or amendments.

The President called for amendments—there were none and the report was carried.

The names of the officers appear on page iv.

FRUIT PACKAGES FOR EXPORT AND OTHER PURPOSES.

By L. Woolverton, Grimsby, Ont.

The need of uniform packages for our fruits is at the present time most apparent. We are just entering upon a new era in our fruit trade, an era of growing and shipping only first class fruit, graded to uniform sizes. For this fruit the box is better than the barrel, and has been used for three years past in our experimental shipments.

In this connection it will be interesting to quote from the *American Agriculturist* an article written by A. S. Baker, of Covent Garden, London, on the "Needs of the English Market."

"The London Market is not well understood in this country as regards the condition of apples: The people here with the finest men, the finest varieties and the finest soils, are getting the lowest prices for apples. England is dependant on three sources for her apples—the United States, Canada and Tasmania. Tasmania need not be considered, as her apples come in when there are none from America. The apples have to come 14,000 miles and the fruit when it reaches England is dry, flavorless and of poor quality. There are no such conditions confronting American growers, who are only 3,000 miles from London, and with good refrigerating plants on the ships.

"The subject of package is of the greatest importance. Many packers put good fruit in both ends and poor stuff in the center. There are three sizes of barrels going to Europe. The buyer knocks out the head, dumps out the apples and makes an offer for the greatest quantity of one grade, which is generally the culls. The shippers would get as much to ship only culls and keep the little good fruit at home.

"The Tasmania package is a box 22 in. long, 11½ in. wide and 10½ in. deep, outside measurement, made like an orange box, with thin sides and three-fourths inch ends, bound with wooden hoops. It holds 50 lbs., or one English bushel. These boxes pack much closer in the hold of a ship, and as freight rates are based on the amount of cubic space occupied, 20 per cent. more fruit can be carried in boxes for the same money than in barrels. Barrels of apples contain too much latent heat and the fruit in the center does not carry as well. The boxes of apples shipped from Tasmania bring 15 shillings per box in 1,000 lots at auction. If the American shipper will grade his stock and pack it in boxes, he will get as much for a box of fruit as for a barrel which holds three times as much. Only two grades of fruit should be sent abroad.

"The remedy for lack of uniformity in standard packages does not, I believe, lie with the Government to pass a law upon this subject, but with horticultural and other societies to adopt a standard package. These should be labeled with the name of the society or board of trade, at the town from which they are shipped. If you ship to the English market the kind of goods and in the sort of package the Englishman wants, there is no limit to the amount of stuff he will take. London banks will advance 80 per cent. of the market quotations on apples to Tasmania shippers. These apples are never opened in the market, but the grades and marks being known, are sold this way. There is a system of inspection at the port of shipment by which the brand of the Sydney chamber of commerce is put on boxes of butter. The butter in Australian standard boxes will bring 112 shillings per 100 lbs. against not over 95 shillings for American butter."

The *Fruit Grower*, also of London, England, refers to Canadian apples in the English market, in an article from which we clip the following:

"What are your views upon the use of the bushel box for apples; do you think that it is suitable for all kinds of Canadian and American apples?" "Well," answers Mr. Walter Draper, "we are satisfied that for ordinary fruit the barrel is as good as any package that could be devised, but for choice, evenly-graded and well colored fruit there can be no doubt that the bushel box is a decided improvement. For such we would guarantee ready sales at good market prices, and in quantity, too. The Californian senders of Newton's adopt this kind of package, and we are sure the Canadian shippers will find such a box of great value from a trade point of view."

Now, it is evident that we have a magnificent market for our fancy apples and other fruits if we can once agree upon uniform brands and uniform packages.

After the experience of the past year we propose for our adoption the following list:

Apples—Barrel*, staves 28½ inches long, head 17¼ inches, circumference at bilge 64 inches. Box—22x11x 10½, inside measurement, with ⅜ inch sides, and ¾ inch ends.

Pears—22x10½x5½. Peaches—Box 18x10 x 5½, with ¼ inch sides and ¾ inch ends.

Grapes—Crate 16 x 16x4½, with ½ inch ends and ¼ inch slats, and containing four veneer baskets.

The barrel holds just 96.51 Imperial quarts, or 100 American quarts, while the barrel we have been using is the flour barrel size with staves 30 inches long, head about 17 inches, which holds 103 Imperial quarts.

The barrel which we recommend above is the one adopted by the American Apple Shipper's Association, and the Nova Scotia people, who ship a great deal to the Boston market, have petitioned our Government to legalize this barrel. I would ask that this Association appoint a committee to examine these packages now placed before you and to report upon the same.

I would also in this connection advocate the inspection of all goods put up in these special packages, just as our Tasmania friends are doing, or else we can never expect to have our fruit in them sold by grade, without having them turned out, as is necessary

* This barrel has been legalized by the Dominion.

with the barrels at the present time. We want to establish confidence, and to do this we must see to it that we ship only inspected fruit true to grade marks.

I would ask that it be made necessary to mark on all the packages of apples, pears or peaches, the variety, the diameter, and the shipper's mark. This is perhaps enough, but if grade is also required, No. 1 means first-class samples of apples not less than $2\frac{1}{2}$ inches in diameter, and pears not less than $2\frac{1}{4}$ inches in diameter; while A No. 1 means the same, but $2\frac{3}{4}$ and $2\frac{1}{2}$ inches in diameter respectively.

Now to avoid the mistakes of the past, we should advocate that all fruit put up in boxes and sent forward in special storage be subject to Government inspection. I would recommend that a committee be appointed to consider this matter also.

I will be glad if you would adopt these packages so that we might all use the same, or refer it to a committee to examine and report. It is most important as we are entering on this business that we do agree together.

Mr. McNeill: As the secretary and others have given considerable attention to this matter, and have had large experience in shipping, I for one would be content to take his experience; and as some standard packages should be resorted to I see no better way of making a beginning than by adopting these. I would therefore move that these packages as named in the Secretary's paper be adopted as a standard as far as possible for the present, subject to revision every year. I would make no further recommendation.

Mr. Symington (Port Dover) seconded the motion, which was carried.

Uniform Fruit Packages.

An important meeting of the committee on uniform packages was held at Grimsby on Wednesday, the 20th of February, 1901, to discuss the question of uniform packages. The following resolutions were passed:

1. That, in the opinion of this committee, legislation should be enacted prescribing certain standard sizes of fruit baskets for use in the home markets, and that all baskets used of other sizes be branded indelibly with the minimum capacity in quarts.

2. That this committee would recommend the following standard sizes of baskets: No. 1, capacity 15 or more imperial quarts; No. 2, capacity 11 imperial quarts, with a depth of $5\frac{3}{4}$ inches; No. 3, capacity $6\frac{2}{3}$ imperial quarts, with a depth of $4\frac{5}{8}$ inches; No. 4, capacity $2\frac{2}{5}$ imperial quarts, with a depth of 4 inches; No. 5, berry box, 1 Winchester quart; No. 6, berry box, 1 Winchester pint.

3. That the branding of sizes of baskets or berry boxes be compulsory in the case of imported fruit, as well as that Canadian grown.

WINDBREAKS.

By A. M. Smith, St. Catharines.

No observing man who passed through the country after the gale of last September and saw the thousands of bushels of apples under the trees where the orchards were not protected and noticed the fruit still upon the trees where they were protected, can doubt the usefulness of windbreaks; and no one, who had his orchard a part protected, and a part unprotected, but could fully appreciate their value when he came to gather his fruit. I think no one will question the statement that there was more than one-fourth of the apple crop of Western Ontario destroyed by the wind besides large quantities of pears, plums, peaches and other fruits, entailing a loss of many thousands of dollars which might have been saved had there been suitable windbreaks planted around the orchards. In my own experience I know that fully three-fourths of my apples, particularly of Greenings, went down in an exposed corner of my orchard while behind the windbreak there were very few if any.

In my peach orchard, which was protected by a windbreak of Norway spruce, there was scarcely a dozen baskets blown down, while many of my neighbors whose orchards were unprotected picked hundreds of baskets from the ground, which they were obliged to sell at half price or less. I am satisfied that my windbreaks of twelve to fifteen years growth have saved double their cost in fruit, besides in several instances having saved my peach trees from being winter killed.

Two years ago, when so many trees were frozen out in Essex and in the Niagara district, several of my neighbors—whose orchards were exposed to the wind and the snow was blown from their roots—lost several hundred of their trees, while mine, only a few hundred yards away behind the windbreak, escaped uninjured—and not only my fruit trees but my berry plants have been greatly benefitted by protection. There was a time in the memory of some of us older men when we had forests enough to partially protect us from winds, and damage to fruit from them was a rare occurrence; but since they have been cut away the wind has free sweep through the country and not a season passes but we have more or less loss, and the question of protection and how best to accomplish it is well worthy of the attention of this association and of all interested in fruit growing. I am glad to see that the question of forestry, which is a kindred subject, is to be discussed at this meeting, and I hope that something practical will grow out of these discussions; for I believe that unless the forests and shelter belts which have been so ruthlessly destroyed in this country during the nineteenth century, are not at least partially restored in the twentieth that the twenty-first century instead of dawning upon a land of fruits and flowers and fertile fields as this Canada of ours is to-day, will dawn upon a land of barrenness and desolation.

Prof. MACOUN: We have had considerable experience in tree planting at the Experimental Farm at Ottawa. One of the reasons why such good fruit can be grown in the Grimsby District, and in the Annapolis Valley, N.S., is because they are well protected; and I think it is very important in planting new orchards in the country to first of all look for natural protection, because, leaving aside the subject of wind protectors, if you get good natural protection your trees will not suffer from winds as they would otherwise. If you cannot get natural protection, the next best plan, as Mr. Smith has well said, is to plant windbreaks. By planting a Norway spruce windbreak at the time you set out your trees, it will make as rapid or more rapid growth than the trees, and by the time the trees need a windbreak, when they are in full bearing, it will protect them very much indeed. The Norway spruce will make from $2\frac{1}{2}$ to $3\frac{1}{2}$ feet in growth every year if you cultivate it properly for the first two years. It is one of the most rapid growing trees there is, and I believe that it is the best tree to plant for this purpose. We have a great many Norway spruce at the Experimental Farm, and after thirteen years experience there, I should say it was the best to plant for the purpose of a windbreak. I do not think it is necessary to plant a dense windbreak, One row of Norway spruce, with the trees from ten to twelve feet apart, will be quite sufficient because in 12 or 15 years those trees will be nearly meeting, and you will get a windbreak sufficient to break the force of the wind, which is really all that is needed. If you check the circulation of air altogether it affords a protection for insects and offers more favorable conditions for diseases spreading, so that it is much better to just merely break the force of the wind and thus protect the fruit from being blown off the trees, or the trees from being injured, than it is to stop the circulation of air to a much greater extent; so that in planting windbreaks I would recommend simply planting one row, or at the most two rows. If you plant two rows of trees I would suggest putting the second row behind the first, about ten or twelve feet from the first, and putting the trees opposite the intervals in the first row so that it would act as a screen. During the last three years we have planted a windbreak on two sides of the orchard of the Experimental Farm, and I expect that in time that will be a great protection to our orchard, which is very much exposed. I am very glad, indeed, that Mr. Smith has brought up this subject, because I consider it a very important one.

Mr. MCNEILL: I am glad that the Professor has put in that proviso about having the windbreaks thin. Personally, I would have them 30 or 40 rods apart if I were planting for windbreak. I must say that my experience is not favorable to windbreaks on the whole. No doubt there are many advantages, as has been enumerated here, and for certain sections of the country no doubt a windbreak is an advantage, but at the same time we have numerous examples, in the County of Essex at least, where the windbreaks have been a positive injury, for the first five or six rows of peaches particularly. A windbreak is merely for the purpose of breaking the wind in severe climates. It is of no special value, so far as I can see, in the southern portion of this Province particularly. I really never could see the great advantage of it in winter protection. It was of no advantage to us in 1899—merely a windbreak; and I must say that I never could see

the economic advantage of the windbreak. It takes a great deal of plant food. Where it is allowed to grow thick it is certainly a protection for fungus diseases and insects; and while it is picturesque, and while I admit I would do a good deal for that alone from the esthetic side, from the economic point of view I have yet to be convinced that there is any advantage in a windbreak

The PRESIDENT: Did you have any experience in the Leamington district or in your own vineyard that year?

Mr. MCNEILL: In my own vineyard, as the result of bad farming and the efforts of my former neighbors, we had a windbreak for about 300 feet, a particularly dense one—so dense indeed that it was one of the things that I was always going to tackle, and it was almost two big a job for me—and it was not the slightest protection so far as the frost was concerned. The vines had been killed right to the edge wherever there was clean culture. The grass sward was a protection, and woods served a far better protection than did the windbreak. It was not a question of protecting from the winds at all, it seemed to be a question of the frost, so that where we had clean culture it went right to the edge of this wind-row along the fence. It is an old French farm.

The PRESIDENT: Did it happen to be on the right side of the windbreak?

Mr. MCNEILL: Yes, the rows ran north and south, and it happened to be on the west side.

A. M. SMITH: Did it happen to retain the snow?

Mr. MCNEILL: No, there was not enough snow to run a wheelbarrow.

Mr. PETTIT: That is just the point. Where we have snow and it drives away, we have damage on the vacant places, and that is where a windbreak would be an advantage.

Mr MCNEILL: A cover crop would gather more snow and leaves and other accumulation of matter that will be a better protection from the frosts than your windbreak. A windbreak is very efficient during such winds as we had last fall undoubtedly, but beyond that I see no value in them.

Mr. MORDEN: A windbreak is out of the question where you have a narrow farm like Mr. McNeill's, because it takes up some room; but where you have wide farms or a series of farms it is a good protection, especially if planted on the crest of a hill, but a windbreak for frost protection is not of much use and a cover crop would be very much better. I have wondered a thousand times, however, that the farmers did not protect their buildings and their houses and their barns for their stock in the matter of winter's cold in the farmers' houses. In the middle parts of Ontario land is sufficiently plentiful to allow room for windbreaks, but no doubt there is a little waste and you cannot make the ground available right up to the very windbreak itself. A sparsely planted windbreak would not do very much service in a great wind such as we had last autumn. One of the great difficulties that fruit growers have is the tilting over of their trees from the south-west.

The PRESIDENT: Is there any need of having that trouble?

Mr. MORDEN: Well yes, there is where the wind abounds as it does in the Niagara peninsula.

The PRESIDENT: Cannot we avoid that by proper planting?

Mr. MORDEN: No, not always. No doubt something can be done in that directfon by slanting your trees more to the south-west, and that is all right, but it will require rectifying from time to time, and a windbreak will do a great deal in that direction to enable your trees to keep upright. I am speaking now of trees that may be a quarter of a mile away from the windbreak.

Prof. HUTT: I think this is a most important question, and I am glad Mr. Smith has brought it up at this time. I am rather surprised to hear our friend McNeill condemn windbreaks as he has done. I am sure if he had had a strong windbreak some years ago when his house was nearly demolished he would not have experienced what he did at that time. (Laughter).

Mr. MCNEILL: The windbreak was not in it at that time at all.

Prof. HUTT: Windbreaks are certainly of great importance for the protection of buildings and crops throughout the whole country. I think Prof. Macoun is right in saying that the Norway spruce is one of the best trees for windbreaks that we have. We have a number of excellent windbreaks at the Agricultural College at Guelph. One that we like best of all is a Norway spruce tree, a double line of trees, the first row alternating

with the second. The trees are about 8 feet apart and the rows 8 feet apart. I think that we might have them 10 or 12 feet apart. Another point is that it is very ornamental in summer, to plant the trees 30 feet apart and then alternate them with a row of maples. The light green foliage of the maples in summer time helps to relieve the dark evergreen and makes a very ornamental windbreak and an effective one in summer. In the winter time, though it acts as a screen, it has not the same value when the maple trees are bare. I think the idea of a windbreak should not be to make a dead calm under the lee of it, but simply to make a screen that will break the force of the wind. The arrangement of maples and Norway spruce as I have suggested gives a good screen and a dense windbreak at the time we want to hold our fruit on the trees. The maple holds its leaves on till all the fruit is off, and thus fulfils the full purpose of a windbreak. I hope the time will come when every farm will have its windbreak or shelter belt. Out in the West where we have been forced to give attention to this subject, they put up belts 30 or 40 feet in width of mixed trees, forest trees, and from those sheltered belts they can take timber as they grow up, and they keep cutting them ; cut off one row and have the other coming up and let that sprout up again and cut off another row—and they get their wood supply from these shelter belts. The trees used out in the Western States very largely are willow and soft maple. Of course in those Western prairie soils they grow with remarkable rapidity, and they keep up a constant supply of timber and firewood from these shelter belts and always manage to cut them so that they have complete protection. Out in that country they had no trees to begin with, and they have been planted largely, while we in this country have been cutting off the forests. I was rather surprised to find in the Western States that they had more trees and windbreaks than we had in this older and supposed to be better part of the country.

The PRESIDENT : What age would one of those shelter belts they put out there be before it would be able to supply sufficient wood for farm purposes?

Prof. Hutt : After the trees have been out fifteen or twenty years they can start and cut them. The willow they cut in ten or twelve years.

The PRESIDENT : That is a very important consideration for them.

Prof. HUTT : They get all the wood they want out of these.

Mr. MCNEILL : I was speaking of a windbreak from an economic or fruit growers' standpoint. When you come to speak of forestry and its use in the protection of buildings, that is an entirely different subject, and there is no stronger advocate of forestry and tree planting than I am. I was just warning the ordinary fruit grower who cannot afford on his limited area of land to plant a windbreak ; but what has been said here with reference to the windbreak for buildings from an esthetic standpoint and as a cover for waste land is quite proper, and too much cannot be said of that. The point that I wanted to impress was that you could not get the crop for five or six rods from a windbreak. You are thus wasting a large part of very valuable land sometimes on small farms ; but certainly where you have large areas of waste land, and places where you can afford to plant windbreaks for esthetic and other purposes, as a matter of comfort, by all means have belts of trees.

Mr. HUNTER (Scotland) : I have been quite an enthusiast at tree planting, and we have planted shade trees in our village for thirty years, but I am beginning to find some of the disadvantages. Windbreaks are like advice—you may get them in the wrong place. It seems very nice to have windbreaks in the barnyards to protect the buildings and so on, but in practice it is not so easily carried out. It is very difficult to grow trees in such positions, especially on those dry plains of Burford and Fairfield. I have planted trees close to the barnyard, and have mulched them and worked around the roots, but they get so hot and dry that it ultimately destroys those young trees and we can get very few of them to grow in those places. Then there is a great deal of traffic around the barns—waggon work and machine work and cattle going around, and those trees will get run over and tramped over and destroyed. It would be a matter of great expense to get any decent trees around a barnyard. You can get them round a kitchen, where nothing is allowed to come, just where it is least required. We have shelter belts around Norwich, running the entire length of the farm, and it certainly has a wonderful influence upon the air. You can go there in the winter when it is blowing a cutting gale and it does not matter which side of that wind protector you are on, you will see the benefit of t—it seems as if the weather had moderated a great deal and it has become nice and calm.

I planted trees twenty-five years ago that afford me a great advantage to the orchard, but we find great damage from the roots, and we cannot grow crops up to within two or three rods of the row. Soft maple particularly takes a lot of moisture. Even if I put on a heavy coating of manure on that ground those trees seem to get the benefit of the manure, and I have had to cut a heavy drain near the fence. I find they are a protection to my trees from getting sun-scorched, in protecting the one side, because it is well known that even planting will not guard against that. You might plant with an angle towards the one o'clock point if you like, but when it comes on a heavy rain and the ground gets really wet in the summer, then comes on a gale from the west, even if you are protected the tree will lean over. You must upright those trees and tramp the ground solid a little to the west of them again or they will get away from you. These are trees that were planted five or six years ago, and many got leaned over last summer when the land was very wet. I find no trouble so far as the hardiness of the fruit trees in winter is concerned. Just as a tree is protected so it is equally tender; as it is not protected so it is equally hardy in the strength of the bud and its ability to stand cold. It is well known that the home of the peach in this country is in the mountains of Virginia, away up in the highest places, dry and unprotected, and I find that where they are more protected the twig grows slender and more delicate, it does not seem to be able to stand the weather and be productive as those in the open. The same remark applies to grapes as far as we have tried them, only in a limited scale. I cannot grow such grapes as some of the Rogers original varieties at all within reasonable distance of this shelter—the mildew prevents them; but if I grow them in the openest place I can or where the least possible shelter is, I grow them without the sign of mildew, and they will ripen the wood better and enable them to stand the winter better than those that are grown anywhere near shelters. In fact the latter do not mature the wood at all; a great deal of the wood will be green when the winter comes on; and in that way it is a doubtful benefit so far as the hardiness of the peach or grape is concerned. The apples seem to vie with the maples, although the maples may be a great distance from them, in getting their tops up slender to get breath. You must be able to spare quite a breadth of ground for these wind breaks if you use them anywhere near your fruit trees. It would be a great advantage at a distance, but not close.

Mr. GRAHAM: Having one of the oldest windbreaks in the Province, I feel the advantage more and more every year. My orchard is in the valley and I live up on the mountain where there are some very fine trees around the house, but before those are matured they are nearly all on the ground; whereas the very large Kings will hang until they are fully matured, right until falling, and I certainly would urge every one who has a natural wind protector such as the side of a mountain to take advantage of it and plant your trees there. Up near Collingwood mountain, where the wind has got a sweep, thousands of barrels of fruit have been swept away during the last two years just for want of a windbreak.

Mr. J. W. SMITH: Not only a windbreak in the shape of trees is good, but where there are hills in the right direction it is a good protection. Being in the nursery business I have looked this matter up somewhat. A year ago last winter there was a great loss of nursery stock where there was a wind protection where it held the snow, but there was no hurt to the trees, neither to the nursery stock nor to the bare trees. My farm runs up the side of the mountain and runs down half a mile. Well, within a quarter of a mile of the mountain I never lost a tree nor a vine, but when I got to the lower end of my place, I had an orchard there that I lost about 35 or 40 per cent. of the yield. A windbreak holds the snow when it is in the right direction whether it is a hill or whether it is planted. What we want in this direction is to get the snow to lay where it falls. After a thaw the water begins to run about 60 or 70 rods distant from this mountain; but go near the windbreak and the snow lies there and does not wet it enough to let it run. The water runs down on the frozen ground and leaches, and it makes no difference. While it is laying, if it comes a heavy frost it will freeze the trees. Up near Leamington the trees freeze down when the weather becomes cold and the lake freezes over, because they have not enough of snow. A windbreak north and south won't do it, but if they have a windbreak east and west at intervals I will guarantee it will save 75 per cent. of the trees that are now killed one year with another. Two-thirds of the peach trees in the vicinity of Jordan, one of the best peach countries in Canada, are on the

high land, and two-thirds of the crop this year generally was not fit for market. Why? Because the trees were not protected. But go up near the ridge where they were protected, and every orchard has good fruit. Few of them knew the cause was root-killing. Near St. Catharines I found a whole orchard of Keiffer pears of 50 trees, and all the fruit was laid on the ground after that terrible wind rushed over them. If that orchard had a windbreak just to the south end of it, there would not have been 10 per cent. of the fruit off.

Mr. HARRY PICKETT (Lorne Park): You cannot grow small fruit to perfection in an exposed position where wind has full sweep, because it dries out the surface of the soil so much. With small fruit where it is sheltered you can get the best result.

Mr. J. W. SMITH: As nurserymen we take up our trees and heel them in. If we take up a tree and heel it in properly, which we do sometimes, in an exposed place, and the thermometer runs up to 80 degrees, which it does sometimes before we can get them out to our customers, and there comes a wind, say twenty miles an hour, and it blows all day for two days, you will see that the tops of those trees are wilted, and if not watered very soon and the parties to whom they are sent do not take care of them, they will begin to dry up, and they will blame the nurseryman for it. If you had a good windbreak around your packing ground to the south and west it will prevent the wind from blowing through there, you can keep them for four days and in better condition. Trees heeled in a nursery in a cool time, will keep for three or four weeks, but it is the wind blowing twenty or thirty miles an hour that dries our trees out. A windbreak will prevent that.

Mr. SHERRINGTON (Walkerton): I think I can solve the problem of these gentlemen in the south. Sell out and come to the county of Bruce. The snow will stay when it comes. I left home Monday morning and had good sleighing. The snow stops with us all winter. You can go out in January and dig the ground. No frost in the ground. We are not so troubled with being frozen out in the winter; the ground is dry and no frost in it during the whole of the winter. You may think sometimes we are very late in the spring in getting on to our land. As soon as the snow goes away we are ready to go to work and the ground is ready for us; there is no frost in the ground. All our plans go right on. The snow fell this year a little earlier than usual; it fell a week ago last Sunday, and it is still on the ground I presume, and very good sleighing, and this stays with us until April and it goes away. I have some dewberry, the leaves of which remain green right through the winter. I would like to have some of you gentlemen come out there and start fruit growing. We have a country there that is second to none in Ontario; we can grow everything except peaches and grapes, and we are growing peaches. In a few years I think we will be able to show you peaches that will just make you hustle.

The PRESIDENT: Peaches will not stand 20 degrees.

Mr. SHERRINGTON: They do with us.

The PRESIDENT: They must be thoroughly matured.

Mr. SHERRINGTON: We have peaches that have stood 30 degrees below zero, and fruit every year. There are trees there sixteen years old that have never missed but one year in fruit.

The PRESIDENT: What variety?

Mr. SHERRINGTON: It is a seedling of the "A 1." Mr. A. H. Pettit has seen it. I have travelled considerably as a judge at fairs at Port Elgin, Lucknow, and all through there, and they all say they have peaches every year. I think there is something in this, that it does not seem to thaw out as it does in the south. The temperature seems to stay more even during the winter, and the buds don't seem to start out till later. The same with pears. I think there is a great deal in an even temperature during the winter.

The PRESIDENT: There is no doubt your conditions for the roots of the trees are much better than they are with us.

Mr. SMITH: We would like to go up there for our meeting next winter.

Mr. SHERRINGTON: I have mentioned that for several years. They are very much interested in fruit growing up there; that district is going to be one of the very best apple districts in the Province, pears and all kinds of small fruit the same, and the farmers there are very much interested, and they would be very anxious to have this Association hold their annual meeting with them another year; and the reason I am pressing it now is that I think when people are ready for it, that is the time to get in.

The feeling may go off them again and they would not probably take hold. They would at the present time. It is not the town that is agitating, it is the farmers.

Mr. HUNTER: Is the San José scale up there?

Mr. SHERRINGTON: We have not got it, I hope I think it would be to the interest of the Association, if they want to extend the influence of this organization through the Province, to go up there for a meeting.

A. M. SMITH: Put in your application for next year.

Mr. SHERRINGTON: This is the third or fourth time we have applied for a meeting, and we are getting tired. You talk about apples. I think the average in our section would be in the neighborhood of 40,000 barrels. We put up 22,000 barrels ourselves, two of us, besides other packers. For quality we do not take a back place with any part of the Province.

FORESTRY FOR FARMERS.

By L. B. RICE, PORT HURON, MICH.

I would be very glad on this occasion if I could say some complimentary things of you. We bring to you the greetings of our Society, and know that you are doing a great work, but I am especially interested in your meeting.

In taking up this branch of foresting, I find that I am very much in line with two of those whose names appear on the programme as preceding me.

I am glad to come before you to present a subject to your consideration in which I feel so much interest, and at the same time one of such vital importance to Ontario.

On my way from Port Huron to Brantford on the train, of the hundreds of wood lots along the road, I did not see one that was properly cared for. In no case was there any chance whatever for young trees to start, and sooner or later the old will be gone and none to take their place, and unless the owners are roused to the situation, your beautiful hills dotted with bits of forest will become bare and bald. In our own country the same conditions exist.

In taking up this subject, I would have been glad to tell you of the work being done in my own State to preserve large tracts of forest land and protect it from fires and from thieves, or to have told you of the great work being done by our general government in the same line, or in helping corporations or private parties who wish to plant out new grounds, by sending out expert men to advise in selecting location or in planting out the trees. But my time is all too short; I must narrow down my talk to the farmer of to-day in his present needs, for the proper care of such small lots of timber as he may have on his farm, or with the man who wants to plant out a young forest either as a wind-break, or shelter belt, to meet his future wants for wood, posts or timber, or to be a source of profit in ten to twenty years.

I shall not take up the subject from the sentimental point of forestry from the love of the trees or the beauty of the landscape, but from the cold business standpoint of dollars and cents. I want to have a home talk with the man who has a small piece of woodland left on his place from the destruction of the great forests that grew all over this land only a few years ago. After that I will have a word to say to him who wants to plant out a new grove of timber.

To the first I want to say that your trees lack vitality, many of them have died and you have cut them out for wood or for timber, and of those that are left, few have made very much growth in the last ten or fifteen years, and dead tops and limbs are to be seen everywhere. Soon the day will come when you will be called to cut those out too, and you have no young saplings moving up to take their places. Like the old veterans of the sixties they are fast passing away and soon the last one will be gone. What is the matter with them? That is just what I want to talk with you about. If you will listen for a few moments I will try and show you where you have done wrong. I would like to tell you of the mysteries of the forest depths, of the elves and the fairies who dwell there, and watch the falling seeds and the nuts, and cover them over with leaves that they may grow into other trees, that plant the wild flowers and feed the song birds.

Only a few years ago your little timber lot was a part of the large fores where the wild deer and his companions roamed at will. The sunlight never penetrated its depths,

and the winds never rustled the fallen leaves. Every autumn the ground was covered over with a nice new clean coat of leaves, while those that fell the year before went rotting on the bottom making a ready prepared food for the trees when they should start to grow in the spring. In addition to this warm coat of leaves, the first snows of winter came sifting down through the lofty tree tops and gently and evenly spread a blanket of white over the leaves, the old logs and the brush, there to remain during the long winter, an additional protection from the cold. Though the storms rage over the tree tops, no wind disturbs this blanket of snow, but each succeeding one spreads more snow to add to the warmth.

But how does all this apply to my wood lot? I will show you. Under these warm coverings the frosts of winter never penetrated, and the leaves hold a reserve of moisture against the drouth of summer. In this loose loamy soil, made rich by the rotting leaves and wood, the feeding-roots of the trees found abundant food to give them luxuriant growth. The result of this was that all of the roots were spread out near the surface of the ground. This was proved by the over-turned tree showing that no roots struck down but all were flat on the surface. Now, if you remove this warm, moist covering from the ground what will be the consequences? The roots of those trees that never felt the frost before will be frozen solid in winter and pinched and shriveled by drouth in summer.

How have you removed the leaf covering? You have cleaned away the large forests, and left only a small tract of timber. This you have pastured till the cattle and sheep have eaten all the young growth that was coming on, and nothing is left to break the force of the wind. Now it rages through the woods and the autumn leaves and the winters snows have been swept away. Under these changed conditions with these tender roots both frozen and dried do you wonder that your trees are dead and dying? The only cause for surprise is that any of them are alive.

A few of the younger elms and soft maples will adapt themselves to these new conditions and strike a deeper root, and survive the ordeal. But all of the older trees must go sooner or later; their doom is sealed, and they must go unless you can restore the original condition of things before it is too late.

Nature has provided a renewal system for its forests. It is a system that has been on trial for a good many thousand years, and so far it has worked well.

In the forests primeval down to this date the old trees have died and fallen and the younger ones are already well grown to take their places. As with man so with trees, the old and feeble have fallen during decade after decade, and the younger and the sturdy have so soon closed up the vacancy that they have not been missed.

What is this renewal system? It is simply this: The little winged seeds come fluttering down to find a lodgment, the maples, the elms, the ashes, the poplars, the beechnut, the chestnut, and the acorn, and the leaves come after and cover them over. Early in spring the tender young shoot stands up through the leaves, and the tree of the future appears. Who is there that has not gathered the delicious young sprouts of the beechnut in the spring and eaten them? The woods are full of these young trees, the pine, the hemlock and the cedar, all struggling for existence, but you have turned in your cattle and your horses, your sheep and your hogs, and have browsed and trampled and routed till there is not a young tree left. Thus you have destroyed what little protection there was to the wind swept ground, and there is no chance for a seed to stand. Now the question is, what to do to restore all of these conditions so as to save the life of the trees. The first thing to do is to drive your stock out of the woods, then put up the bars and lock them, and throw your key away so that you will not be tempted to turn them in again.

Then let the grass and weeds grow as they will. They will make a "catch" for at least a part of the leaves, and hold them on the ground to make a winter protection for the roots of the trees.

We study to get the best winter protection for our orchards, and why should we not for our forests? Some few seeds from the trees will find lodgment in these leaves and weeds, and will get protection enough to grow. You can assist nature by going through the woods and scattering seeds of desirable trees with a free hand. In vacant places plant in walnuts, catalpas, or any variety of trees that you may want. You will be surprised to see how soon the young trees will cover the ground and the older

ones will stand out with renewed vigor. You must allow a thick growth of underbrush of whatever kind around the outskirts of your timber lot, particularly along the fences, as it helps to break the force of the wind.

This manner of renewing the timber on the land will apply to any waste land, steep hill sides, river bluffs, or ravines, where there is already a sparse growth of timber, or where the timber has recently been cut off. To illustrate this I will give to you the experience of one of the best experimental workers in the country, Prof. Budd, of Iowa Agricultural College.

He says: "As an example of extreme rapidity of growth, twelve years ago I purchased 40 acres of recently cut bluff timber land for the small sum of $200. At that time I might have secured hundreds of acres of similar land, which now is cut up into homesteads, where the occupants make a scanty living by cultivating the marshy, porous soil. The 40 acres is now like an oasis in the uninviting tract, with an even growth of white oak, red oak, burr oak, hickory, ash, red elm and other valuable timber. Thousands of these trees are over one foot in diameter, and peculiarly tall and straight owing to their close growth. If cleared and the young trees utilized at the present prices for railroad ties, timber for wagon hubs, posts, rails, wood and other economic uses, the proceeds would far exceed the aggregate selling value of the crops grown on adjacent tracts of like extent for the 12 years."

Many of you have waste places on your farms where there is a sparse growth of timber or where the timber is being cut that is of little value for cultivation now in use for pasture. If you would fence the stock from these lands, and protect from fire, you might repeat the experience of Prof. Budd, on your own farms. Should you wish to change the timber you could scatter in seeds of catalpa for posts, of the white ash, oak or hickory for timber, or you could purchase cheap seedings of the chestnut or black walnut and plant in desirable places. Keep out the stock and the fires, and nature will do the rest, and you can rest assured that she will do her work well. Our work must be in harmony with her, and as nearly as possible restore the original condition of things. We cannot fight against nature without losing every time. Surely there is pasture enough on your broad acres without robbing future generations of the forests which are their natural birthright.

Now we come to the second part of my talk which is to the farmer and others who wish to start forest plantations, wood or timber lots, shelter belts or wind breaks. In these days of blizzards and tornadoes shelter belts and wind breaks may be the means of saving much property, for the young trees will strike a deep root, grown as they are in exposed place, and they will withstand almost any storm.

After you have made up your mind that you want a plantation, the next question is, what shall I plant? When we hear a man speaking of planting a new forest we think of one who is looking forward to the wants of his grandchildren to the third and fourth generation, but it has been demonstrated that a man who has passed the middle age of life may plant to meet his own wants on the farm or in the vineyard, or he may plant and look for good returns financially.

If you want stakes, posts or railroad ties, you will plant locust or the hardy catalpa. The latter will give the quickest returns but it is not absolutely hardy with us. It is on its northern limit here, but it has this advantage, if it winter kills while young it will send up a half dozen sprouts in the place of the one killed, for the root does not kill. If after it is older you can use it for posts and stakes, so nothing is lost, for your trees need thinning out as they grow. Even catalpas should be planted much thicker than they can grow to prevent their making tops too near the ground. If instead of planting catalpas to fill up the ground, which are worthless while small, you plant white ash, oak or hickory, you can sell the thinnings for hop-poles. These will bring, when 1½ to 2 inches through and 7 feet long, $10 to $12 per thousand feet, and as they get larger the limbs are good for timber and tops for poles or wood. White pine can only be planted for timber when it reaches good size, so it must have other trees between to produce good results. In planting either black walnut, white pine or catalpa, you should give the space that you expect them to occupy when good sized trees, and as it is necessary to have something between them to force them to struggle up to catch the light of the sun, thereby giving them tall, straight bodies without limbs, you will use something that has a commercial value, while small as stated. If I were

tc start a young forest I would plant 200 black walnuts to the acre ; that would make them 14 feet 10 inches each way. I would then plant between them, with rows both ways, the catalpa for posts ; this requires 600 trees, and they with the walnuts would stand 7 feet 5 inches each way. But experience has taught us that at less distance than that the catalpa will make heads in from 3 to 5 feet from the ground and be comparatively worthless, so I would fill in the one now and plant another between to make them as close as the trees in a nursery row, with a tree as above for hop poles requiring 10,000 trees.

I will give you some statements from reliable persons showing the profits that have been received from trees so planted out, and the growth made in a few years.

In former years the locust was planted throughout the country for post especially in the west, but the advent of the borer caused them to be discarded for the handy catalpa. Now thousands of acres of these trees are being planted by railroad corporations, and by private individuals for posts and for ties.

I quote from Bulletin No. 27, U. S. Department of Agriculture, Division of Forestry ; " A plantation of catalpas near Hutchinson, Kansas, planted in 1892, began a year ago to reimburse the owner. (That would be in 7 years.). The trees taken out at that time made two posts each. One or two stakes could have been taken from the tops.

Another from the same: Mr. S. W. Yaggy, four miles west of Hutchinson, in the sandy valley of the Arkansas River, has 440 acres of catalpa. He planted at the uniform distance of $3\frac{1}{2}$ to 6 feet apart. The first planting was done in 1890. When the trees were two years old they had formed tops within 3 to 5 feet from the ground. This was a serious defect, so the trees were cut back to the ground. After six years from the time of cutting back 2500 trees were cut out from eighty acres in thinning, only the larger ones being taken out, each making two posts. These were sold for $1240.

The same authority states that Mr. E. T. Hartley, near Lincoln, Neb., has one acre planted to willows, which has provided all the necessary fuel for the farm, and to-day there is more standing timber on it than ever before. The plantation is in a ravine of little value for other purposes.

I will add a word for the Carolina poplar as grown in Port Huron. In 1883 I planted a row of these trees on a dry sandy pine ridge in front of a house on Willow st. Just before leaving home I measured some of them, and found them 6 feet in circumference 2 feet from the ground. Another lot planted the year before measured 6 feet 4 inches, same height. One of these trees would give a good 16 foot saw log, and more than a cord of wood from the top. The wood is light, tough, and strong, and seems well adapted for any purpose where thin, light, tough timber is needed. I have specimens of the timber here, and would invite any one to examine them. But of all of the timber of trees of this latitude for profit, I think that the American black walnut heads the list. It is indigenous to our soil, and perfectly hardy, and is comparatively free from the attacks of depredating insects. It grows rapidly into a tree of noble proportions, and while it loves a rich, bottom ground it will thrive on almost any fairly good soil. Its roots strike down deep into the subsoil, and it gathers largely from the elements, and if the leaves are left on the ground it will enrich its own soil. It has sometimes been called a witness tree, because its presence is a living witness that the soil is rich. It will not stand the tramping feet of stock, and it needs the full protection of a growth of timber around it to attain perfection.

In the Michigan State Hunt Society report for 1882, on page 81, Wm. H. Regan, Secretary of the Indiana State Hunt Society, says, " A man in Wisconsin planted a piece of land with black walnuts 23 years ago. The trees are now 16 and 18 inches in diameter, and have been sold for $27,000.' The writer does not give acreage or number of the trees, so we cannot judge of the profits.

In the report of the same Society for the year 1885, I find an exhaustive report on the " Forestry Problem," from the pen of Charles W. Garfield, who has earned the name of " Michigan's Forest Champion." Mr. Garfield was at that time, and for several years before, Secretary for that Society. He says, " Mr. Hughs, of North Atchison, has had an experience of thirty years in tree growing in Kansas. Nine years ago he planted a lot of walnuts on his place in Doniphan County, and now they are large, vigorous, and handsome trees. For the first two years their progress was slow, but after that they grew as fast as cottonwoods. He picked half a bushel of nuts from

each tree the 7th year, and the same summer they afforded a grateful shade." "Mr. Hughs is satisfied that a walnut planted in '82 will make a better tree in '89 than a soft maple of ordinary planting size, set out at the same time."

Mr. Garfield also reports the following : "Ten years ago Mr. Graves, of Texas, planted ten acres of black walnut by hand, 200 to the acre, in all 2,000 trees. The trees are now nine inches through, and are growing at the rate of one inch a year. Last year the trees bore 400 bushels of nuts, which brought $2.50 per bushel, or $1,000 for the ten acres, good interest for land worth $10 per acre." "If at the age of 20 years one half of the trees are cut and sold for $25 per tree, $25,000, the nuts from the remaining 1,000 trees will be worth $2,500 per annum." He might have added that in ten years more the timber remaining would be worth $50,000. This is certainly a good investment, but it is much easier to figure large profits on paper sometimes than to realize large profits in actual business. "The hills are always green in the distance."

I will give you one case more. Mr. C. B. Wilson, of Jacksonville, Ill., drove me out to his farm some time ago to see some black walnut trees. I measured them and they were sixteen inches through.

They would saw into timber a foot of clean black walnut boards and have the tops, limbs and stumps left. The stump itself would sell for $5, to saw into veneers.

"What could you sell these trees for, for cash?" I asked. "I could sell them for $25 per tree, and in ten years I could sell them for $50." That would be at the rate of $10,000 per acre for the use of the land for thirty years, and the by products such as hoop timber, posts, wood, nuts, etc., would more than pay all of the cost of planting and care of the trees and interest on the investment, taxes, etc.

This seems astounding, but when you know the man who has compiled these statements, and his care not to be misleading, you can but feel that they are true. You will notice that each case referred to in this report comes from widely separated localities, and that all agree in placing the value of trees at twenty to twenty-three years old at $25.

With this fact established, I see no reason why one need to hesitate to plant a forest where the black walnut should be the leading tree for profit.

I don't for a moment suppose that every one who plants will reap such a harvest as the figures above would indicate ; but if you plant wisely and cultivate well for the first five or six years, you cannot but win success. After that time you can leave the place to itself, only cut out the extra timber as it needs thinning. Leave a protecting growth of anything that wants to start along the fences, witch hazel, tagalden, anything that will help to check the force of the wind in sweeping through and carrying away the leaves.

After a few years you will be surprised to find that the native trees of the locality are coming in to fill up the ground as the others are cut out and make this a perpetual forest. If you wish you can scatter seeds of especial varieties for an undergrowth. Your larger trees will thrive all the better for this thick undergrowth on the ground, particularly if this is made up of a variety of timber.

Notice the old pine monarchs of the forest towering far above the thick timber. How they thrive.

In taking hold of this work do not start out because you think that it is the sure way to wealth but because you need the windbreaks and the protecting influence of growing trees. Do it to meet the demand for wood, stakes, posts and other timber on your farm. Do it for the love of the beautiful in your surroundings and the diversified landscape. Do it for your children and for coming generations. Do it because the future needs of your country demands it of you. I care not what your purpose may be, if you will only do it.

Since reading the above at Brantford I have received the following from Mr. A. E. Sherrington, Fruit Experimenter for the Bruce District near Georgian Bay :—

WALKERTON, Dec. 22nd, 1900.

Dear Sir : I measured those walnut trees I was speaking to you about while in Brantford, and I find them better than I thought they were. They measured 6 to 8 inches in diameter at 3 feet from the ground and they were from 60 to 70 feet high from the ground to the first limb

and as straight as can be. They were planted 18 years ago this fall. The nuts were put in the ground where the trees were to remain. A few were transplanted and they have made the largest growth. They are planted 12x6 feet alternate in the row. There are about 300 in the lot, and the party is planting out a large block next spring.

This is a good report, showing as it does what may be expected so far north. Evidently, his trees are too near together to give them such height for the size. If he had given four times the space and had filled in with catalpas he could cut out four parts now.

CO-OPERATION IN THE SHIPMENT OF PRODUCE.

By Ernest Heaton, Toronto, Ont.

The question of the systematic marketing of our produce is perhaps the most important practical question before the people of Ontario to-day. As Mr. Dryden said last night in this hall, the export problem cannot be tackled by individuals acting separately. The only solution lies in co-operation. We have now to discuss how this can be done, but the subject is so broad that it is impossible for me to attempt to deal with it fully in the short time at my disposal.

Co-operation in the shipment of fruit at once brings to our minds the orange groves of Southern California, where, as you all know, the marketing of fruit has been developed into a science, and has been made a most remarkable success.

A few years ago I paid a visit to that country, when I had occasion to study closely the orange industry, and I could not help feeling then that, if we only gave the same care to the culture of our fruit orchards in Ontario as the people of California give to their orange groves, and if we were only half as systematic in the marketing of our fruit, we should have no cause to envy the fruit growers of the Pacific slope.

There are always two kinds of grower in every community, the people who want to sell for spot cash, and the people who prefer to consign their stuff in the hope of making a larger profit. With both of these California does better than Ontario. Here the buying of fruit has been left open to any inexperienced, irresponsible man who likes to enter into the business with the assistance of an advance from an English broker. We know the result! Dishonest packing and the discrediting of the apple business of Canada.

In California the business is almost entirely in the hands of a few large firms—like the Earl Fruit Company and Messrs. Porter Bros., and others—who have a permanent staff of experienced buyers and trained packers and who ship their fruit in their own refrigerator cars. Their brands are known all over Canada, the United States and Great Britain, and they have succeeded in pushing the sale of California fruit each year further and further afield.

But it is for their method of consigning fruit that Californians are chiefly remarkable, and it is to this that I wish particularly to draw your attention to-day.

I do not pretend to say that we could duplicate the system here, but I am quite sure that there are some of its features that could be adopted in Canada.

The growers form themselves into associations. There are local associations and a central association. The members can sell outside of their association, but if they do they are bound to pay a forfeit of ten cents per box. The local associations employ skilled hands to grade and pack the fruit, and they ship the fruit to the Central Exchange. The Central Exchange has agents at the different market centres, who telegraph market reports and receive the fruit for sale by private contract, or by auction as they deem best. When a shipment is received from the local association it is forwarded to the market which, according to the received reports, promises best at the time. The shippers receive dividends from the central association, a portion of the proceeds of each shipment is retained. If any shipper suffers a loss from the damage of delay of fruit, all the members of the association contribute to make it good. After this sum is deducted an average is struck of the proceeds of the shipments, according to the different grades; the actual cost of the management of the Central Exchange is charged up, and a final dividend is declared at the end of the season. The Central Exchange also fulfils a useful function by buying wholesale and distributing to the local associations the material for the manufac-

ture of the boxes for packing fruit. The popularity of this organization is constantly increasing and to-day the fruit associations of California market thirty-five per cent. of all the citrus fruit grown in the State.

This, of course, is all very interesting, but the question that concerns us in Canada is, can we learn any useful lessons from the people of California ? Is it possible to apply the principle of local associations here ?

Each local association should own or lease a cold storage warehouse, packing house and evaporating plant. If a number of responsible men would club together to lease such buildings for a term of years there would be no difficulty in securing capital to erect them and the Government would help.

There are a good many people who say it is impossible, as co-operation involves an absence of jealousy, and a willingness to give as well as to take, which is generally supposed to be rare amongst us here. Our people, it is said, are not built that way. In answer to this, we may point out that there is a local fruit growers' association already existing at Burlington on co-operative lines for the exportation of fruit, and if co-operation has been successful in the manufacture of cheese, why not in the marketing of fruit ? Again it is said what may succeed in established fruit districts like Burlington, cannot be successful in more scattered communities where orchards are smaller and further apart, and it would not pay to bring apples to a packing house to be graded. There is something in this objection ; but it is matter of degree, and there is no reason why portable grading machines and expert packers should not be employed in the less thickly populated sections of the country.

For a central association controlled by shippers there is a great field for usefulness, even if local associations are likely to be slow in formation. Such an association would not be restricted to any particular market, and there is no reason why it should be confined to fruit. It might, with economy, embrace all kinds of produce, for the services required by the different kinds of shippers in many points identical. Its functions would be to give instructions how to prepare produce for market, to furnish to its members the latest information respecting market prices and sailing dates of ocean vessels, to arrange for railway transportation, to look after shipments at the seaboard, to control shipments so as to regulate prices by preventing a glut in any particular market, to receive produce at the port of destination for sale, either by auction or private contract, and generally to push the sale of Canadian produce, wherever a market can be found.

It must be borne in mind when we are organizing this Association that we cannot succeed in selling our fruits in the British market unless we dovetail our machinery with the established channels of trade.

Through an association of this kind special contracts could be made for the raw material to be used in the cases and wrappings used for export and special rates might be made with rail and ocean steamship lines, and pressure might be brought to bear upon the brokers in Great Britain to make a straight commission charge covering their commissions and all charges *ex quay*. This would overcome the objections that have been made to the alleged excessive charges of commission merchants.

It will be said, perhaps, that all this should be done by the Government. I do not think so. The work must be done by business men, not by politicians chosen for their party services. But Governments, like Providence, help those who help themselves. Such an association will have a potent voice in formulating the policy of the Government, or, let us say, in giving them backbone in any forward policy they may adopt, and Heaven knows ! there is room for such a force. Some people imagine we have made great progress in the development of cold storage, and cold storage means a great deal to the people of this country, but if we look at Australia we can see where we stand. At present there is engaged in the Australian trade a fleet of 114 steamships fitted with mechanical refrigeration while Canada has only 23 vessels trading from Montreal, and two of the Australian vessels have more cold storage capacity than all the Canadian vessels put together. So far is cold storage as concerned, we have reason to be ashamed of ourselves. We have only tinkered with the question.

I would impress upon you, gentlemen, that it is most important that this subject should be thoroughly discussed at the present time, if there is anything at all in the suggestions that I have made ; for we are as yet merely at the beginning of things. Prof. Robertson is responsible for the statement that of the twelve principal fruit products,

wheat, living animals, dressed meat, cheese, butter, eggs, lard, raw fruit, condensed milk, potatoes, poultry and game imported by Great Britain, Canada could readily supply thirty-three per cent., whereas at the present time she only makes a paltry contribution of seven per cent. Prof. Robertson's statement means, if it means anything at all, that the only thing that prevents the quadrupling of Canadian trade with Great Britain in these articles is the want of agressive, systematic effort, and we must not forget that Great Britain is not our only market. This is the time to formulate the lines upon which our energy shall be expended. We will not build castles in the air, but I would like to point out that in some respects we are the most favored people upon earth. Not only are we by virtue of our geographical position in the very centre of the British Empire, but like the chosen people of old we have, too, our Balaams who come to curse and remain to bless. There was a time when the young men of this country went whining after the United States. They could hear nothing but the eagle's scream. They did not see the opportunities that lay before their eyes, and they forgot that God had placed them in this country to develop its resources. At that time President McKinley thought that he could clinch matters, and with a hostile tariff bring the people of Canada to their knees, to become hewers of wood and drawers of water for the United States. He did not know the stuff we are made of. He put us upon our mettle. With our backs to the wall, we set to work at once to find independont markets for our products and manufactures, and we set to work to perfect the machinery of our export trade, with the result that we are now upon our feet. The scales have fallen from our eyes. We know that we can be independent of the United States, and we know that our young men can find at home all the fortune that they want, for all we have to do to obtain riches, is to develop the potential wealth that lies at our feet. There was a time when England did not recognize the duties that she owed to her brothers in the Empire, when no difference was made by the masses of the English people between Canadians and the citizens of the United States, when they all were called Americans, and in the wider name Canadians were lost from sight. It was Paul Kruger who changed all that. The tumult and cheers which within the last few weeks have greeted our Canadian boys in the leading cities of Great Britain are a sign of the change of the attitude of English people towards Canada. These cheers have their counterpart in the world of business. To-day the business men in England are only too anxious to assist the Canadian people in developing trade within the empire. If sentiment goes for anything, the trend of trade and of capital from Great Britain will be to Canada in preference to the United States.

We must not neglect any market, but now is our opportunity to develope our Imperial trade. It rests with the practical business men of Canada to accomplish this by an aggressive system of co-operation in the development of Canadian trade throughout the British Empire.

Now gentlemen, I believe it is somewhat of a departure for this Association to speak on matters of this kind. I have always understood that the work of your convention was chiefly in the direction of protection or defence against bugs and against winds. I may be mistaken in this, but I would like to see this very important question fairly taken up by this Association, and I would like to see you take the first step to put into practical form the suggestions I have made to-day (Applause).

Mr. WHITNEY (Iroquois) : Ever since coming to this meeting the subject of that paper has been upon my mind. We have heard two great difficulties spoken of—the correct method of packing fruit, honest packing, and the transportation question. I believe the suggestions as to the methods in vogue in California will solve the difficulty. It was my pleasure during the last Spring to spend some months there and I studied this question very closely, and the system practised in California met with my great approval, and I am glad to say that one part of our Dominion has already adopted it. British Columbia has the system in force to-day, and they are not behind the other parts of the Dominion in fruit raising. The only difficulty that I see in co-operative fruit selling is in regard to the different kinds of fruit that we would have to take to this exchange. We have winter fruit and summer fruit, and perhaps half-a-dozen kinds might be taken to the exchange in one week, to be packed and shipped. If that difficulty can be overcome I think there would be no other. These exchanges command to the respect of all the growers. Every grower feels that he is being honestly treated, and without this confidence it would be impossible to carry it out. The method in operation in California is something like this :

When the shipping and exchange managers hear that there is a chance for the shipment of a car or several cars of fruit, say oranges or lemons, they apportion this carload among all their patrons who are the growers. I have a brother-in-law there engaged in fruit raising. Once he received notice that he would be required to send in 50 boxes on a certain date. He prepared himself to do so, took the 50 boxes just as they were picked from the trees without any culling, simply put them in loosely in the boxes. and drove over to the exchange They passed through a gentle inclined plane, and on each side of the fruit as it goes through there are revolving brushes that brush every partical of dust or dirt from the fruit. They pass all through another inclined plane, and girls stand on each side and make a selection, culling as the fruit passes along. Of course there might be more danger of bruising apples than oranges. They take out the very largest fruit and put it to one side as being of very little value. They take a uniform good-sized navel orange as their No. 1, and if there are no small ones they are selected and passed through another shute, and thus when they get to the other end they are all ready, uniform in size, and these are hurriedly packed in paper, and they know just how many oranges of a standard size will fill their box. These boxes are immediatly taken and put in refrigerator cars,thus obviating the necessety of cold storage. In Grimsby or in my own home we would not need refrigerators locally if this system was carried out, because the fruit will be placed at once upon the cars, and shipped at once to the proper destination already bargained for. All the people throughout Ontario know what it means to co-operate in the matter of the cheese and butter industry, and we have not to educate them up to the advantages of co-operation. All we need is some action on the part of the leading fruit growers or business men to set this movement going, and I believe we must and will come to it. Our present system is very antiquated and cannot stand.

COLD STORAGE FOR FRUIT AND OTHER PRODUCTIONS.

By Hon. F. R. Latchford, Commissioner of Public Works.

It may be expected that, after the somewhat depreciatory remarks of Mr. Heaton concerning politicians, I should premise my observations with an apology. I do not, however, intend to do so, because I do not think I am one of those who, after entering public life, cease by that fact to take interest in the general welfare. Such men are, I believe, not numerous in this Province. There are few who do not realize that additional duties are cast upon them when they are called from private life to a public position, and will not accordingly interest themselves all the more in everything that makes for the welfare of the people. (Hear, hear). That at least is my view. Accordingly, although I happen to be in the field of politics, I shall not make any apology on that account. The subject, stated on the programme is not quite that on which I thought to address you. It is true indeed that when invited, I said I would attempt to speak to you on cold storage, but I should prefer to speak of cold storage not as applied generally, but with special reference to the storage and transportation of tender fruits. There are many fruits that can be preserved and stored without what is known as cold storage, though I think that even hardy apples and pears could be improved by receiving considerably better attention during the shipment to the Old Country than they now receive. An instance was brought to my knowledge when in Montreal some time ago, wherein a large cargo of apples consigned to England had been heaped up in the warmest part of the vessel. The result was that the apples were almost completely destroyed. Now, attention should be paid to the requirements of trade by the steamship companies, so that such accidents—if accidents they can be called—should not occur.

I shall endeavor simply to deal with cold storage and transportation only, because the necessity for a proper and improved cold storage is all the greater according as the fruit becomes more perishable. The subject is not altogether a new one. I recollect reading in your very valuable report what was said by Prof. Saunders at Whitby in 1896, and it was evident that at that time he was saying all that could then be said about the cold storage and transportation of tender fruits. You will remember that he told you a large shipment of fruit had been made in cold storage in 1886 to the Indian and Colonial Exhibition at London, that they arrived in excellent condition, and that

some 2500 plates of our magnificent fruits were displayed, to the admiration of the English people. Up to the time he spoke, in an interval of ten years, the success of that shipment has not been repeated. Why it had not been repeated someone responsible must answer; the fact remains. Now, that shipment was made in compartments fitted up under Sir John Carling on two vessels sailing from the port of Montreal. It was my good fortune to have some acquaintance with the method under which those fruits were sent over, and since that time I have taken—though occupied in a profession which did not deal directly with this matter—a very deep interest indeed in the subject of cold storage. I am a fruit grower and a flower grower in a small way, and I have always had a deep love both for fruit and flowers, and as a matter which in my opinion may materially improve the conditions of a large portion of the people, I have a deep and abiding interest in the subject of cold storage. I believe that to the fruit growers of this country there is no subject of greater importance. Perhaps there is no subject on which enlightenment is more required. Since Prof. Saunders delivered his address, there has been a number of experiments. I have seen some of those experiments conducted in buildings which violated every principle of right construction. To give you a demonstration of the reason those experiments failed, I have brought with me and now exhibit to you a piece of decayed wood, and which was till it came into my possession a little over a year ago, part of the lining of a building constructed for the preservation of perishable products, a building erected at the Central Experimental Farm, Ottawa, where the highest scientific knowledge would be, one would think, available. The sample produced is no worse than was the greater part of the interior lining of this cold storage building. There is not the slightest doubt that this piece of board was, when it was put into that building perfectly sound. Now let me ask you a question. If a cold storage building can rot a pine board in a few years is it not perfectly obvious that such a building could not preserve tender or any other kind of fruits from decay? Decay is always with us. It is indeed but a process in the work of nature. We are striving to produce a somewhat different thing from that produced by nature when we raise such fruit as this which I hold in my hand (holding up a large apple). Nature's effort is directed not to the production of the envelope which we use, but to the production of the seed within. You well know that in its original condition the apple was little more than a mass of seed with a bright attractive covering which a bird or animal would seize upon and carry away and thereby disseminate the seed. The covering was useless after the seed matured except for the purpose of dissemination. Nature having perfected the seed proceeds by means of decay to set the seed free, so that the decay of fruit is, so to speak, a perfectly natural process, directed no doubt in many cases not only to preparing the means of dissemination, but also to providing a medium in which the seed can find some nourishment during the earlier stages of its development. While decay is a natural process, and it is not possible in many cases to prevent it wholly, we may be able to retard it, and we shall do that the more easily if we know the causes of decay. The causes of decay and decomposition in animal tissues have been very extensively studied, especially during recent years, and the revelations which that study has brought forth have w nderfully ameliorated the conditions of the human race. We all know why of old a slight surgical operation brought on great suffering and often death. To-day, as the records of the recent war show, exceedingly severe wounds can be treated with success. This happy result has been brought about by the study of the causes of decomposition in animal tissues. We now know that in the air surrounding us there are at all times present the germs of organisms which assist in the process of decay, which cause decay. Speaking generally—and I do not wish to deliver an academic discourse on this subject—they may be reduced to three classes: the molds, with which you are all familiar; the yeasts, with some of which you are familiar; and bacteria. They are always with us and all three play an important part in the decomposition of fruit. Pasteur took a bunch of ripe grapes and by cultivating the yeast spores present upon it found that they produced ten or twelve different species. The germs of the molds are constantly in the air. You have only to expose a sliced apple in this room for a short time, in a high temperature and a little moister air, and you will see a large crop of molds rapidly developed on the surface. Now we have also the bacteria about which we hear so much in the latter days. Many of these are well known to be beneficial, but some p ay an active part in decomposing fruit. As soon as you bruise a fruit you first of all rupture the cells of which that fruit is made up—these little globules of protoplasm

surrounded by a substance called cellulose—each holding its own little life, so to speak. When you rupture the cell you destroy the power of resistance which the cells had when perfect, and prepare a soil on which the ever present spores of molds and yeasts can grow, and bacteria increase and multiply in their own extraordinary way. But for these agencies of decomposition living tissues would not decay. In high altitudes where the air is dry, it has been found that there are few if any bacteria, few if any molds or yeasts present in the air. In Colorado for instance, you can expose meat in the open air, even at high temperatures, for a considerable period and it will not be tainted ; you can expose fruit and no molds will grow upon them, no yeast will develop ; the fruit will simply part with its moisture, owing to the dryness of the air, and become dessicated, as it is called, or dried up. Now, it has been established that the spores of yeasts and molds cannot develop below a temperature of 35 or 40 degrees. They cannot grow at low temperatures. Nor can bacteria multiply, though the low temperature will not kill them. They will be present ; they are as I have said, always with us, and the only effect of a low temperature is to retard their development. The reason then, that a low temperature preserves fruit and other perishable products, is simply that it does not permit of the development of germs.

In producing low temperatures different means are employed. I do not intend to say much of the methods and systems employed to produce low temperatures. They are of many forms, and a great degree of mechanical perfection has been attained in many of them, and the highest scientific attainments have been directed to the production of low temperatures at comparatively small cost. What has received least attention is the application of the low temperatures so produced to the preserving of perishable products. The application has been least scientifically made where it should be made most scientifically. Not many months ago I saw in a ship in the port of Montreal, a compartment intended for the transportation of tender fruits. I could only compare it, as to fitness for such a purpose, to the ice hut of an Eskimo. You had cold all around the sides of that chamber and at the top, and there the system advertised as perfect began and ended. The one consideration thought of was the production of low temperature, and that I must say was attained in a remarkable way; but the fact that your shipments of fruit in such compartments have not been successful, of itself demonstrates that there was something wrong. Nor have the shipments of meat from Australia or New Zealand been very much better. It is frozen there in large quantities and sent frozen to England where it is defrosted and sold at a profit, but yet at a low price as compared with English mutton. There is a reason for this. I am not going to cite the opinion of an English grazier or an English butcher in regard to this meat, but I will give you a statement of the Agent General of New Zealand in England in an official report to his Government. This report is published in the New Zealand Journal of 1898, in the Appendix on page 17. After referring to the excellent quality of New Zealand mutton at the place of origin he says:— "I have eaten Merino mutton here (in London) which has been about as agreeable as a slice of red pine wood, the color of which it somewhat resembles." So that the shipment of frozen meat has not been a bewildering success, although so great is the demand for meat in the English market, and so cheaply can New Zealand mutton be sent there, and so cheaply can it be sold at a profit, that the poorer people buy it very largely. But still the meat does not arrive there in nearly as good a condition as I believe I can show you is possible.

In connection with cold storage, we can, I think, take a lesson from the men who have been studying bacteriology, from Pasteur down to the present time. Pasteur has shown that the most putrescent liquid will not decompose at all if sterilized in the first instance and afterward exposed only to pure air. When a bacteriologist wishes to procure a volume of pure air, the first thing he does is to filter the air at hand in such a way that all germs shall be eliminated from it. Is any such process open to us? Can we exclude from the chamber in which we are carrying fruit susceptible to these destructive agencies, or eliminate from the air within such a chamber these agents of decay? Now I answer that there are such means, and assert that they have not received proper attention, and as a consequence the shipments of quickly perishable fruit have not been a success.

Before referring to such means let me say that in the first place *cold storage must be economical.* If the cold storage does not cost you less than you get in the increased

value of your fruit it is of no advantage to you. You must have economical cold storage; storage that is cheap to construct and cheap to maintain. About insulation I will not speak more than to say that there you have the chief cost. The more money you expend properly on insulation, the better will be the result, but there is a way of securing good insulation cheaply, and that the Government of which I am a member has set before you in a pamphlet recently issued. The best medium of insulation is still or dead air. It is a difficult thing to obtain and keep, yet it can be obtained and kept, and it may be obtained and kept cheaply. The external air is usually of a much higher temperature than that at which you wish to carry your products. Now two proximate bodies, no matter what their temperatures are, are constantly exchanging heat. Ice itself has heat; it is not cold except by comparison with substances of higher temperature, we cannot get down to the degree of absolute cold with ice or even with refrigerating pipes There is a certain elevation of temperature which they have above the point of absolute cold, and there is an exchange of temperature between the ice or other cooling body and the air outside. You are constantly losing by radiation and absorption of heat. There is a loss to the body of higher temperature outside. Insulation is necessary to prevent such loss, and as an inch of still air conducts heat about five times less than pine of the same thickness, still air should be used as a medium of insulation wherever possible. The plans when submitted provide for this. The sawdust filling shown is not as good a non-conductor as the air whose place it in part occupies, but its presence is necessary to keeping the air in its interstices still. The insulation you will notice does not immediately cover the ice, but is placed over the ceiling above the ice, in order that the ice itself shall be exposed for a purpose which I shall presently mention. There will be no greater loss by absorption than if the ice were immediately covered by the sawdust or some other good insulant while there will be an advantage which cannot be otherwise obtained.

Your structure must not only be cheap to construct but also cheap to maintain. You will remember that in old days when we were heating our houses more generally by means of hot-air furnaces than we are now, we took the air from outside the building, and had to heat it often from below zero up to say 70 deg., requiring necessarily a large expenditure of fuel. Today under the same system we take the air to be heated within our houses at say 50 deg, and have to heat it up through 20 deg., only, instead of through upward of 70°. A great saving of fuel is thereby attained. Now if you can get your air for cold storage purposes at pretty near the temperature you need and have to cool it only through say 10 deg., there will be a great economy in cost of maintaining a mechanical or chemical plant, or if you are using ice, a considerable saving of your ice. In a cold storage building recently built in a neighboring city they are now taking outside air at 60 or 70 deg.,—in summer it would be 85 or 110 deg.,—and cooling it down to 32.; that is cooling it through 30 or 40 deg. I said to the superintendent, "Why don't you take your air in this cooling chamber and use it over again?" "Oh", he said, "it is impure, we could not do that; it is smelly, and it gets moist, and we could not do it. It would destroy everything we have." Perhaps it would, with his system, but if that air could be taken at a temperature at say 40 or 45 in the upper part of the chamber, purified and reduced to 35 deg., you would have to reduce it only through 5 or 10 deg., instead of through 30° or 40° thus materially economizing the cost of maintenance. *The air can be so purified, cooled and utilized.* We cannot do better than follow nature, and avail ourselves of her forces in material things at least. Now there is a great force present always with us in refrigerator chambers and everywhere else, the force of gravitation. That force can be used to great advantage in connection with cold storage. Wherever you have cooling pipes or ice you have also absorption of heat from the air and a consequent increase in the density of the air. Air being a mixture of gases, expands like gases, when under the influence of heat and the force of air so expanding is quite powerful, and may readily be directed and utilized. The air near the ice or pipes will fall, and falling it will push through or against any less dense body of air that may be in its way. It is manifest that to obtain the full effective force of the air so falling, its path should be made easy. Every obstacle lessens that force. It should be permitted to fall free, unopposed by any conflicting current. Such a current conflicting with the descending volume of cooled air may arise from the expansion of heated air which being of less specific gravity than air around it of lower temperature will rise. The downward current of cold air and the upward current of warm air must not conflict. If they should, we shall have available

not the sum but the difference of the two forces. The difference is all that the most of the constructions at present in use have to promote circulation of air. This circulation is not to be sought as an end, but as a means to an end. Let us take the circulation which might readily be produced in this hall. The windows on my left are but slightly separated from the outer air on this winter day and the room is coldest on that side. Place on my right opposite those windows, a pair of steam radiators, and we shall have a very rapid circulation of air. The air on the window side, being colder, will fall to the floor, and flow like water across the floor from left to right, simultaneously the air over the radiators will expand and rise to the ceiling, and flow across it towards the windows.

If the windows extended along the whole of the left side of the hall and the radiators along the whole of the opposite side, there would be an even downward flow along the whole length of the wall on the one side, and an even upward flow along the whole length of the opposite wall. The volume of air falling on the one side and the volume rising on the other would not impede each other. Each would assist the other, and you would have a very rapid circulation of air, the more rapid according as the difference in temperature was greater between the two sides of the room. This circulation would exist were all openings into the room hermetically sealed. You will see from this how a strong draught may exist in a room even though no air currents come into it from without. You would have a rapid circulation of air in a room cool on one side and warm on the other, but that circulation of itself would be of no benefit. The air, though circulating rapidly, would not lose any of the impurities with which it is charged, but it would simply tend to distribute such impurities throughout the whole of the chamber. Circulation, then, for the mere sake of circulation is of no advantage. It is, however, of the utmost importance as a means to a most desirable end. That end is the purifying of the air within the room.

The impurities consist first of all of an excess of carbonic acid gas. Ordinarily this gas forms but an infinitesimally small portion of the air, yet on it all vegetation lives. The quantity present in the air is so trifling as to be discernible only with great difficulty ; as Faber has so well said, if it were breathed away, or if the sea drank it all in, or would not give back again what it drinks, in a few short hours the flowers would be lying withered on the ground, the mighty forests would curl up their myriad leaves, show their white sides and fall. There would not be a blade of grass upon the earth.

I mention this not because the presence of this gas in small quantities is injurious, but to show you on what almost imperceptible chemistries the preservation depends.

In the ripening of fruits carbonic acid gas is constantly given off. In addition to the presence of this gas, we shall have the spores of the various decomposing agents to which I have referred, and probably bacteria themselves in an active state. Then we shall have something more. Within the chamber, as soon as you store things in it, there will be produced odors, a different odor from each article. Certain products will not only give off odors but absorb them. Milk and butter are well known to be readily susceptible to odors, and in some shipments in cold storage of eggs and apples, the eggs have been found to absorb the odors of the apples, and were consequently good neither as apples nor as eggs.

You know that water has a strong affinity for odors. If you place a glass of water in a bedroom over night, it will in the morning be unfit for use. In the interval it has absorbed foul gases from the room. Such gases are always present in the air in greater or less quantities, but they may be got rid of if you can bring them into contact with a body like water having the power of absorbing them. It is remarkable that the gases of which air is chiefly composed are but very slightly absorbed by water. A given volume of water will absorb but two-hundredths of its volume of nitrogen, and but about four-hundredths of oxygen. On the other hand, water will absorb one and three-quarter parts its volume of carbonic acid gas, about four and a half parts of its volume of sulphurretted hydrogen, and more than one thousand times its volume of ammoniacal gas. If therefore you can bring the air charged with deleterious gases in contact with water, the normal constituents of the air will not be themselves absorbed, while all the injurious gases will be. This, then, is one of our problems : How can we cause the whole of the air contained in a storage chamber, charged as it is with injurious odors and gases, to come into contact with a body which will absorb such odors and gases and allow the air to pass on freed from them ?

There is another problem. In many cases the products stored contain a very large percentage of water some of which they are constantly giving up to the surrounding air. Fruits contain often as much as 90 per cent. of water; meats a lesser though still a large proportion. Moisture facilitates, as I have shown, the growth of bacteria, molds and yeasts. How shall we get rid of it? If you bring air into contact with a body of lower temperature, the moisture in the air will condense on the cooler body. This phenomenon is manifest at present on the windows of this hall. The moisture formed in large drops upon the glass has not, as you know, come from the outside. It has accumulated owing to the fact that the temperature of the glass is lower than the temperature of the air within the room. Here in the model car before you we have in the centre a body of ice, lower in temperature than the air in either end of the car. Let us now take advantage of the circulation which will result, if we permit it, from this difference in temperature. If we bring all the air in the car in contact with the ice we shall have the excess of moisture in that air condensed upon the ice. Another highly desirable result will follow. The surface of the ice is covered with water. The coat is a thin one, resulting from the melting of the ice and the condensation of the moisture in the air, but it is sufficient to absorb excesses of carbonic acid gas and other injurious gases which are present in the air, and so purify the air within the car. We could by means of fans force the air any way we please, but we have at hand ready for use the natural force of gravitation, to which I have referred, and the expansive force of vapors. Let us apply these forces rationally to the problems before us. The air in contact with the ice not only loses its moisture and its impure gases; it loses also its heat; the germs it contains are imprisoned on the liquid surface and carried off in the drip. The deeper the mass of ice through which the air falls, having regard always to the fact that its course must not be wholly obstructed, the greater will be the condensation of moisture, the more thorough will be the absorption of gases and odors, the greater the reduction of temperature, and the more complete the filtration from the air of all dust particles and germs that may be in suspension in it. If the ice chamber were closed at the bottom, the air could not pass out; it would remain in the chamber just as water would in a bucket. If you cut away the lower part of the bucket, the water will flow out, and will continue to flow if the bucket is replenished and the opening unobstructed. Here also when we make an opening in the bottom of the chamber, the air under the influence of the force of gravity will flow out into the storage chamber. It there comes under the influence of the warmer air present in the storage chamber, and the warm walls of the car or other building. It absorbs heat from its surroundings, expands and rises through the products stored in the chamber, or carried in the car or vessel. If no outlet were given it, it would simply accumulate until the pressure in the storage chamber would be equal to the pressure in the cooling chamber, when stagnation would result, with all the disadvantages which we are desirous of avoiding. If an opening is made into the ice chamber, the pressure of the expanding air in the storage chamber will be exerted in that direction, and as the air is cooled and falls away, a relative vacuum will be created in the upper part of the ice chamber which the air in the storage chamber will rush in to fill. The line followed in the storage chamber by the air in such a movement would be the old physical line of least resistance. The air flowing out at the bottom of the ice chamber would for most of its volume flow across the floor of the car to the end where, owing to the obstruction, that part of it which had not ascended under the influence of the heat it had taken up, would turn and flow back into the upper part of the ice chamber along what would be approximately a diagonal line from the lower angle of the storage chamber to the point of junction of the ice chamber and the ceiling. The air below that diagonal line would be in motion; the air above it would be almost at rest; it would be stagnant, holding all we wish to eliminate from it, and it would largely so remain. To put this part of the air in circulation, a false ceiling is placed in the car, as it may be in any storage chamber, extending from the duct leading into the ice chamber to within six or eight inches of the opposite end of the car. The air flowing into the ice chamber past one end of the false ceiling—which practically forms a duct along the whole roof of the car—induces a current of air in the duct, which gradually extending to the more distant end of the car, draws up the otherwise stagnant air. In small constructions the ceiling duct may be disregarded, but in cars and large buildings its usefulness cannot be over-estimated. By its means the air is made active throughout the whole of the storage chamber. There is rapid and thorough circulation from the

storage chamber through the ice. The air is dried and filtered every time it passes through the ice, and moisture and odors are absorbed and pass away. It is, however, constantly receiving accessions of foulness from whatever is carried in the storage chamber. The process must therefore be continuous to be of any use, and must cleanse the whole of the air as rapidly as possible. To effect this end, the forces available must be utilized to their highest power. If you bring the downward current of cold air into an ascending current of warm air, the power available will be simply the difference between the two forces. If you make the upward current co-operate with that which flows downward you will have the sum of the two forces. Strange as it may appear, many of the systems in use do not adopt this obviously correct principle.

Where the necessity arises for placing the cooling medium above the storage chamber,—and this may often be a matter of economy—the cold air may by means of proper flues be still delivered at the floor of the storage chamber, and the heated air taken out at the highest point. In such cases it is of course absolutely necessary to thoroughly insulate the ceiling, otherwise condensation will take place there, and the collected moisture will drop back on the goods stored and soon become the breeding ground of molds and slimy organisms such as are commonly seen in most of the cold storages in this country, and in most of the refrigerator cars in use. The car or storage chamber which is moist in any part is unfit for use. It is easily possible to construct our cold storage in such a way that there shall be no moisture in any place except the ice chamber, or when mechanical or chemical cold storage is used, on the freezing pipes.

I have during the last few years looked at a good many cold storage rooms in this Province, and I have been astonished at the want of thought manifested in their construction. Perhaps I should not be surprised in view of the imperfect systems in use on our railways.

I have here a model of a car invented by a Canadian, Mr. Hanrahan, who has led the way in scientific refrigeration, and who is, I am glad to notice, present with us to-day.

The refrigerator cars in common use are not built on the plan of this model. They have tanks at the ends made usually of galvanized iron. Some have wire netting at the top and bottom so as to promote circulation through the mixture of ice and salt commonly used. It is urged on behalf of such cars as against those built like the model, that only two doors—which are points of weakness in a car,—are used instead of four ; that it is easier to transfer freight from one car to another while the old style cars are just as good for refrigerating purposes. Well, just consider the facts for a moment. Suppose you have at each end of a car just the construction you have in the centre of this model. There would be a downward flow of air at both ends and the two currents would flow inward along the floor towards the middle of the car. If you had a current of water falling down at one side of this room and another at the other, they would flow along the floor towards the centre, and the effect would be seen at once. You cannot see the air, and this, while perhaps a disadvantage in studying refrigeration, is in all other respects a great blessing, as, if the air were visible, all things else could not be seen. If then water was flowing from the ends of a car towards the centre, you would observe the two currents come together, obstruct each other, accumulate, and if the two currents were equal, as they are opposite, you would have rest and not motion. That is precisely what happens in nearly all refrigerator cars. The air in contact with the tanks is chilled and falls ; it flows towards the centre from both ends ; the two currents meet there and while some of the air will undoubtedly rise, a large portion of it will be impeded and stagnation ensues. The effect is that in the centre of the car there is often no circulation at all with the result known to many of you who have taken the trouble to look into a shipment of tender fruit in a refrigerator car only to find that all the fruit in the centre of the car had been spoiled while that close to the tanks might be in fairly good order. In the present car the air flows downward through the ice, outward towards both ends of the car where the temperature is highest, and there is an up current of warm air which rising to the ceiling flows back into the centre of the car. You have two volumes of air rotating rapidly inward, and bringing all the air in the storage chamber constantly under the influences which I have referred to as effected by the ice. There may be slight disadvantages in maintaining a car with four openings instead of two, just as a Pullman car has disadvantages from certain points of view over the ordinary passenger car ; it costs more to build

and will carry fewer passengers, but it is built for a special purpose, and in a refrigerator car proper refrigeration should be the first consideration.

If you have good refrigerator cars you will not need to cool your fruit before shipment. The reason is obvious. How will you cool your fruit in the first place? You answer, by cold storage. But it is just as easy to have proper cold storage on wheels in the form of a car as to have it stationary in the form of your Grimsby building If you have a proper car your fruit will be transported in good order to Winnipeg or the seaboard in the same time you now waste in cooling it in your stationary cold storages at Grimsby.

With proper care you can load all fruit as soon as it is picked. It may happen that it is not possible to get a car load at one time or place, or even the half of such a car as I now show you, and that storage will be required to keep the fruit until you obtain a sufficient quantity for shipment. The best way to attain this end is undoubtedly by such co-operation as Mr. Heaton referred to in his opening remarks, but as necessary preliminaries you must have those varieties of fruit which the consumer most desires, and you must injure them but as little as possible in picking, assorting and packing. Any injury to the fruit simply provides a soil on which the everpresent agencies of decay will grow and thrive.

What is the best packing and package for cold storage is largely a question of experiment. I hope a great deal of attention will be paid in the near future to experiments, to determine just what is the best way in which to pack fruit. I may tell you that theoretically, and not speaking from any practical experience, fruit should have a packing medium only sufficient to prevent it from being injured by or injuring another fruit. The packing should be porous, otherwise it will not permit the escape of gases which are generated in the fruit, and which are, I think, injurious to it and hasten decay. Your package for cold storage should be a package which will permit a circulation of air all through it. That is theoretical too, but I think experiments will prove the correctness of my statement. There is a disadvantage, however, about ventilated packages that I wish to call your attention to. It is that when the fruit is taken out of cold storage in a ventilated package and exposed to the ordinary air, the moisture in the air is condensed and remains upon the fruit As the chilled air falls away, it is replaced by volume after volume of warmer air which also leaves its deposit of moisture and passes away, and the process of deposition goes on until the fruit attains the same temperature as the air. The consequence is that if you take an open package of fruit out of cold storage and expose it to the air it becomes in a very short time quite wet. Now, that is not from within the fruit; it is wholly from without, wholly a deposit of the moisture contained in the atmosphere, so that theoretically, and practically too—because it has been demonstrated—while fruit should have a ventilated package while in cold storage, it should, when brought out of cold storage, be placed in slide-closed packages, or by being placed in another box so that the increase in temperature of the fruit should come to it by absorption of heat through the box and not by direct contact with the air. Outside air at say 80 degrees will soon communicate its heat to the fruit, and the fruit may then be exposed and it cannot condense any moisture; it will be and remain perfectly dry. If you then have ventilated packages for cold storage you should either be able to close them when you take them out, or put them in closed receptacles until the fruit attains the same temperature as the air in which you desire to expose the fruit for sale.

Then, as I have said, you will require to co-operate one with another, and I know, speaking for the Government of the Province, that you will have its hearty co-operation, and, I believe, the co-operation of the Government at Ottawa. Then perhaps the two governments could co-operate, each helping in its own sphere the people as best it can. Last year we passed an Act at Toronto to assist any one or any body of men who wished to erect cold storages to the extent of one-fifth of their outlay up to $2,500. That is some help, and we hope it will prove an incentive to cold storage.

The necessity of providing better transportation facilities should be brought strongly to the attention of the railway and steamship companies and the Ottawa Government, which is charged with trade and such matters. The whole chain of cold storage should be complete, from the grower with his cold storage at the point of production, through the car to the port of shipment, on the ocean and at points of distribution to consumers. Now two of those links are in charge of the Dominion Government—not wholly, because that government itself is dependent upon the car companies. If you are convinced that

one car is better than another, then you should insist upon the railway companies providing that car. That is a matter of experiment with you. An old car with imperfect insulation has been constructed on the system which we think is a good one, and you can experiment with that car. It is not as good as it could be because the insulation of the car is not good, and unless you have good insulation your ice is going to waste away quickly. On shipboard the whole system must be changed. The system has been altered to some extent. You have not been told about it, and perhaps may not be, but the system was materially changed after the Hon. Mr. Dryden made a shipment to the Old Country. I told you of a ship in which I saw what should be called the Eskimo system adopted, which had exposed pipes all around the sides and on the ceiling. It operates much as an Eskimo igloo would. All the moisture contained in the air is condensed on the sides and ceiling. If they are very cold of course it is frozen there; if they are below 32°, as frequently happens, any moisture condensed drops back on the goods intended to be carried safely, and I have seen it so drop back in the port of Montreal. After the success of the trial shipment to which I have referred the ceiling pipes were cut off on the "Manchester Commerce"; no cold brine was allowed to circulate in such pipes and air ducts were formed by sheeting in the pipes on four sides of that chamber from near the floor to near the ceiling. The result was that there was a circulation near the walls and stagnation in the centre. Better results followed, but not nearly as good as if all the pipes had been combined and placed in a coil on one side of the room, separated from the storage proper by an insulated partition, not extending quite to the floor or ceiling and with a proper duct along the whole ceiling. You would then have considerable difference of temperature between one side of the room and the other, the circulation would be unimpeded and rapid and you would have the other results that I have mentioned.

I have occupied a great deal too much of your attention to-day. (Voices: "No, go on.") But I feel the seriousness and importance of the subject, and speaking as I do disconnectedly and without much order I fear I am becoming wearisome to you.

I might speak about the advantages which would come to us from an increase in our fruit trade. They have been dealt with and well dealt with here to-day, and I shall leave them to your consideration. I hope, however, that with the increased interest in cold storage, and the more scientific attention devoted to it, we shall soon be enabled to increase many fold our trade with the Old Land. There is a great market there, and with proper cold storage we can send to it our surplus product and receive a large return which is now lost to us. The greater the advantage to our people, the more will they be inclined to live in this bountiful and beautiful land. We have here, not only in this vicinity but throughout the whole of this province, large areas of excellent land which could be devoted to fruit culture, and which are not now devoted to it because the return is not what it might be. I look forward with confidence to a process of development of this country, of expansion in many lines, and especially in the production of fruit.

The Governments at Ottawa and Toronto are, I am sure, anxious to do everything that is possible to advance your interests. It has been stated here to-day that fruit growers must help themselves. That, I think, is the proper spirit, and governments, like Providence, are disposed to help those who so act. Speaking merely for the Government at Toronto, though I feel that I might give you a similar assurance on the part of the Government at Ottawa, I wish to say in conclusion that the fruit growers have our hearty sympathy, and will have our encouragement and assistance whenever and wherever possible.

AN EXPERT ON COLD STORAGE.

By Mr. J. F. Hanrahan, Ottawa

When I came here to-day I did not expect to be called upon to say anything in connection with cold storage, but since taking hold of the cold storage for the Ontario Government I think I could give you a little practical information. When you are undertaking cold storage you must remember it is necessary to have everything completed in its entirety—just as it takes a hundred cents to make a dollar; ninety nine cents do not make a dollar. I have a question which I have submitted to Hon. Mr. Dryden Hon.

Mr. Latchford, Dr. Mills, and the principal professors, and that question is this: Are the carbonic acid and other gases which are generated from fruit during the process reaching to a stage of putrefaction, beneficial or detrimental to that fruit? That is one of the questions I want to solve. Dr. Mills stated kindly to me that he was going to have Prof. Shuttleworth and Prof. Hutt solve the problem, and from what I understood I think we will soon have a definition of it. The next thing is this: In the *Globe* this morning I noticed that Dr. Saunders said yesterday that packing presented a problem that was not yet solved. Now, gentlemen, I have never taken any interest in fruit; my whole mind has been concentrated on cold storage. I have delved right down into its depths, and I conceived an idea, and I made a construction in accordance with that idea, and with that construction I made a test, and from that test I got a result; and if you get a result there is a cause for it. Why has this problem not been solved? You see that Dr. Saunders says that packing presented a problem that was not yet solved. How are we going to discover what is the most practicable method for carrying perishable goods to Europe in the best condition? That is one of the cents that goes to make the dollar. First you have to get a perfect system of cold storage—never mind mine, get the best. In the next place have the temperature of air in one chamber 35 deg., in another 40, in another 45, in another 50, and in another 55, if you want to ship different varieties of fruit as they come into season. Then at different stages of maturity, place some in deep packages, some in shallow packages, some in open packages, some in closed packages, some wholly wrapped in paper, some partially wrapped in paper, some with wool, and some with excelsior or any other means. In my estimation the whole system of handling fruit to-day is as crude as it was twenty years ago. By this experiment you will find out what is the greatest possible length of time that fruit will carry. I may say so far as that little system of mine is concerned, there is nothing like it on top of earth, because the ice is supplied in the construction so that we get the circulation by the unification of two pressures, of two extremes. Unless extremes exist, circulation cannot take place. I want to say here that I am not in politics, but the fruit growers of Ontario are under a deep debt of gratitude to the Hon. Jno. Dryden for the efforts he has made in their interests in relation to cold storage, and I know it—(Hear, hear, and applause) —and also to the Hon. F. R. Latchford. I want to say right here, I am not after this position just for the money that is in it, but honor to whom honor is due, and I know where Mr. Dryden antagonized some of the wealthiest men in this country in the interests of the fruit growers (hear, hear). I was requested to go down to Montreal and examine the cold storage on the "Manchester Commerce." There was a series of pipes all under the four walls and on the floor and ceiling. I came in the door, took a look around the chamber, Mr. Blue of the Manchester Ship Canal Company was there, and he said, "What do you think of this?" I said, "You can't get any circulation in this chamber." "Oh yes," he said "we can." I said, "I beg your pardon, that is an utter impossibility." So he wanted me to explain, and in the meantime he came out and took out a paper, like a lot of other people that think because they understand business that they understand what cold storage is. Well, they have got to take off their coats and discover it. I said to him, "Look here, do you see that building? Well, you might as well take that building and carry it on your shoulders as expect to get circulation in this chamber." The chief engineer was in and heard me make the remark, and he said, "Mr. Hanrahan you are right, if that door is closed there is no circulation after one hour." I said, "I thank you for your kindness in making the admission, but it isn't necessary for you to do it in order for me to know it." (Laughter.) Then I went to work and put up the construction. The idea of my construction is this, that the odors, moisture and gases must be forced out of the atmosphere so as to purify that atmosphere before it returns to the refrigerating chamber again. Although much has been said about the chain of cold storage and the results at the Paris Exposition, I could tell you some things that would surprise you about the consignment of fruits that were landed in Paris for exhibition. The absurdity of anyone trying to make you believe they have got the best chain of cold storage in the world. It is no better than they have any where else, in regard to the application of the cold. The means of the reduction of the temperature of the atmosphere is just the same. I want to tell you I was handicapped in the construction I put in the "Manchester Trader" because I had only so long to put it up, and I am sorry the construction cost as much money as it did; but necessity knows no law, the fruits were on the way, I had to

get the construction put in, and it could not be done in Montreal in a minute. However, I did the best I could. I wanted to get the pipes placed so that each row of pipes would not be in an angling position, because air, like water, flows in the line of least resistance. I was obliged to go to work and make the plates of wood; I should have had them of iron. The construction was crude, but the system is all right. I was in Ottawa when I heard the "Manchester Commerce" had arrived in Montreal, and I went down and saw a gentleman who is closely allied with the party connected with the scheme of cold storage that has given such wonderful results, and I said to him, "I must go down and see the 'Manchester Commerce.'" "No," he says, she is loaded up and gone." But what did I find when I examined this cold storage, at the request of Mr. Dryden? The pipes were all exposed around the walls, and on the ceiling there was your condensing surface without the elimination of the odors, moistures and gases of the air. When I went back I found the whole of the walls covered with a sheeting of lumber in trying to use my ideas. The pipes were 2½ inches in diameter; the space between the wall and the interior surface was about ten inches, and there were 7½ inches on the sides by which the air could flow back to the chamber in the same manner as it left it That is not all; they left a 10 inch flow at the bottom, and a 10 inch return at the top making a 10 inch outlet from the space where it was reduced; then they go to work and put a one inch pipe across with tight packages placed on top, thus only leaving about a one inch communication between the chamber thus forming it and the chamber where the products were placed

In my opinion, it is important to get the odors, moisture and gases from the product as quickly as generated, while being carried in cold storage; but that cannot be done with a tight package. There must be a direct communication between each individual piece of fruit and the air.

Rev. Mr. Ball: It should not be wrapped.

Mr. Hanrahan: That question is not yet solved. If the gases and odors generated from fruit during the process of putrefaction are detrimental to them, and you take each individual piece of fruit and not only wrap it in a piece of paper, but twist it up so as to hold the gases and then put it in a package such as shown here with a series of cells, the consequence will be that each piece of fruit will be submerged in its own gases. I have been working on this thing for quite a little while, and am working on it for pure satisfaction to show that the Hanrahan system has no equal. I am utilizing nature as far as it lies in my power, that is, the natural law that you can get circulation by pressure alone, or by suction alone, and that by the combination of pressure and suction, you utilize all nature's forces. If the fruit growers will do their part I will guarantee to do mine. Here is a package I have worked out in which, when the fruit is packed and the cover fastened on, there is a direct communication between every individual piece of fruit in the package and the external air, so as to allow the odors and gases being carried off with any surplus moisture the fruit may possess. When the packages are placed in the cold air, owing to the extreme warm air and the condensing surface, the air is colder than the surrounding atmosphere. You close the slides and it becomes a sealed package, and then you raise the temperature of the product by radiation rather than by the air coming in contact with it and condensing moisture on the surface of the product. I do not say this is perfect yet, but it is a stride towards it. I would like to see that problem solved. You can never get it solved on the lines you are now working on. You have yet to discover what is the most perfect way for packing. (Applause).

Mr. McNeill: I understand there is no communication between this car and the outside air.

Mr. Hanrahan: No. The moment yon form a communication between the external and the internal airs the principle will be just the same as if we were trying to heat this room and you open your windows on a cold day.

It is only owing to the extremes between two temperatures that proper circulation can be kept up, and the greater the extremes that exist between the two bodies the more rapid will be the circulation of the air. I take the ice tank and place it in the centre. Each end of the car is naturally a little warmer than the centre, because the intensity of the cold is the intense cold of the ice. Now, cold air descends and flows to the line of least resistance; hot air ascends according to natural law, and as the hot air ascends it carries off the odors, gases and moistures, and as the cold air descends in the

ice chamber it creates a suction as the hot air ascends with the moistures, odors and gases and the cold air returns purified from the refrigerating chamber.

Mr. E. D. SMITH : Do you not think that pipes filled with ice on the side of the room would answer the same purpose ?

Mr. HANRAHAN : You have not a set of them in Ontario that is right to-day. Now it is a very strange thing to think of it—there are only eight degrees of extremes existing there. Say the temperature of that ice is 32 degrees, say the temperature of the chamber is 42 degrees ; you can understand how sensitive it is, owing to the unification of those two pressures. If you take care of the atmosphere that surrounds the product, the product will take care of itself. Why is it that putrefaction does not set in ? It is owing to the absence of odors, moisture and gases.

There is another question in reference to taking your fruits on board ship that is worthy of your most serious consideration, and that is in reference to the size of packages. You ought to have a standard size package. If you want a half bushel package, make it the same width and length of the bushel package and half the depth so as to lay right over the other one. When you want to make a quarter package, make it the same length, half the width, and the same height as the half bushel package—that gives you a peck. There should be on one side of each package a strip, and they ought to be kept apart. I had great trouble last summer with the shipment at Montreal on account of the various sizes of packages. Another thing that came before me, and that I had a little row about in Montreal was the rough way in which the packages of fruit was handled. Somebody is to blame and the fruit growers should adopt the proper means for the handling of their fruits. The limit for the carrying of some fruit is say five days. Well, what will be the consequence if you carry it six ? Supposing the greatest length of time a certain kind of fruit can be carried under the most favorable conditions is ten days, then do not try to carry it eleven.

Mr. CASTON : How much ice does that car take ?

Mr. HANRAHAN : I do not know in regard to the consumption of ice in that car I fitted up in Montreal. It was G. T. R. insulation, but it was the Wick system, Mr. Dryden had quite a fight to get the work done. I will build a thousand of those cars and put in say four tons of ice in each, and, if the fruit is packed in any kind of reasonable weather, I will guarantee to run those cars five days without re icing.

The SECRETARY : Should that ice chamber be completely filled ?

Mr. HANRAHAN : It depends upon the distance you want to carry it. Another point Hon. Mr. Latchford made was a very good one, about cooling the fruit on board the car. I have seen an absurdity in pamphlets and bulletins on cold storage about chilling your fruit before you ship it. The longer you hold it in cold storage before shipping the longer you are from getting it to the market, and the greater the detriment to your fruit before you get it into the market.

E. D. SMITH : You cannot bring the temperature of fruit down to 35 or 40 degrees with that car.

Mr. HANRAHAN : It is not a question of temperature at all ; it is a question of eliminating the odors, moisture and gases from the air ; the consequence is that the temperature is gradually going down.

Mr. E. D. SMITH : It is too gradual, that is the trouble.

Mr. HANRAHAN : Oh, no ; if you will only get those problems solved—find out the proper method of packing fruits, and also find out whether carbonic acid gas or other gases are beneficial or detrimental to fruit, I will take care of the cold storage.

Mr. MCNEILL : We find when we put our fruit in a car at once when the temperature is about 90 degrees that we have to use from two to three tons of ice in order to cool the car down, then we re-ice it before we send it and it is all right.

Mr. HANRAHAN : You will have to do that under any conditions. You get right back to the old point that you cannot get something out of nothing ; it does not matter where you get it, you have to pay so much for getting it.

Mr. MCKINNON : I think there is one little practical difficulty that Mr. Hanrahan does not understand, not being a fruit grower. It is this, that we cannot pick all our fruit to fill the car in one day and put it on board the car at once and send it away. It takes three or four days for us to fill a car, sometimes a week, with that selected fruit which it is necessary to send to England which requires such careful packing, although

we can easily fill a car of ordinary fruit in one day. Now, we cannot always depend upon the car being there just when we want it. That is the first difficulty. The second is that if the car is there we have to pay a pretty high sum for the delay of the car for a whole week; so that in practice it is well to have a cooling chamber at the point of shipment, or what is very much better, at the point of packing. I think it is better that the fruit should be chilled to a certain degree before it is even packed. I think that it packs with much less risk of damage if it is chilled a little before packing, and then having been chilled properly I quite agree with Mr. Hanrahan that then it may be put on his car without any cold storage at the point of shipment.

Mr. A. H. PETTIT: It is a large expense to build cold storages all over the country, and it would pay those sections where the fruit was being shipped to pay the charges on a car standing if it could be secured for that locality; it would be cheaper than cold storage.

Mr. MCKINNON: I doubt if it would; it would not be so certain.

Mr. A. H. PETTIT: I hope we won't be bothered in future as we were this year by having a properly fitted steamer only once in three or four weeks.

Mr. HANRAHAN: That shows the necessity of having such a steamer once a week.

Mr. A. H. PETTIT: It appears that this gentleman has spent a lifetime in developing this very valuable improvement in the cold storage system, and I move a most hearty vote of thanks to Mr. Hanrahan for his most excellent services along the line of cold storage, particularly for his able services in this line in the horticultural interests of the country.

Rev. Mr. ANDREWS seconded the motion, which was carried unanimously amid applause, and tendered to Mr. Hanrahan, who in reply said: "I will promise you that if you people will do your part I will do mine." (Hear, hear.)

ADDRESS BY MR. J. F. CLARKE, PRINCE EDWARD ISLAND.

In regard to our varieties of fruit, I may say Alexander and Duchess of Oldenburg have made an excellent success in Prince Edward Island. I spent four years in the Annapolis Valley and enjoyed being there very much, and got pretty well acquainted with fruit and fruit men there, and I felt that Prince Edward Island was not doing enough in fruit growing, and on my return I talked to the farmers there. There were fruit growers in Prince Edward Island long before I was born, and one gentleman, Mr. Cairns, came there from Scotland about 80 years ago, and you will sometimes hear of the Cairns apple, which he brought from Scotland. It is a very good apple, and looks something like the Ben Davis. There is something about your fruit here that I notice that I do not know how to describe; it is smoother and rounder than our fruit. We grow the Ben Davis, but it is very oblong in shape; here you have them comparatively round, and the ribs don't show up in your Tallman Sweets. Your Mann looks like what we call the French Pippin.

REPORT OF COMMITTEE ON SAN JOSE SCALE.

In the opinion of your committee, a serious mistake was made by the large number of owners of infested orchards who offered determined opposition to the carrying out of the original intention of the act, and that if public opinion had supported the Minister in his efforts the scale to-day would be almost if not entirely exterminated. We desire also to place on record our appreciation of the efforts of Hon. John Dryden in behalf of the fruit industry of this Province. We would now recommend:

1. That a system of inspection be carried on in all suspected districts, with a limited number of suitable assistants.

2. That every grower in suspected districts be required to inspect his own trees during the months of November and December in each year, and to report to the inspector

not later than the 1st day of January following, on suitable blank forms to be furnished, that the work had been carefully performed, together with a statement of the condition of the orchard at the time of inspection.

3. That, as the work of treatment is still in an experimental stage, the Government should make suitable material, both whale-oil soap and crude petroleum, available to the people on the same terms as supplied to growers last year.

4. That in isolated sections where the scale is found to a very limited extent, the treatment of the trees be carried on by and at the expense of the Government, under the direction of the inspector.

5. That, with regard to nursery stock, the most careful measures be continued to properly protect the purchaser from infestation from this source, and to this end all fumigation be done under the supervision of the Government, and official certificates be issued to accompany each shipment.

M. PETTIT, Chairman.

Mr. MURRAY PETTIT: I will move that this report be adopted as read.

Mr. CASTON seconded the motion, which was carried.

The SECRETARY: I would like to move that the same committee be continued during this coming year, because this insect is gradually increasing upon us and I am sure that the work of the committee is just as necessary for the year to come as it has been in the year past. Mr. SCARFF seconded the motion, which was carried.

A. H. PETTIT: There is one point that I think might be well considered in connection with that report. There was a strong opposition in many parts of the Province where the scale was bad. I think some members of that committee should come from that section of the country. They would give strength to the representation to the Government. Those who have changed their minds and are now in favor of this legislation should be on the committee.

The following were appointed as a committee for the ensuing year: M. Pettit, R. Thompson, G. E. Fisher, E. Morris, Wm. M. Orr, W. H. Bunting, John Wigle, Major Hiscott.

Professor MACOUN: I wish to draw attention to these navel oranges that were grown in the open air in half barrels by Mr. Cameron of Niagara Falls Park, and he says they equal any oranges in the market. He also sends some lemons which are very fine.

The SECRETARY read a letter of explanation from Mr. Roderick Cameron, Queen Victoria Park, Niagara Falls.

Professor MACOUN: I think we should all take an opportunity of tasting these oranges before the meeting closes. I should also like to call your attention to the very fine specimens of Keiffer and Idaho pears the President has brought here. They are extraordinary. He has also brought some fine specimens of quinces and peaches, the peaches grown by Mr. Morris. He has also brought some fine Vergennes Grapes.

The Secretary read a letter from E. E. Wartman, Kingston, in reference to an apple box providing for convenient inspection.

SIR,—I express you to-day one of my Patent Fruit boxes. This minature size is not a practical size, I got it made for you to kindly put in a prominent place. The grade of fruit determines the number of trays. I claim this is the quickest inspected fruit case in America. Fruit may be removed and replaced in ten (10) seconds. The King apples in this case are not shown as superior, only they are three inch standard grade.

E. H. WARTMAN,
Kingston, Ont.

FORESTRY FOR FARMERS AND FRUIT-GROWERS.

PROF. H. L. HUTT, ONTARIO AGRICULTURAL COLLEGE, GUELPH, ONT.

There is perhaps no subject at the present time which is more deserving of attention by the farmers and fruit-growers of this country than that of forestry, and unless we arouse ourselves and give it that attention which its importance demands, we shall be compelled to suffer more and more severely for our negligence.

The forestry problem which our fathers and grandfathers, the earlier settlers of this country, had to face was quite different from that which faces us to-day. They found the land thickly covered with forest and watered by numerous streams. The question with them was how quickest to get rid of the trees to make a clearance for the growing of crops. With axe and fire clearances were made. Year by year they have widened, until now the country is nearly all clearance, and it is only here and there that a bit of the original forest is to be seen. And what has become of the numerous brooks and streams? The clear running brooks of those summers are now our dry gullies down which the muddy water rushes for a few weeks in the freshets of spring.

But let us look deeper and see what else has attended this undue removal of the forest, this stripping mother earth of her natural covering. Where has gone the fertility which produced the crops and bountiful harvests of those days when more than half the land was in forest? Some of it no doubt has been carried away in the crops sold off the farms; but has not the greater part of it been washed away in the floods of spring and been carried out into the rivers and harbours where the Goverment annually spends thousands of dollars in dredging it out of places where it impedes navigation.

Why have we not the rains and showers which then so frequently watered the crops and pastures, while now the drouths of summer seem each year more severe and prolonged? This is becoming a most serious question. Why the increasing extremes in our climate, the more severe heat of our summers and the more biting cold of our winters, this loss of fertility, of showers, of shade, and of shelter, has it not been largely brought about by the loss of our forests.

Why these annual floods, which in spring now threaten destruction to both life and property in so many parts of the Province? Right here in Brantford, besides the great losses which have occured from time to time, over $100,000 have had to be expended on works for flood protection alone. Is not all this directly traceable to the removal of forests?

Why these cyclones and tornadoes supposed to belong only to the prairies, but which are now becoming all too common in their visits? Our unseasonable frosts, and floods, and drouths and cyclones are they not traceable largely to the undue removal of the forests? We shall not take time to enter into an explanation of the reasons for the existing state of affairs, but is it not time we began to arouse ourselves to the importance of this question?

In order to maintain conditions most favorable to agricultural and horticultural prosperity, there must be a due proportion between field and forest, and at least twenty or twenty-five per cent of the country should be in woodland. In some European countries the people, and the Goverment back up the people, have deemed it wise to maintain a much larger proportion than this. In Germany 26 per cent. and in Austria 33 per cent. of the land is reserved in forest. How much attention have we given to the maintaining of forests in Ontario?

The representative of this riding, while speaking in the Legislature last year upon the causes which were responsible for the annual floods here, drew attention to the scanty proportion of woodland in some of the central counties which help to swell the floods of the Grand River. In Haldimand the proportion of woodland is only 16%, in Waterloo 12%, in Oxford and Perth 10%, in Wellington and Wentworth only 9%, and in Brant County only 7%; and it is said that in some of the southern counties the proportion is only 5%. Is not this an alarming state of affairs?

The forestry problem with which we in this generation have to deal, therefore, is how can we most quickly re-forest from 10 to 20 per cent. of our country, so as to restore conditions to a proper equilibrium. It would have been much easier and better had we given attention to this at the proper time, and not allowed the removal of forests to go beyond the point of safety. But now, when the harm has been done, and we are all now more or less responsible for it, does it not become the duty of every landowner to look to his acres to see what he is doing in this respect? For every five acres he owns, has he one acre of woodland? To reduce the question of forestry to such figures may appear somewhat unreasonable, but how else is the proportion to be kept up unless every man is willing to do his share? It is not at all unlikely that the man who has all his land under cultivation would be reluctant to give up the immediate cropping of such land for the growing of trees from which he could not expect much return for years to come. But

it is this short-sighted policy of thinking only of the present, regardless of the future, that has robbed us of the forests and brought about the present unfortunate condition of affairs, and unless we can adopt a more unselfish policy, looking to the welfare of posterity, what is to become of those who are to follow us? We in this generation cannot afford to share the spirit of that son of Erin, who declared he would leave nothing to posterity because posterity left nothing to him.

In considering the question of reforesting, it is natural to suppose that the less valuable lands should be the first to be reforested. The steep hillsides and rocky lands, the river banks, lake shores and swampy lands, the gravelly krolls and waste lands, which should never have been stripped to bareness, should all be again covered with trees as soon as possible. Such lands kept under forest might be made to yield a good annual profit, besides increasing the yield and enhancing the value of the adjoining lands; but the reforesting should not stop at the waste lands. Shall he who has all good land go on chopping every acre of it and leave his less fortunate neighbor, who has a lot of poor land, all the reforesting to do? In justice to the community and to posterity every man should do his share in this respect, whether his land be valuable or not. Just here is one of the greatest difficulties in the way of reforesting. We of this generation are more concerned about present self interests than those of posterity or the community at large, and I fear that, unless landowners throughout the country can be made to see the value of reforesting as a profitable investment, it will be a long time before much progress will be made.

The profitable side of the subject, however, is one which gives more and more encouragement the more it is studied. It is quite true that no immediate returns can be expected from newly-started forest plantation, but the investment is a safe one, and the value of the plantation increases each year.

The value of belts of timber, in the shape of wind-breaks and shelter-belts, which should be planted to protect the crops and buildings of every farm, can hardly be overestimated; and these, when once started, soon grow into value when given a little care at the start. But in addition to its value in this respect, the woodland may be made to yield a good profit from the timber which may be cut out without injuring the value of the forest in the least. The forest, in fact, should be looked upon as a perennial crop, which can be made to yield a good profit with no more labor expended upon it than is required in thinning and harvesting the timber.

I have felt this is one of the important questions that we in Ontario must give some attention to, and unless we can get down to business and make a better showing in this older part of the country we will have to pay dearly for our neglect. Perhaps it is not a question for the Government to deal with. They are doing a good deal in the way of forestry reserves in the newer parts, and this question of re-forestring the older parts is a question which the people themselves will have to deal with. We need more public sentiment in favor of it. I think that when people see the necessity of it they will soon get proper ways of going at the work. I have asked a good many questions in the paper, more than I have answered. I think it would be advisable at some of our meetings to take up this question more fully and see what could be done in the way of more practical methods as to how re-foresting could be started in the older parts of our Province.

Mr. Whitney: Can you tell us how they do in Germany? They carry out forestry there very thoroughly.

Prof. Hütt: The forestry question in Germany is one that is carried on by the Government under military control. The forest lands there are looked on as a national property, and every bit of land that is not used under crop in some way is kept under forest, and these forests are carefully cared for, the trees are harvested, none of them are allowed to waste. The trees are cut up, right to the small branches, so that there is hardly anything left of it, and every bit of this wood has value, and there is a revenue derived from it. They look upon a forest there as something valuable which must be protected and preserved. In France, where they have not nearly as much wood as they have in Germany, they have very stringent laws regarding the cutting off or removal of forests. No wood is allowed to be cut without permission; a man may not even go out in his wood lot and cut down trees without permission, and he may be prohibited from cutting those trees if it is considered that it would be a waste to remove them. If they are on the hillside where they might cause the washing away of land, or needed for any other purpose that they consider desirable, they can be prohibited from cutting them down. I do not

think it would be best for us to have such stringent laws here, but I think it would be better to give more attention to the planting out of shelter belts. In the older parts of the Province every farm should have its shelter belt, a good wide belt of mixed timber planted out, a number of the more valuable trees along with them, and these looked on as a crop from which the farmer gets his winter wood, and probably in time get a good revenue from it. It is surprising how some of these trees grow into value for wood, and they would add greatly to the value of the adjoining property. In the severe winter two years ago there were many cases where crops were destroyed away from the natural forest or natural timber or shelter belts, while right in the lee of the timber belt the crop, particularly wheat crop, was good.

Mr SHERRINGTON: What kind of timber would you recommend for planting?

Prof. HUTT: I think there should be a good variety. I would take first some valuable hard wood, take the black walnut and oak, hickory, some of those nut trees, and then follow with some more rapid-growing trees as a third crop. Take the box alder, a very rapid growing tree, to sdade, and you want a grand shade to force up the other trees. Then as soon as ths ground is covered with trees the inferior trees should be thinned out, first to get a mixture of the more valuable woods, ash, maple, elm, which have now great value on account of their wood. One thing about it is that the value of wood is constantly on the increase The price of timber is constantly increasing, on account of the great scarcity of it, and I think there will be very little danger of overdoing the thing in the way of reforesting.

The PRESIDENT: How is the reforesting done, by seeding or planting?

Prof. HUTT: By both. I think some of these trees are best grown right from the nut; oak, walnut, hickory, and trees of that kind which have a large tap root, are better from the seed being sown. Then other trees which are not supposed to be so valuable might be transplanted, just the small trees put in, just about a year old, and then dibble them in; they can be planted very quickly and very cheaply. Of course many have been grown directly from the seed, but they are better to have some of those nursery trees give them a start.

The PRESIDENT: Is there a difficulty in planting young trees in an old forest where there are some old trees, or is it an advantage to grow alone?

Prof. HUTT: There is a big difference in the different classes of trees. Some trees will stand shade, others will not. Trees not requiring shade will of course not thrive so well in a large forest, while the beach will stand any amount of shade.

Mr. SHERRINGTON: In the case of white ash, suppose it attained a growth of six inches in diameter and was then cut, would it then reforest itself, or throw up suckers again and go on?

The PRESIDENT: Yes, the ash will.

Mr. SHERRINGTON: A gentleman in our neighborhood has put out about an acre of ash trees this fall, and he is going to reforest about 100 acres, but he sowed the white ash seed; he is going to leave them until they grow up thick, and will leave them until they get as thick as spokes for buggies and keep the suckers down, and there is a demand now for about 6 inch diameter stock, and 6 feet long, which sells at 50 cents a foot. We have another gentleman, Mr. Shaw, Q. C., who planted a belt of black walnut about eighteen years ago, planting the nuts, and now he has walnut trees 30 to 40 feet high, and about 8 inches in diameter.

The PRESIDENT: That means a growth of nearly half an inch a year.

Mr. SHERRINGTON: Yes. They are doing well and making a very satisfactory growth and have been bearing nuts for some years.

Mr. E. D. SMITH: This is a most important subject, but one feature of it ought not to be overlooked, that is to select a soil suitable for the trees. (Hear, hear.) When I was young I was very enthusiastic about reforesting some land, and was planting it rather for profit, and I planted about five acres with walnuts, 8 feet apart each way, and I kept it there for about seven or eight years, and finally got discouraged and had to tear them out. They would not grow as the land was not suitable for walnuts; which require a deep dry soil, mountain side or the foot of a mountain where it is deep and rich, while this land was thin and poor. My idea was to select the least valuable land for reforesting, but in this case it was a failure. No doubt it would have been all right if I had selected the right kind of tree for that soil.

The PRESIDENT: Had you a good surface soil?

Mr. E. D. SMITH: Yes, fairly; it was not deep.

Mr. SHERRINGTON: This soil where those walnuts are that I speak about in our neighborhood is a pretty strong clay.

The PRESIDENT: Has it been farmed for years?

Mr. SHERRINGTON: Yes, just on the border of the corporation of the town. They were cultivated right along.

The PRESIDENT: Was there any fertilizing?

Mr. SHERRINGTON: I could not say. I presume there was, for anything he does he does it right.

Mr. PICKETT: What distances did he plant them?

Mr. SHERRINGTON: There is a double row, I should say the distance would be about 5′ to 6′; they are not closer than that; I never measured the distance. It is right along the west edge of his orchard; he has seventeen acres of an orchard.

Mr. WHITNEY: Would it not be well to pay a little more attention to this subject of reforestry in the "Horticulturist?" It is more important than we think of just now. I intend to write up the subject in my own paper, and do all I can in our eastern part.

Mr. G. C. CASTON: On the north side of an orchard about five miles north of where I live there is a row of black walnuts, the largest of them is about 8 or 9 inches in diameter. I think there are eight or nine of them in a row. It is a rather bleak place, and they are as thrifty and healthy as can be, and seem to be growing as well as trees can grow. The walnut was not found anywhere within 40 miles south of that, but this is growing there and doing well. This question of forestry is vital to this country. In our section we have had more wells go dry this summer than ever I knew before, and we have streams that once drove mills which are entirely dry now. We lose the moisture furnished by capillary attraction by not having a surface of green leaves; we are getting too much like the prairie. We will have to turn our attention to forestry in this country. The lack of moisture is due chiefly to the want of trees. If we knew, as fruit growers and farmers, what we lose from lack of moisture, we would hardly believe it. We ought to make a start along this line of reforestry. In the northern sections there are a good many counties that have strips of land called waste land. The lumbermen bought that land with timber on it. They then took the timber off; but it did not pay taxes. I believe it would be advisable for the Government to take that land and reforest it, because it is not good for agricultural purposes.

The PRESIDENT: Is there any growth on it?

Mr. CASTON: No, not to amount to anything. Cattle run over it; it is a kind of free pasture. If that were covered with some of the economic kinds of timber it would serve a three-fold purpose: it would help to retain the moisture, it would ameliorate the climate, and supply fuel for years to come.

The PRESIDENT: If the cattle had been restrained would not that all have been reforested naturally?

Mr. CASTON: In spite of the cattle some land has covered itself with pine and poplar. Poplar is a very fast growing wood and can be used for making one kind of belt, but unfortunately the second-growth pine, when they get big enough for a belt timber, are cut off by the lumbermen. A few years ago the Government passed a statute that any person planting a tree along the road would be allowed 25 cents for each tree, in commutation of their statute labor, but the tree had to be three years planted, a living and healthy tree. There has been a great deal more tree planting along the roadside of late years than formerly. The Government have turned their attention now to reforestry in some wild tracts of land in the northern district, and with a good deal of success, but we ought to turn to it in the older sections. We should have the land growing something, if it is only melons, and not lying barren.

Mr. RICE: Nature had made seeds in such a way that they will seed themselves. For instance, ash seed is made with a wing to it, and a sharp point, and it is sure to strike on that sharp point and will pierce the moss, or the grass, and plant itself. There is no great knack in planting White Ash seed, and so with the maples. The seed of the Soft Maple is very large, and often that maple will grow as fast as the poplar or the cotton wood. You plant it out and it will grow two or three feet the first season, and the second season be five or six feet high. That is what we call the Dark Stem Soft Maple. I

got the seedlings from Nebraska. I find they stand our climate better. In Port Huron we are troubled about our shade trees ; our native Hard Maple does not stand our climate, and even the Soft Maple is subject to the borer so much that it is very little use to us, and this western maple I got stands the drought better than any of our native maples and it grows so rapidly that trees I planted twelve years ago are now twelve inches in diameter and forty feet high. Now if we would scatter these seeds in our woods, nature will take care of them. They can be flung around and as soon as they strike they work right down through the grass

Mr. SHERRINGTON : What is the difference between White Ash and Rim Ash ?

Mr. RICE : I do not know any difference at all. I do know that the White Ash makes a splendid tree, and they run up so fast that they make a fine growth. Since I read my paper, a gentleman, about seventy years old, said to me that he wanted to plant ten acres next spring of black walnuts, saying he had the nuts all saved ready. I told him to spread them on the ground and cover them over enough to keep them moist the rest of the winter and then plant them next spring. In protecting nuts, imitate nature just as near as you can. Nature will drop those in the leaves ; scatter the leaves over and do just exactly as you think nature would. Spread them around the ground, scatter a few leaves over them, and leave them there till the spring. In planting sweet chestnuts, get the nuts from trees grown in the north and they will produce hardier and better trees. The native chestnuts grown on your hillsides here may be cut off and they will sprout again like the catalpa, and you will have a perpetual forest after you get chestnuts once started, as long as you keep the cattle out of them. The great key-note of starting forests is to keep the cattle out and keep the leaves on the ground. Also keep your fires out of the woods If you observe these rules you need not trouble but what you will have a perpetual forest. That system of forest renewal was established, the Bible scholars say, about 6,000 or 8,000 years ago, and it has worked well so far. The forest has been renewed ages after ages, and keeps right on. We had good forests when we came here but we are tempted to disturb nature and so we are losing our forests. Here is a board from a Carolina poplar tree that is eight years old, and here is a board out of a tree seven years old.

Mr. CASTON : That is like Lombardy Poplar.

Mr. RICE : No, that is a great deal better than Lombardy Poplar. You will find one thing peculiar about this lumber, it will work very thin, and you may pull a little strip off it and you cannot break it in your fingers, it is so tough.

Mr. CASTON : Is it as hard to get rid of as the Lombardy Poplar ?

Mr. RICE : Nobody wants to get rid of it.

Mr. CASTON : Lombardy Poplar is as big a pest as the Canadian Thistle.

Mr. RICE : It is just how you look at it. I always protect the Canadian Thistle.

The PRESIDENT : So do I.

Mr. RICE : If I was going to buy a farm and one was covered with Canadian Thistles as high as my head and so thick that a rat could not get through it, and the other was clean, I would take the Canadian Thistle farm every time by all means.

The PRESIDENT : So would I.

Mr. CASTON : You could never in two generations get the fertility back again if you have Lombardy Poplars.

Mr. RICE : There is no trouble at all.

Mr. SHUTTLEWORTH : How do you get rid of the thistles ?

Mr. RICE : There is one man up in our section that has the nicest way to get rid of them that I know of. He fall plows the ground, then drags it once or twice during the spring and gets an immense growth on it, then in June plows them under, and sows to buckwheat, and rolls them down as flat and solid as he can, and he gets an immense full growth of buckwheat, and the next year he has got good ground for any crop, and he has no thistles.

The PRESIDENT called attention to the Hairy Vetch which grows ten feet in length, and which was being tested this year as a cover crop.

REPORT OF THE EXECUTIVE COMMITTEE.

In presenting the Report of the Executive Committee we would like to call attention to the constant growth and development of our work.

In the year 1859 this Association was organized, and in 1868, when it was organized under the Agriculture and Arts Act, it numbered 242. In 1886 it numbered 1,652, and to-day it numbers 4,500 paid members.

The cost of publishing our journal is constantly increasing, and must do so if we are to keep pace with the times. This year it has cost us about $2,500. You will notice that we have printed regularly 48 pages and cover which, with the increased number of pages, makes a very material difference in the printing bill and the amount of matter published. And we have a notice that there will be an advance in the cost of the paper for 1901 of $17.00 a month, or $204 per annum.

Another heavy expenditure is in connection with our affiliated societies which, in return, are a great source of strength. We have now over fifty of these societies in affiliation with us, and very soon we shall probably have all the horticultural societies in the province with us. So far we have helped these societies very materially by sending a lecturer once a year to address them on a flower or fruit topic—a system which keeps these societies in touch with us, and at the same time educates the public. The expense of these lectures is between $200 and $300 per year, and is increasing annually, Indeed, to do this work as it should be done, an expert should be employed. We would advise, in view of these new undertakings, that we ask the Department of Agriculture to make our grant for 1901 $2,500 instead of $1,800. We have not for many years made any such request, and we are sure that now the time is opportune for such a request in order that our work may be carried forward as effectively as possible.

The SECRETARY: I would move that this Association endorse the report of the Executive and Directorate.

A. M. SMITH seconded the motion, which was put and carried.

GARDEN FAVORITES.

BY W. T. MACOUN, CENTRAL EXPERIMENTAL FARM, OTTAWA.

As I presume that the ladies, who are to follow, will take up the subject from the aesthetic standpoint, I will confine my remarks principally to the cold and practical aspect of the question relating to growing flowers, and also bring before you what we consider the best flowers to grow. In arranging our flower garden we had in view the keeping up a succession of bloom from early spring till late autumn. By adopting good rotation, as it were, you can have a splendid show of bloom from the latter part of April, in fact from the middle of April, until frost comes in the autumn. In arranging this garden I divided the classes of plants into spring flowers, bulbs, annuals, perennials, and in some cases dwarfed flower shrubs. I may say that perennials in this case included the lilies and irises. By getting a proper collection of bulbs in the autumn you may have a selection of fine bloom from the middle of April until the latter part of May. There are so many beautiful varieties of narcissus that it is surprising that more people do not get some of the better sorts. We very often get good results from the mixed bulbs, but you will get far better results from named varieties, because in this way you can arrange your garden so as to get the best effect and also be able to study the different varieties to tell your visitors about them. Unless you have done this you do not know the satisfaction there is saying to a person when he come into your garden, "This is a Kaiser Kru that I paid ten cents apiece for, the most expensive bulb in the market," and so on. It is a great satisfaction in knowing something about them and having something to talk about. Now, these named varieties will cost a little more than the mixed sort. I have made out a list of what I consider the few best flowering bulbs.

Early flowering Crocuses, Squills, Hyacinths, Tulips, Narcissus.

Now, if you have only seen 5 or 6 combinations of colors upon early bulbs, you may imagine what a fine sight it is to see fifteen or twenty of those fine varieties growing in

your garden, though you may not be aware that the number of varieties has gone up into the hundreds, and these are the very best, and I assure you it is very hard to restrict this list to the few varieties that I have mentioned. Besides bulbs there are a great many hardy narcissi. As a rule the only naricissus we find in the garden is the Poet's narcissus. This is a very hardy sort and blooms very freely. There are a great many varieties in narcissus, just as there are varieties of bulbs, and by getting eight or ten apiece of these you will never regret it. At Ottawa, where we have very severe winters, we can bring these fine narcissi through without any trouble by simply giving them a little mulch straw in the autumn. The varieties which I consider the best for planting are the following :

Cynosure, Stella, Incomparabilis ft. pl. Orange Phœnix, Sulphur Phœnix, Princeps, Golden Spur, Emperor, Horsfiedi, Bicolor Poeticus Ornatus, Poeticus, Poeticus ft. pl.

This will give you a succession of narcissi covering probably three weeks, and any of you who have not seen those beautiful narcissi can't imagine how fine they are. If you have seen them in the florist's window, some of these immense fellows with long trumpets, you may think they are very difficult to grow, but they can be grown just as easily as the Poet's narcissus, which you see in every garden, and they are so much better that it is surprising more people do not get them. We should also have some hyacinths in the garden, as they are beautiful flowers and do very well when planted in the autumn and given direction. I have made but a short list of these.

Hyacinths.—Gertrude, Gigantic, Lord Macaulay, Roi des Belges, Grand Lilas, Von Schiller, La Grandesse, Norma, Grand Vidette.

Of course there are many others, but these are, in my judgment, among the best. These are also the best kinds for pot culture in the winter time. It is a great mistake to get too many varieties of hyacinths in the winter. There are certain kinds which force much better than others, and which give you all the range of bloom that you desire. The list I have given I have found best for the house and garden. Of course we should also have in the garden in the early spring the snow-drop and the squills, crocuses, which come on before the bulbs, narcissus or hyacinths. Unless you have some early flowering perennials you are going to have a blank in the garden before the annuals or later flowering perennials begin to bloom, and we have found that the Iceland poppy fills this blank. It begins to bloom very early in May, and will continue to bloom all summer if the ground does not get too dry. It is one of the most satisfactory perennials that we have found at Ottawa. It has stems from six to eight inches long, which make it very desirable for cutting, and the prevailing color is of a lemon-yellow, which is very effective in vases and makes it a very useful plant for decorating in the house. The Iceland poppy seed themselves and come up every year, and by leaving some of these in your beds you will get this succession of bloom following the bulbs. Then, after the bulbs there is always a long time in most gardens when there is very little grown, hence the advantage of having this Iceland poppy. Then there are a great many fine early flowering perennials. It is a necessity to plant annuals to make a show in the bed all summer through. These, however, will not begin blooming until about July, so you may have to make provision by early bulbs and by your Iceland poppy and by some other perennials, and there are plenty of them.

Mr. Rice : Is the Iceland poppy an annual ?

Mr. Macoun : No, it is a perennial ; but you very often get it to flower the same season. The seed from the first flower in the spring very often flowers the same season. I will now give you the list of the best annuals to grow. No one can do without sweet peas. They begin blooming about the first week in July, and you can have them up to the hard frost, and I am sure that you will agree with me in saying that there is no finer flower than the sweet pea. You will have no trouble at all in finding plenty of varieties to suit you, because they are all good. Then there are nasturtium, poppy, verbena, petunia, portulacca, coreopsis, aster, dianthus, marigold, zinnia. The zinnias are rather coarse, but make a fine show for fastening together. These annuals I have mentioned keep up a better succession of bloom than any other. I should have mentioned the Phlox Drummondi, which is among the very best to grow. Among lilies there are so many beautiful sorts that you can have a succession of full bloom from the latter part of May until September, which is a very long season. The best species are the Lilium auratum from Japan, and Lilium speciosu ; then there is a variety of Lilium elegans

which is very handsome; it is a sort of crimson-red color, but it makes a very fine effect. Then, among the irises, you can have a series of bloom from the latter part of May until the middle of July. The Siberian irises, which are not very good compared with some others, but which begin to bloom the latter part of May. They are closely followed by the German irises, which you should certainly grow. We have, I suppose, one of the best collections in the country at Ottawa, and all who visit it are surprised at the beauty of the different varieties. The color ranges from white to purple, blue, pink or reddish shade, and they are all intermingled in the flowers so well that it gives them a remarkably handsome appearance. Then following the German irises are the Japanese irises, which are very easily grown, and which extend the season of irises up to the middle of July. A great many people think you have to plant the irises on moist soil because our native irises grow there, but it is not necessary. Some of our best results in irises are on light soil. I might say that we have about 1,200 varieties and species of perennials growing at the Experimental Farm at Ottawa now, and among those I have chosen a few which I consider the best for planting and which cover the field very well, which I will now show you. Of course these dry specimens do not give you any idea as to the beauty of these plants. Mr. Macoun then exhibited a large collection.

OUR FRIENDS, THE FLOWERS.

By Miss A. Hollingworth, Beatrice, Ont.

I wish I could have seen more farmers here, because I want to talk to them of Horticulture. I have always lived on a farm myself, and I want to see the farmers' homes the prettiest in the country, and there is no reason why they should not be, yet the town and city people make a better show of their surroundings than the country people notwithstanding all the advantages that nature has lavished on them. Of course we have some very beautiful farm homes in Ontario, but the majority I find are very desolate looking places, and there is no excuse for it. Why there are not more flowers grown around the farm houses I cannot understand. Two summers ago I travelled around Midland and only saw one good flower garden, and that was at the home of an old bachelor over 60. (Laughter) You generally see a forlorn looking little bush in one corner, and perhaps some orange lilies growing up amongst the grass, but in the great majority of farm homes there is a bad want of flowers. It is not necessary to have a great quantity; that is a great mistake, because you may try to do too much. Farmers have not time to have specially fancy plots such as they have where gardeners are employed. Rockeries are very nice if you have a hose and can give them plenty of water, but if you cannot give the time to them better not have them, because they look very dreary with dry flowers upon them. Another thing that looks often foolish, is the hanging baskets and the long narrow boxes nailed to the window ledge. This is a good idea for the town houses, and I have passed houses in town that were simply delightful to look at because of the bright window boxes, and I have passed other houses that were an eyesore because they were not attended to. If one goes in for this sort of thing it ought to be attended to or let alone. I find that for busy people the most satisfactory thing is to plant shrubs and vines, and if we cannot afford the nursery stock the woods will help us out with beautiful native vines, and if we cannot afford fancy trellises we can make rustic trellises, get young seedlings and dig holes each side of the garden path and wire those seedlings back and make a rustic arch and train vines over. I have those over my garden paths and over the verandah and over the summer house, and those go a long way towards making a house more home-like; it looks as if somebody was living there, and not just a calling place. Another thing I notice is that I seldom see rustic work in the country where we can have it for the trouble of making them, and also in the towns where people can appreciate these things. There is no reason why we should not have rustic seats and flower stands, because they are easily made. I think the cedar is the nicest for this work. I took a photograph of a seat that was made at Niagara Falls, and used that as a model. You will also find young pieces with a very graceful curve at the bottom of the trunk, and those curves can be used to great advan-

tage in making this rustic work. My hands are rough with this sort of work; I do these things rather than have my home desolate. We take these curved stems for the back and the arms and the legs and the seat, and then take these four feet cross bars for the bottom of the seat and split the lighter part of the stems in two and nail them flat side down on the seat. It is seven years since we made that, and it is a good substantial seat yet. We make flower stands on the same principle. I would like also to speak about house plants; I like to see lots of plants in the house. There has always been a theory about that they are not healthy, and it is the most foolish thing that people who think it safe enough to keep them in their living rooms think it is not safe to have them in the bedrooms. That is all nonsense. There is nothing better to have around you than plenty of plants, because they not only purify the air by taking up the carbonic acid gas which we have thrown out, but they are a good indication of the sanitary condition of the house. If your house plants are not in a healthy condition your house is not fit for you to live in, and you may well look to your means of ventilation. Of course there may be other reasons for the trouble. We often make the mistake of keeping too many window plants in the one window. A plant needs a good deal of light, and it is better to have a few healthy ones than many sickly ones. At this time of year it often happens that our window plants get frozen, and if we let them alone they will generally die, but we can often save them by removing them as soon as we find they are frozen to a room where the temperature is just a little above freezing point and shower them well with cold water and then cover them up and keep the light from them. In that way we can save delicate plants that would otherwise die. I have often followed that plan with delicate annuals in the garden, then I have gone out before sunrise and watered them with the coldest water I could get and often saved them in that way. After house plants have been in the house all winter we must make the change gradually in taking them out to the verandah, and the same again when we are bringing them into the house in the fall. You will often notice that the leaves and the flower buds also will turn yellow and fall off. There is a great difference between the atmosphere outside and inside, and the plants are very sensitive to it, and in the fall instead of bringing them at once into a room that is heated by fire you should put them into a room where is no fire and give them plenty of fresh air.

Make the change as gradually as possible. If you are troubled with plant lice or other pests, the best insecticide is tobacco cut up and left over night on burning coals in a room with the plants, or in a large packing case if there are not many. Those who have the care of children should not miss the refining influence of flowers. A four year old child whom my sister had taken while her mother was ill, on her return home begged to be taken back because of the flowers in my sister's home. I find that is the case with almost all children. When their minds are beginning to unfold, the ruling passion with them is a love for plants and animals, and it is a pity that more advantage is not taken for developing their finer instincts. We find that instead of that, children are often made old in their ideas; grown up people tease little children about love and marriage, and stuff their heads with all the wrong notions that should not be there to the exclusion of better and purer knowledge that parents should instil in them. How much better it would be to set the children's minds thinking of the great wonders of nature around them. I am sure that any child would be delighted to learn the history of the pollen grain, that fine yellow powder that falls from the centre of the flowers. It seems so insignificant, and yet like all Nature's workings it is so wonderful. Miss Hollingworth continued her address, giving an interesting history of the pollen grain with illustrations.

FRUIT AND FLOWER CULTURE IN ENGLAND AND IN CANADA.

By Mrs. John Hoodless, Hamilton.

I have come to you to-night to ask your co-operations in securing better facilities for educating women in their special occupation on the farm. This stimulus was given me two years ago when I was visiting in England. I have no doubt that there are in this audience a good many revolving in their mind the question, what can women do in agri-

culture, in horticulture, in fruit growing? I used to wonder in the same way, but by a happy circumstance I was enabled to visit in England the agricultural and horticultural schools for women, and was astonished to find what has been done there and what can be done by women. I spent three days at the Lady Warwick Hostel at Reading and also attended a conference at Reading College at which I heard very fine addresses on various subjects, among others how our Canadian produce is shipped to London, and the condition in which it is received, some facts which would not be altogether complimentary if I attempted to tell you all about them. This college is only one of many institutions of the kind throughout the country. I also met representatives from Belgium, Germany, Sweden, and France who told me about the agricultural schools for women in those countries. In Belgium the women receive quite as much attention in the agricultural colleges as the men, in fact they have a very thorough course; and, as you all know, the women in the United States are receiving almost the same attention in the agricultural schools. I know that all the gentlemen present are representative Canadians and extensive fruit growers. I believe if you encourage the Government authorities we could have something done for women here, but you know we women have no votes and therefore have not a great deal of influence. My reason for coming here to-night, is to ask you to use your vote and influence for the education of women in this land. In the college mentioned, Lady Warwick Hostel, the majority of the students were gentlewomen—a very desirable element to interest, because we all know that women of refinement and culture with trained minds, can grasp points and will take much more intelligent interest in matters than the uncultured women of denser mental power. There cannot be too fine training or too much education for women who are going into a question of this kind; therefore they have made rather a stipulation that all those entering shall be women of a certain degree of culture. I saw those young ladies not only digging in the garden, but trenching, preparing the soil for mushroom beds; I saw them working in green houses, and doing everything that could be thought of on a farm garden, or in small agriculture. I discussed the question with the warden, the professors and teachers but, in order to get another point of view I got up early one morning to speak to the gardener so as to get his opinion as a practical man. I asked him if he thought young women would ever be a success in this work. He said, "Madam, I have been astonished at the progress made by these students. I have worked in Mr. Sutton's garden for years, and other large seedmen's institutions, and if I had large green-houses I should rather have women in them than men." I asked why, and he replied, "because they are so much more careful in potting. They attend to the details of the work; they take far more interest in their work in training vines or anything of that kind, they are so much more deft, they are not half so apt to break them. Taking them all in all I consider it is quite in order for women to do this finer work in the green houses" (Hear, hear.) In England they are always bemoaning the surplus female population, and they must find something for them to do; but is not that fast becoming a question here? In Ontario we have quite a surplus female population, therefore is it not time we were considering what we are to do with these unoccupied individuals who should become producers as well as consumers in the interests of their country?

I also saw these students working in the poultry yard, saw them even stuffing fowl. Of course they are taught all this scientifical y, not altogether with the view of their doing it themselves but with a view to their directing others. A lady calling at my house last summer and speaking of the question of directing others said, "Five years ago I was left two estates to manage. One was a vineyard, the other a farm. I went from New York to take charge of this vineyard on the Hudson without the slightest knowledge of anything about it. The gardeners wanted to run things their way, but I saw that I had to be very careful or I would lose money. I went to a scientific gardener, spent two or three days with him, had him show me how to prune grapes and pack them; I packed three tons myself in little five pound baskets and got the highest price in New York markets. In two years I came out ahead, but it took me a year to find a man who would do things as I wanted him." They would insist on doing it as they wanted; and that is the difficulty women have to contend with. (Laughter.) Therefore you can understand why a scientific training is necessary if women are to make a success of this work. Just after Mr. Woolverton asked me to address this meeting I wrote to the lady president of the Agricultural and Horticultural Union of England, and asked her, "What

can I say to our people about the shipment of Canadian fruit to London?" and she replied, "Tell your people to send their fruit to London in better shape; tell them to pack the fruit in small packages, pack according to grade, to put the good kinds in one box, and the second and third grades by themselves." I found when I was in London that by packing choice grapes and pears by themselves as first grade they brought enormous prices,—they are simply for the nobility—only dukes and the royalties can buy these. When they are packed good, bad and indifferent together they bring the lowest price. This I saw for myself. The same remark applies to the packing of eggs. A packer's agent said that Canada sent the worst speciments of eggs to London of any country that sent food products to that city; he showed me some of them—big eggs, little eggs, yellow eggs, white eggs, all packed together in a crate, consequently they brought the lowest price—just the same as the fruit. Of course you know the reputation apples have—big ones at the top, the poorest in the middle. I have had them say to me, "You have good apples in Canada, but you have dishonest packers." (Laughter.) I said, "We have a few honest packers." Londoners will pay any price, and they are perfectly willing to pay for the best. Now if you can arrange a cold storage system such as we heard so beautifully described this afternoon, and with proper packing so as to secure the London market, I think the fruit growers would soon become rich. I have a little notice here which I clipped out of an English paper which I thought might be interesting concerning grapes from Canada:—

"There is now every prospect of a cheap supply of fresh grapes being put upon the English markets in future years during the autumn and winter months. Already the test shipments of these fruits, carried in refrigerated chambers, are on show at Manchester, and the trade expresses much satisfaction at the salable nature of the fruit. There can be no doubt that this great development of the Canadian fruit trade in the United Kingdom will do much to extend the demand for cheap late grapes, for hitherto the middle and working classes have had to depend upon the hard Spanish Almerias, which are sent into our ports packed in cork-dust in barrels weighing from 50 lbs. to 60 lbs. gross. These are the well-known green grapes, so popular with grocers and dried-fruit traders. The Canadian supply will ensure ample quantities of luscious, aromatic grapes, of far superior quality to the Almerias and at a reasonable price. These new grapes have already produced a bit of a sensation in fruit trade circles, for when arrangements have been completed the English markets will be kept well stocked with regular shipments of fresh grapes put up in dainty little baskets, and thus render the storage of the Almeria grapes by market men, to ensure supplies after Christmas, unnecessary. The quality of the fruit is excellent, and it is highly satisfactory to know that Canada can send to this country all the late cheap grapes we need. Although, as previously announced in the *Daily Mail*, the Canadian fruit exports will include the finest pears that are grown, yet the addition of late grapes by no means exhausts the list. Various other fruits are to be sent in time, and the French, Spanish and Dutch shippers will find many of their fruits displaced by the superior products despatched from Canada.

It was only last year that satisfaction was expressed. When I was there two years ago they condemned the Canadian fruit as it was then sent in. Is not the trade in England, as outlined in the paragraph I have just read, worth striving for? At one of the conventions I was unfortunately called upon to second a toast at one of their banquets—which was rather a progressive idea for that staid old country—I took this opportunity to ask the British gentlemen present to explain what had puzzled me considerably in the London markets, in which I was intensely interested. I said that I had been through the London markets, had seen on the bulletin boards all sorts of foreign products—from Germany, Russia, Denmark, Normandy and other countries—but it would take a patent magnifying microscope to find Canada. The answer given was "The reason Canada was not put on the bulletin boards was because its products had got a bad name," and they added, "The fruit, the poultry and the dairy produce that comes in here, if really good, is sold as British, and the inferior is labelled Canadian." Now I thought that very unfortunate. I made enquiries, and told it was true that many of the food products had come over in bad shape and consequently the Canadian fruit had got a bad name, the first class goods had been sold as British in order to bring a good price. They said, "If Canada sends us first class articles we will guarantee to give them a preference." (Applause and "hear, hear") That remark was vigorously applauded by two hundred and fifty representative British gentlemen. Now the question is, how are we going to get our people to export these goods properly. An agricultural paper tells us what women can do in this matter. The article divided them into two classes, the educated and the uneducated. The educated would be useful in writing delivery notes names of plants, directions, invoices, letters, etc., gathering and packing flowers and sundry fruits and vegetables as peaches, grapes, tomatoes, cucumbers, etc.; tying up choice plants, cutting making, pruning, seed sowing and grow-

ing etc., etc.; while the uneducated could do potting, hoeing, weeding, dressing against insects, watering, seed saving, tying and training, thinning grapes, etc., etc., and much of the same kind of work as undertaken by the educated, but turned over to them as being of a rougher nature. Training schools for women are receiving a great deal of attention in England, and the necessity for them here was emphasized last fall when I offered a prize for the best trussed fowl at three or four of our exhibitions. Some farmers asked what was meant by trussed fowl; they wanted to know if they were to be cooked, plucked, or what had to be done. Now when our people do not know how these things should be put on the market, how are they to learn without teachers? The thought occurred to me that it would be a good plan to bring out one of these scientifically-trained English women who can explain and show us exactly how these things should be placed on the English market—one who had had sufficient experience and training to co-operate with our packers and show them exactly what should be done. That is just a thought, suggested in passing, from a woman's point of view. Speaking again of the Lady Warwick Hostel, I saw the students making mushroom beds; one lady told me she had served a three months' apprenticeship to this, and the year before she had made quite a large sum from the cultivation of mushrooms alone. Now when these things can be done in England, they can be done in Canada. About three years ago we asked the Farmers' Institute to co operate with us in establishing women's institutes throughout Ontario. The government made a small grant for their support, we have had meetings, papers, and talks until we are weary of them. We want something more than talk, and the women's institutes have got to the point now when they want a practical teacher. Many admit that they do not know how butter should be prepared for the market, that they do not know how to care for fruit or flowers or anything else scientifically and they are anxious to be taught. Therefore, scientifically trained teachers, who will go out through the different districts and give the women, through the women's institutes, a thorough practical training is the need of to-day. You may think this is a Utopian scheme, but it has been done in England at the expense of the county councils, and I believe our county councils would co-operate in such a movement. We have asked our government, through the women's institutes, to consider the establishment of a women's building at Guelph. I do not know whether they have given the question any consideration or not, but I assure you there is and there will be a demand for that training. In order to show you how this question will appeal to the intelligent class of women, I may say that during last year at the Normal School of Domestic Science in Hamilton this question was discussed with the result that three students are making application to enter the Guelph College to learn butter making and poultry raising; and to take lectures in bacteriology and entomology; so you see there is rather an intimate relation between the two subjects. I was struck to-day, in hearing Hon. Mr. Latchford's address, by the very close connection between domestic science and flower culture. When those girls came to our school they had not the faintest idea of taking up horticulture, or dairying or anything of that kind, but they got interested in bacteriology and other subjects related to these questions, which led them to believe there were such instructors needed. This is why I come to you to night to ask you as representative Canadians to support the women in their appeal to the government for a building at the Ontario Agricultural College where young women may study entomology, scientific flower and fruit raising and any other branch of agriculture for which they may be fitted. In passing I may say that flower culture may be made very profitable. Few people in the city think their table complete without flowers, and the demand for these things is increasing; from being a luxury, flowers are now considered a necessity. Such an institution as I am here asking for will strengthen your cause and give you true helpmeets in your homes. I repeat what has been done in England and other countries can be done in Canada. The year before last I was collecting information from the different provinces as to "What were the Possibilities for Women in Agriculture?" for the Paris Handbook. From every province, even from Manitoba, where they would not expect to do very much in the way of fruit and flower culture, the answer was that such work could be made profitable by the women. Provide the training school, send your daughters there instead of to a commercial or Normal school, then agriculture for women will become popular. (Applause.)

SHIPPING APPLES TO GREAT BRITAIN.

J. M. SHUTTLEWORTH: I have been very much interested indeed to hear the addresses that have been given to-night by the ladies, and also those that were given this morning and yesterday by the gentlemen. As you are aware, I have taken issue with some of the views expressed. A great deal has been said about the ignorance of Canada by our English friends. For seventeen or eighteen years I lived in England, and I did find that there was ignorance, but not such gross ignorance as one would suppose from what has been said by some. Dr. Saunders spoke about not being able to find Canadian apples in Liverpool and also made the statement that our apples did not reach places very far outside of Liverpool. They must have been consumed somewhere, and someone knew about Canadian apples. The point is this: our Canadian apples last year were falsely packed, most dishonestly packed, and it brought ruin or almost ruin, to a great many of the men who packed those apples, or for whom the apples had been packed dishonestly. There were about 500,000 barrels of apples shipped last year to Great Britain from Ontario alone. Had there been 250,000 instead of 500,000, more money would have been brought back. This is a very important question, this one of dishonest packing, and one that we must not shirk in any way, shape or form. We have got to get at it in the best and quickest way we can if we want to keep our reputation, or at least regain it, for we had a better reputation a few years since than we have at the present time. I may say that this year I have had but very few complaints from our people on the other side of false packing. Our fruit was good, price was low, and there was not the same incentive. If our English friends can take nearly 2,000,000 barrels of apples at a fair price, what are the possibilities of the Canadian trade? What are the dimensions to which the Canadian trade might reasonably and profitably be developed? I think we might say there is a strong sentiment in favor of Canadian products at the present time. There is a very kindly feeling on the part of the English consumers towards us, that if we can put on their market as good, or a little better, fruit than the others they will consume more of our fruit and pay us better prices for it, but they will take it in preference, provided it is just as good, if they know it is Canadian fruit. I believe that. There is a good deal of sentiment after all, and you will see that more and more as the years go by, I think, If we can take 500,000 or 1,000,000 barrels of our apples, packed as they are now and with the quality of fruit that we are giving them and the varieties, and get a fair price, I think we might reasonably expect that a profitable business might be done in the future with better facilities for shipping, with better handling of our fruit, better grade fruit and with better varieties. We could double or even treble it; some think more than that. I think we could improve the quality of our fruit and we will get better prices for it. Referring to the varieties as suggested by Prof. Macoun, there are three varieties that you ought not to grow at all—they are hardly fit for a man to eat. These are the Gano, the Ben Davis and the Pewaukee. The only thing that redeems the Gano and the Ben Davis is their fine appearance, but those that are grown in Kansas are very superior to our Ben Davis and Gano—a difference that I cannot account for. In order to make our hardier varieties such as Spy, and Greening good standards, there is nothing better we can do than graft them on very hardy stock, such as the Tallman Sweet, and we would thus get profitable crops and hardier and better fruit. I am speaking this not so much from my own experience as from information I have had from men who have had experience. I would ask those who are better capable of judging whether I am right or not, whether the Tallman Sweet is a good stock to graft Spys on? (Voices, "Yes"). With improved transportation for the better handling of our fruit the Spy I believe is going to be the apple. It deserves to be. It keeps its nice fresh crispiness until all other apples have become dry. It is a nice looking apple generally, unless the foliage has been exceptionally heavy, or where the trees have not been properly pruned. It is a very nice looking apple; it has a bright appearance.

A DELEGATE: How would the King do?

Mr. SHUTTLEWORTH: The King is a nice looking apple, but there is some objection to the growing of Kings because it is what we call a shy bearer. It takes well. It is a showy apple, but I do not think quite so much of it as I do of other varieties. The apples are usually too large. They bring very high prices because they are showy.

The reason the Ben Davis has sold in the past is because the apples are showy ; they do to dress windows, and they keep their appearance longer than any other apple. They have been used more for show purposes than anything else, that is our Canadian Ben Davis, but if we can get better fruits in our warehouse, which we shall shortly do by having better transportation facilities and better care of our fruit, we will have a surplus of Ben Davis, and they will bring the price they deserve to bring—the lowest price. The most important question we have to deal with outside of the packing is the question of transportation. If you would see, as I have seen in the past few years, the holds from which our apples were taken, you would wonder we ever got our apples there at all. (Hear, hear). I have climbed down into the holds after the hatch was taken off, and the carbonic acid gas made me dizzy. Now, can apples keep in such an atmosphere ? Until some appliances are used we will never get over that difficulty, because the first duty of a captain of a vessel is the safety of his vessel. I have crossed often times in bad weather when it was as much as a captain could do to get his vessel in, and where he had to batten down his hatches and batten his companionways for the safety of his ship. Unless we can protect that fruit and give it fresh air we shall have many rotten cargoes. For a long time I have been urging upon our steamship people to pay greater attention and care to the handling of fruit, while on board. About 8 or 9 years ago we were handling a large quantity of fruit from Boston, and one of the lines seemed to think that apples were pig iron, the way they handled them. I saw them discharge their fruit on a gang way, about 18 or 20 feet up, and they were skidding the apples down one after another, and sometimes the barrels would shoot 20 feet, and sometimes the head would be burst out and the apples would be spread all over the dock. I told the man in charge that that must be stopped. He asked me to move away, or I would be hurt I said I would not. The thing developed into quite a quarrel. However, they telephoned up to the office and asked them what to do. They asked me to come and see them, which I did, and I told them if they could not handle fruit better than that they had better stop altogether. We cabled out and stopped shipping on that line. It was not long before those people realized how important it was to look after their shipping. Instead of getting eight or nine steamer loads they got nothing. We hit them in the right spot. It is the only place you can hit them. The only place you can hit a dishonest man that packs his fruit falsely is in the pocket ; and hit him hard. Those people asked us what they should do, and we told them we would not use their ships unless they handled the fruit properly, and now they have some of the best fruit-carrying boats in existence, they have put in exhaust fans and they are drawing off this carbonic acid gas and they are letting in the fresh air. Our apples are arriving in perfectly good condition from these vessels all the time, no matter what the weather is. I believe they will shortly put those appliances in all other boats, and those lines that are going to cater to the interests of their clientelle will endeavor to do what is best for them, because their interests and the patrons' interests are identical, if they only look at it in that way. I might say that the boats that sail from Montreal have not anything like the capacity for the fruits that they usually carry. Some one said, I think to-day, that apples were stood right against the funnel. Well, they can't get there very well, but they can get in the bunker hatches, and that is hotter than they should be. Some of them have been stood in places where there is not a possibility of getting ventilation. They have nothing but open, funnel-shaped ventilators, and you cannot drive air in there. You cannot possibly get fresh air down into those hatches when they are nearly full, or full right to the brim, with a cargo, but you can draw out the bad air and fresh air will find its way in, if you have appliances for it. Another very important matter is that of distribution. You can understand that after our fruit has undergone those hardships incidental to a voyage, under the conditions which you may infer from what I have heard, the sooner those apples are put in the hands of a customer the better it is for everyone concerned. To distribute a good deal of fruit through the country as it lands would simply mean ruin. When you have distributed in London, Glasgow, Liverpool and Manchester you will find that you have about covered the ground. If you attempt to send apples to Wolverhampton or to Birmingham or to Leeds or to Sheffield, you will find that you will miss many chances of getting markets. At Liverpool for instance you will have buyers, as we do, from all those large cities. Sometimes Birmingham is loaded up with fruit ; if you had a shipment, or consignment, going to Birmingham you would come upon a glutted market. Sometimes Manchester is loaded

up, sometimes Leeds, etc. But when one market is loaded up three or four others may be wanting apples; they have not bought so heavily the previous weeks. Sometimes the trade is better there; sometimes textile manufacturers are in good shape, and sometimes the iron, sometimes the coal industry in Wales, so that we have to get a congregation of buyers at a central place to get an even market where prices will run even throughout the season. This is a point which is not quite well understood. For instance, if I have Tallman Sweets—an apple that is not generally liked—I always look over in one corner for bids from certain men from a place called Bolton, where they like Tallman Sweets, as they do in Baltimore on this side and they like Bellflowers in Baltimore. Those differences exist there very markedly. I would never dream of sending Tallman Sweets to Manchester, unless we could get some of those buyers up through the Rosendale Valley to come down and buy them. I would never think of sending Russets to Glasgow up till a certain date, because they do not want Russets there. That brings me back to the point of the middle man; the man who is trained for that service is able to understand those conditions better than you gentlemen here, who are (or should be) looking to the eradication of your insect pests, doing your work well here and not attempting to do it there. You want good, honest middlemen—the only legitimate trader, practically, and you have to depend on him. If we can only get good, honest middle men, backed up by this same sentiment on this side that we want the best accommodation possible for this fruit trade, we will get a great many things from the steamship companies and transportation companies we could not otherwise get. We know what is wanted from that end; you know what is wanted from this end. If you will only back us up we will get some of those things that we want, that we say are necessary. I might make a few suggestions in regard to peaches, pears and grapes. I do not think that our grapes will take very well there. We will have what they call the low-class trade. Englishmen like to bite their grapes, like to take out the seeds, and they don't like to swallow them, as they are afraid of that complaint, appendicitis. They can get those Almerias, mentioned by Mrs. Hoodless, a more solid grape and a nice grape to eat. They can also get the Muscatels and some other grapes from Malaga, and they will never want to eat our grapes over there for the reason that they cannot bite our grapes, as the centres are very sour and very tough. So until we improve the quality of our grapes we may never hope for a real good trade for grapes. I should like to be with you to-morrow, if possible, to talk over that Act to prevent dishonest packing, which is ruining our trade. It has made me sometimes ashamed to think that the apples came from Canada. I have been hauled over the coals a good deal for taking the stand I do in that matter, but I believe I am right. I believe it is harmful to our trade, harmful to our pride, and it is wrong. (Applause).

REPORT OF COMMITTEE ON RESOLUTIONS.

Mr. WHITNEY read the following report which was adopted as read:

Your committee on resolutions beg leave to report as follows:—

(1) That this association deeply regrets that our director, Mr. Thomas Beall, has been prevented from being present at the present meeting, owing to illness and death in his family, that we have missed his valuable assistance in our discussions.

(2) That this Association extends to the family of the late Charles E Woolverton our heartfelt sympathy, and that we hereby record our appreciation of the valuable services he always rendered to the cause of fruit culture.

(3) That this Association would hereby tender to Mr. L B. Rice, Port Huron, the esteemed delegate of the Michigan Horticultural Society, our thanks for his valuable address and that we have highly enjoyed his presence at this meeting.

(4) That this Association hereby returns thanks to the Mayor and Council and people of Brantford for their welcome and the use of their Town Hall for our meetings, and that we assure them that they have helped us in holding one of the best meetings in the history of this Association.

(5) That we hereby tender thanks to the ladies and gentlemen who have aided in making this evening's meeting pleasant.

(6) That this meeting of the Ontario Fruit Growers' Association desires to express and put on record its regret that this Association has not received greater recognition at the hands of the Dominion Government in connection with the recent Paris Exposition.

Considering the important work that this Association is doing, the wide scope of that work; and considering especially the services that it rendered in collecting the fruits of this province for the exhibit made at Paris, and the splendid contributions which its members individually and collectively made to that exhibit, which attracted the attention and admiration of all the nations of Europe, we regret the apparent oversight on the part of the Department of Agriculture at Ottawa, that a representative was not chosen from among the officers or members of this Association or some one directly in touch with the fruit growing interests to represent these interests at the said Exposition; nor was this Association consulted in the choice of any representative sent to the said Exposition to represent the interests of Canadian fruits and fruit growers there.

Furthermore; in view of the Pan-American Exposition to be held in the city of Buffalo during the coming summer of 1901, and considering the importance of making a large and attractive display of Canadian fruits at that Exposition, we deem it in the interest of the fruit growers of Canada generally, and due to the exertions and influences of this Association that some active fruit grower recommended by its executive should be chosen and appointed by the Department of Agriculture at Ottawa, or by the Agricultural Department of Ontario, or by both conjointly, to take charge of such exhibit of Canadian fruit as may be made there.

INSPECTION OF FRUIT.

Mr. A. H. Pettit, presented the following report of the Committee on Inspection:

We, your special committee to whom was referred the question of legislation to prevent fraud and misrepresentation in the packing of fruits, beg to recommend that Bill No. 127, as submitted at the fifth session, eighth Parliament of Canada, be so altered and amended to read as follows:—

Fruit Marks Act.

1. This act may be cited as the Fruit Marks Act, 1901.

2. This act shall come in operation on the first day of July, 1901.

3. Every person, who by himself or through the agency of another person packs fruit in a closed package intended for sale, shall cause the package to be marked in a plain and indelible manner before it is taken from the premises where it is packed;—(*a*) With the initials of the Christian name and the full surname and address of the packer; (*b*) with the name of the variety, and (*c*) with a designation of the grade of the fruit.

4. No person shall sell, offer, expose or have in his possession for sale any fruit in closed packages unless the name and address of the packer is marked upon the package in a plain and indelible manner.

5. No person shall sell, offer, expose or have in his possession for sale any apples or pears packed in a closed package which is marked the grade A. No. 1 Canadian, unless such fruit consists of well grown specimens of one variety, of normal shape and not less than ninety per cent. in each package free from scab, worm holes, bruises and other defects, properly packed and marked in a plain and indelible manner with the minimum size of the fruit in inches (or fraction thereof) across the core of the apples or pears as the case may be.

6. No person shall sell, offer, expose or have in his possession for sale any apples or pears packed in a closed package upon which is marked the grade No. 1 Canadian, unless such fruit consists of specimens of one variety, sound, of fairly uniform size and not less than eighty per cent. in each package free from scab, worm holes, bruises and other defects, properly packed, and marked in a plain and indelible manner with the minimum size of the fruit in inches, (or fraction thereof) across the core of the apples or pears as the case may be.

7. No person shall sell, offer, expose or have in his possession for sale any fruit packed in a package upon which is marked any designation of size, grade or variety, which falsely represents such fruit, or in which the faced, or shewn end gives a false representation of the contents of such package; and it shall be considered a false representation when more than fifteen per cent. of such fruit are substantially smaller in size, or inferior in grade to, or different in variety from the marks on such package, or from the shewn or faced end of such package.

8. Every person who, by himself or through the agency of another person, violates any of the provisions of this Act shall, for each offence, upon summary conviction, be liable to a fine not exceeding one dollar and not less than fifty cents for each package which is packed, sold, offered, exposed or had in possession for sale contrary to the provisions of this Act, together with the costs of prosecution, and in default of payment of such fine and costs, shall be liable to imprisonment, with or without hard labor, for a term not exceeding one month, unless such fine and the costs of enforcing it are sooner paid.

9. Whenever any apples or pears packed in a closed package are found to be falsely marked, any inspector charged with the enforcement of this Act may efface such false marks and mark the words "falsely marked" in a plain and indelible manner on such package.

10. Every person who wilfully alters, effaces or obliterates wholly or partially, or causes to be altered, effaced or obliterated, any inspector's marks on any package which has undergone inspection, shall incur a penalty of forty dollars.

11. The person on whose behalf any fruit is packed, sold, offered or had in possession for sale, contrary to the provisions of the foregoing sections of this Act, shall be *prima facie* liable for the violation of this Act.

12. It shall be lawful for any person charged with the enforcement of this Act to enter upon any premises to make an examination of any packages of apples or pears suspected of being falsely marked in violation of the provisions of this Act, whether such packages are on the premises of the owner, or on other premises, or in the possession of a railway or steamship company; and any person who obstructs or refuses to permit the making of any such examination, shall, upon summary conviction, be liable to a penalty not exceeding five hundred dollars and not less than twenty-five dollars, together with the costs of prosecution, and in default of payment of such penalty and costs, shall be liable to imprisonment, with or without hard labour, for a term not exceeding six months, unless the said penalty and costs of enforcing it are sooner paid.

13. In any complaint, information or conviction under this Act, the matter complained of may be declared, and shall be held, to have arisen, within the meaning of Part LVIII of *The Criminal Code*, 1892, at the place where the apples or pears were packed, sold, offered, exposed or had in possession for sale.

14. No appeal shall lie from any conviction under this Act except to a superior, county, circuit or district court, or the court of the sessions of the peace having jurisdiction where the conviction was had; and such appeal shall be brought, notice of appeal in writing given, recognizance entered into, or deposit made within ten days after the date of conviction; and such trial shall be heard, tried, adjudicated upon and decided, without the intervention of a jury, at such time and place as the court or judge hearing the trial appoints, within thirty days from the date of conviction, unless the said court or judge extends the time for hearing and decision beyond such thirty days; and in all other respects not provided for in this Act, the procedure under Part LVIII of *The Criminal Code*, 1892, shall, so far as applicable, apply.

15. Any pecuniary penalty imposed under this Act shall, when recovered, be payable one-half to the informant or complainant, and the other half to Her Majesty.

16. The Governor-in-Council may make such regulations as he considers necessary in order to secure the efficient operations of this Act; and the regulations so made shall be in force from the date of their publication in *The Canada Gazette*, or from such other date as is specified in the proclamation in that behalf.

17. Wherever the term "closed package" occurs in this Act, it shall mean one in which the contents are invisible and that cannot be opened and reclosed without material damage to said package.

The word "packer" when used in this Act shall mean the person on whose behalf any fruit is packed.

Mr. McKinnon: I move that the words "packed in a closed package" be struck out of section 7.

The Secretary: I would second Mr. McKinnon's motion. I think it is all right.

Mr. McKinnon's motion was put and carried as regards clause 7, to leave out the word "closed," allowing the words to stand, "packed in a package."

The motion to adopt the report as amended was put and carried.

APPOINTMENT OF INSPECTORS UNDER THE ONTARIO ACT.

Mr. McKinnon moved the following motion in reference to appointing Inspectors for the Ontario Act, which was carried: "That in the opinion of this Association the successful operation of any Act for the prevention of fraud in the packing of fruit will depend almost wholly upon the competency and character of the officers appointed to enforce it. That this Association, therefore, without wishing to interfere with the legiti

mate patronage of the Government of Canada, hereby memorializes the said Government to consult the Executive of this Association with regard to the appointment of any such officers acting within the Province of Ontario." Mr. Elmer Lick was appointed to represent the Association at Ottawa in conjunction with Mr. E. D. Smith, M.P.

FRAUD IN THE SALE OF FRUIT.

Mr. CASTON: I have a motion memorializing the Ontario Legislature to enforce the Act to prevent fraud in the sale of fruit.

The motion was seconded by Mr. Murray Pettit and carried as follows:

"Resolved that the Fruit Growers' Association of Ontario do memorialize the Legislature of Ontario as to the necessity of providing some machinery for the more effectual enforcement of the Act for the prevention of fraud in the sale of fruit."

SAN JOSE SCALE.

By PROFESSOR W. LOCHHEAD, ONTARIO AGRICULTURAL COLLEGE, GUELPH.

The San Jose Scale question has reached a very acute stage, and something has to be done. The first point I wish to impress upon you is that the remedies are before you for the regulation of the Scale. I do not mean that it is likely to be exterminated by any means of that kind, but we have materials at hand by means of which the scale may be controlled. It will never be controlled unless some systematic effort is made by the fruit growers or by the Government. The present practice of allowing fruit growers, or the owners of orchards that are infested, to spray according to their own wish, virtually, will not get rid of the Scale. I maintain you might as well throw water into a sieve. You know the life history of the Scale. You know that trees that may be treated in the spring may have comparatively few Scale left, and by the 1st of August the trees may be comparatively free from Scale, but if your neighbors' orchards are badly infested, then by the first of October, or middle or end of October, your orchard will be as bad as your neighbors', virtually. You know the agencies which are at work disseminating the Scale. These are the winds, the birds, and the fruit packers themselves. I think it is better for this Association to deal with this matter and to impress upon the Government that some systematic effort should be made to keep the Scale in control. You should impress on the Government the necessity for a more rigid inspection. The Government, I think unwisely, left off the work of the inspection of the orchards last season, a season and a half now, and I know for a fact the Scale has spread to other parts of which we had no idea at the time. A competent corps of inspectors should be kept at work, and the orchards which were infested should be looked after. Then the Government should pass some measure which would compel the owners of orchards either to spray their trees, or to pay for the spraying of the trees when done by the Government (Hear, hear) That is the only way I see that the Scale can be kept in control. The Scale has spread terribly this last summer, and we have reached a crisis, and I would urge upon you to do everything in your power to persuade the Government to help you in the matter. You cannot work it yourselves; you must have Government intervention in the matter. Whether the Government is prepared to supply soap at the same rate as before I do not know, but it would be a good thing to continue it another year at any rate, and to provide a corps of Inspectors, and to see that the soap is up to the mark. I think we should back up the officials in this matter. We have been blamed for not furnishing a suitable remedy, but as I told one of your members, we are as up to date as any state in the Union. There is no state more successful than Ontario. The State of Ohio has appointed an Inspector and given a large appropriation to see that orchards are inspected and treated with whale oil soap, which we believe to be the best and most efficient, and any trees that are not treated by the owners when found to be infested are sprayed by the officials and the owner is compelled to pay the cost of the work. In New Jersey the Scale is a very serious pest and has been for years, the infested districts there being much worse than

ours, but the fruit growers there have not given up hope; they are treating every year. They have tried many remedies, and they maintain that the crude petroleum is the most effective. Professor Smith has recently shown that the successes and failures of the recent petroleum experiments in New Jersey are traceable to the standard of the oil which has been provided. Where the oil fell below a certain standard, tested by the hydrometer oil test, it resulted in either death to the trees or life to the scale; but where the oil was above a certain standard then it almost uniformly succeeds. Of course he does not mean that it was eradicated by any means, but simply that the fruit growers can, by persistence in spraying, get a good crop of fruit upon a tree.

Mr. McKINNON: What is the average cost of spraying in the States for a full grown peach tree, say?

Prof. LOCHHEAD: I would not positively say. Professor Smith says in his report that a pint and a half of crude petroleum is sufficient for an ordinary sized peach tree.

The PRESIDENT: How often do they spray in a year?

Prof LOCHHEAD: I understand just once.

The PRESIDENT: Are there any cases where they have been successful in saving an orchard?

Prof. LOCHHEAD: Oh, undoubtedly. Professor Smith mentions in his report an orchard which the owner thought was beyond redemption, that this year gave a splendid crop of marketable fruit after treatment with the crude petroleum.

The PRESIDENT: The supposition is, then, that it will have to be continued year after year?

Prof. LOCHHEAD: Yes, I hold out no hope that the scale can be kept in check by a single spraying this year, and not needed next year. It must be continued year after year.

FIGHTING THE SAN JOSÉ SCALE.

By GEORGE E. FISHER, FREEMAN.

I endorse all that Professor Lochhead has already said in regard to this matter. You will remember that at the beginning we made a general inspection in the fruit sections of the country, and afterwards, finding the Scale upon some young trees, went to the nurseries, and found the Scale in the nurseries, and got a list from every nurseryman, which list occupied sixty pages of foolscap, and we followed the trees that were indicated by this list over the country, from one end to the other, and found the Scale in a hundred different places. Those trees were taken out and destroyed. Subsequent examination revealed the Scale in thirteen places, and still later examination in ten places, so that these ninety places appear to be clean at the present stage of the work. This occupied the whole time from the first of October to the close of the year, and the men were driven in by heavy snow storms, and the sudden change to cold weather, and they came in with frozen ears and noses, and the weather made it impossible to continue the work at that time. On the 12th January we went into the nurseries and we made an examination of all the nurseries of the Province of Ontario; we examined four millions of trees, tree by tree—not as it was done on the other side, where an inspector goes through, taking a number of rows, or perhaps takes a walk around a block. The Scale was located in seven nurseries, and a very large number of trees were destroyed to destroy a very small amount of Scale. You will learn from this what a deluge of scale the country has been saved from by this work. I have every confidence in the work that was done in the nurseries. I believe our nurseries are very clean at the present time. At the beginning it was thought that there was only a little Scale in the country, and that the proper way to dispose of that Scale was by burning; and from my experience and what I have learned since I fully endorse the course that was taken. (Hear, hear), I think it was the only right thing to do. But in the course of our work we found that the Scale had spread beyond what was supposed, and that to continue destruction by burning would necessitate the destruction of a very large percentage of the trees in some of the large fruit sections, which was not considered practicable; it was therefore thought desirable to resort to remedial measures. Then, at the suggestion of the Minister

last winter, we endeavored to get material here in Ontario. Soap manufacturers in St. Catharines, Hamilton and Toronto were consulted, and nobody was in a position to supply us, and they did not know where to get the material, and so we had to go outside of the country last year, which would not be necessary again. The feeling among the people last year was that whale oil soap was a safer remedy than anything else, and was perfectly reliable. The reports that have come to the Department from those that had visited infested sections would lead to that conclusion; but I have learned that in treating orchards the Scale had not sufficiently recovered its ground, by the time that those inspections were made, to enable those who made the inspection to know very much about the real condition. The Commission which went through this country in June and July, and went to Catawba Island, and returned from there reporting that the soap was a satisfactory remedy, had very little opportunity to know from examining the trees at that time of the year. The Scale remaining alive after the application had not sufficiently multiplied to make their presence very conspicuous, but during the months of August and September and to the middle of October they multiply very rapidly indeed, and when I went to those places in October I found the Scale on those trees without any trouble. There is no reflection cast on the early examination

Mr. McKINNON: Weren't these trees being seriously injured when you saw them last?

Mr. FISHER: I will come to that a little later. As regards the effectiveness of the soap, we got what we then and still supposed to be the best soap available. It was distributed to those who would undertake to do this work, with the understanding that they would do it according to instructions provided, which required that the soap should be applied to the tree in the strength of two pounds to the gallon of water when the trees were infested, and a pound and a half of soap to the gallon of water in cases where there was no Scale known to exist, and it should be applied to the tree until all parts of the tree were covered; but in subsequent examination, on knowing how much soap had been received by the growers and the extent of orchard treated, we found that the soap had not been used in sufficient strength in the mixture, and early in the season, when the soap was still to be seen on the trees, we could tell from that, that it had not been applied thoroughly, because some portions of the tree would show the soap and other portions would not, and a little later on, these portions where the soap had not been applied were breeding quantities of Scale. It was quite easy to see that the work had not been thoroughly done. Under such circumstances as these it was not surprising that the work was not satisfactory. But quite a number of persons did not do the work thoroughly, using the full quantity of soap and applying it as well as they could, wetting the trees all over, and in such cases—especially in the cases of trees that had become encrusted, where the Scale had become plentiful and encrusted so that there were several layers of the Scale to be saturated by the application, the results were very disappointing. We did some work ourselves, in order to be satisfied about the value of the remedies, and we have no example in which we can feel that we have materially reduced the Scale on any tree. This work was done with the whale oil soap. When I say this, I mean that the condition at the present time is not better than it was a year ago. Of course the application has been a very great check upon the Scale, and had these bad trees not been treated they would have been encrusted with the Scale by this time, and as it is they are in just as good a shape as they were when the treating was done generally. And that condition prevails throughout the country. It seems to me that there is a condition essential to any remedy which is used on trees for the destruction of insects, and that condition is that the remedy shall remain soft on the trees for a very long time. Crude petroleum is as near the condition as we can get. It will remain weeks, and even months, in a free condition on the trees. Now, soap that will remain on the trees in that condition I am sure will do good work, and I am sure also that the soap that we used this year was made from somewhat lower grade materials than are necessary; that is, better grades of material should be got. I went to Catawba Island this fall, and made a pretty careful examination into the conditions there, because I found opinion very much divided. Some people there are still a little afraid of the oil, but a great many of them feel that they must abandon the use of soap for crude petroleum. Some of them say that they have used whale oil soap on their trees for three or four years in succession, and that while this has been going on the Scale has increased to such an extent that the trees are

very much worse at the present time than they were at the beginning of the treatment. In fact some of them say that some of their trees in their orchards are weakening under the attack of Scale, but from what I have seen in our own work, I cannot see that the Scale is likely to increase where the work is well done; I think the soap will keep the scale down in those orchards to what it was when we began. There is, of course, always an opportunity of it spreading. Spreading goes on very quietly, and we don't know very much about it. That is one of the most difficult features in the work. It has been found in a great many orchards in which it was not found a year ago. It may have been in those orchards. I found the same conditions in regard to soap all the way through. The price of material has increased, and the tendency has been to use a grade of material that would enable soap makers to sell at old prices, and soap is none to good, at best, and in order to do good work it is necessary to use the very best material. In Ohio I do not think they favor whale oil soap in the government work. They think that a whale oil soap can be made that will kill the scale, and that whale oil soap reaches it and holds it in check, and that it is sufficient to use on the trees. They regard the other remedies as unsafe. The effect of whale oil soap on the trees in regard to cleaning them up is very marked indeed. We found that the crude petroleum would not distroy leaf-curl; whale oil soap used at half strength is just as effectual in destroying leaf-curl as when used at full strength. Another little experiment which I thought very nice was that we ran off some ordinary lye from ashes from the leach, and that was put on several rows in a youug peach orchard, and the leaf-curl did not put in appearance on those rows, while the balance of the orchard was so badly affected that almost all the foliage came off. The spraying was done immediately before the buds opened. That is the time which seems to be the most propitious, when it seems to be the most destructive to the insects and the least injurious to the tree; it does not seem to make any difference whether you are using whale oil soap or crude petroleum or what you are using, the tree, because of its greater activity at this time of year, has more resistance, and because of the greater activity of the Scale is more susceptible to injury. But we have in Ontario some very good examples of the use of crude oil.

I will refer to some trees that were treated at Titterington's, in St. Catharines. There were nine trees treated. Three of them were supposed to be treated with 25 per cent. of crude petroleum with water; three with 33 1-3, and three of them with 40. We had a pump with one valve drawing from two chambers, and the quantity of material was supposed to be regulated by the size of the aperture. This we tried for a while, but found that it would not give us the regular quantity, and then we tried kerosene and water, which was very satisfactory as far as the positive action went, but the behavior of the mixture in the hose was very disappointing, and that was abandoned. The London people are making a pump which, as far as I have used it, has been very satisfactory indeed, and I think you can depend upon that London Spramotor combination pump as reliable for making a mechanical emulsion of either kerosene and water or crude petroleum and water. It seems to work very nicely where it is used carefully; but oil and water are so different in gravity they seem to be a very slippery combination, and you have to use a good deal of judgment and care in applying them. And right here I would like to caution those who will use this emulsion, about spraying any portion of the tree more than once. We will assume that you are trying to put on an emulsion of 25 per cent. of oil with water. If you allow the nozzle to pass several times along the portion of the tree, you are putting on 25 per cent. every time the tree is covered with the nozzle, and in putting on this percentage you are endeavoring not to allow the nozzle to cover any portion of the tree more than once, and in order to make thorough work you should be very careful about doing the inside or upper side of the limb on the opposite side of the tree from where you are standing. But I have got away from those trees of Mr. Titterington's. We had a number of trees treated with soap. There were four or five different kinds of soap used there, with no good results from any of them, inasmuch as the Scale on the badly infested trees was very much more plentiful this winter than it was last. There are nine trees treated with crude petroleum, and it is almost impossible to find a single specimen of the Scale on those trees. They stand very near together, and the comparison is very marked. One of these trees treated with crude oil has a limb which is badly infested. Now this limb serves the purpose of showing that that was a badly infested tree when it was treated and it also shows how easy it is to miss a portion of a tree. I think any of you who

would visit Mr. Titterington would be very much pleased for having made the visit. The crude oil is a perfect remedy so far as the destruction of the Scale is concerned—almost perfect but not quite. There are always some left as far as we know, for out on the young growth on those same trees you will find a live Scale. There is a marked difference, however, between the oil and the soap in the resistance of re infestation even when recently applied. I found some trees in August and I applied soap with a whitewash brush to several of them, the trunk and large limbs, as far up the top as I could go without going into the foliage. The Scale was perfectly killed up as far as I went. Above where the treating had gone the Scale increased so that the top of the tree was entirely encrusted, a very marked increase, and I think that you may take that as a fair example of the increase of the Scale this year on infested trees. You could scarely find a bit of bark that was exposed to view on those trees, and at the time of their treating on the 18th of August the Scale was only in such quantity as you would understand when I tell you that it was nicely peppered over—that is the way that we speak of it among ourselves. On the lower portion of the trunk the condition remained much the same as when the soap was put on. Between that and where the soap was there was a great deal of re-infestation. The Scale had come down from above, where the treating was done, and had fixed right there on the soap within a month, and had come to maturity, and had given birth to young that had fixed in the neighborhood of their mother. The breeding seemed to go on on the top of that soap just about as well as anywhere else; but it is different with the crude petroleum, because no Scale can fix themselves or live on it. I can take you to trees that are badly infested that were treated with crude petroleum in the spring of the year; the Scale remained there just as it was when the oil was put on them, but all dead, and there is nothing alive on the main branches or large limbs of the tree anywhere; the only part of the tree that has been treated with oil that you will find live Scale is some portion of the tree that has been missed or out on the young growth beyond what was present when the treating was done. There is that difference between the oil and the soap. I have endeavored to ascertain what Canadian oil is like and to compare it with what is necessary for such work, and the result is that we have no oil in Canada of sufficiently light specific gravity to be suitable for the purpose. Professor Smith says in his Bulletin that oils that show a specific gravity of less than 40 are not fit for this work. There seems to be too much paraffine in such oils, which has the effect of closing the pores of the bark, and the trees die apparently from strangulation. I have had a good deal of trouble in getting a hydrometer suitable for testing oils, and I have brought one here to show you that I got at Mr. Potter's in Toronto, and I made enquiries at a great many places before I found anything as suitable as that. You notice that the specific gravity is ascertained by placing this instrument down into the oil, and the lighter it is the further down into the liquid the oil will go, and consequently register a higher degree. If it is heavy it will stand up so that probably 35 to 40 would be the specific gravity of a heavy oil. Now that has to be taken at a temperature of 60 degrees. Well, here is a thermometer arranged so that you can test the temperature of the oil, and it is also arranged that if the oil registers a greater or a lower temperature than 60 degrees you add or subtract according to the condition.

Mr. MORDEN: What does water 60 degrees register in that?

Mr. FISHER: I have forgotten the decimal, but water is a heavier fluid than oil.

Mr. MCKINNON: The water, I think, is 100 per cent., and then the oil is measured in terms of water.

Mr. FISHER: Well, that does not show those terms. I have seen instruments that do, but it is not necessary to determine that at all for this work, and having the thermometer in connection with the hydrometer makes it very convenient for testing oil at any temperature.

Mr. LICK: That is specially for coal oil?

Mr. FISHER: Yes.

Mr WHITNEY: Are you aware that the crude oil on the Pacific coast does not contain paraffine, simply asphaltum? They cannot make illuminating oil from it; it is used for asphaltum pavements and for fuel. It struck me that perhaps that kind of crude oil would not be open to objection.

Mr. FISHER: Well, I fancy that if the paraffine were entirely absent the quality of esisting re-infestation would also be absent, because is it not the paraffine remaining on

the trees in small quantities that saves the tree from re-infestation? I think it is. We are not quite sure that Professor Smith is altogether correct in what he says about the proper condition of oil, and for that reason I think that we should try our best oil with care, and if we are not satisfied to use it in the condition in which it comes from the ground, I am told by chemists that we can bring it to the same condition in which it was found in lighter fields by taking the best oil we have and adding the lighter elements—putting in benzine and kerosene in sufficient quantity to bring it to the proper consistency. Now there are a number of questions asked in regard to the oil. A great many people are afraid of it. I have never seen a tree injured by soap, although the soap is very destructive to fruit buds if applied in the winter. If applied before the frosts are over it will certainly kill all the buds on your peach trees. It is well to remember that. But the crude oil is less destructive to fruit buds than soap, but it has been found to be very destructive to the trees. In some sections a great many trees have been killed by it, and in other sections individual trees

Mr. MORDEN: Do you use it in April?

Mr. FISHER: Yes; but not in winter, as I think it will destroy the fruit buds. That has been our experience. If you use it after the frosts are over you will be less likely to injure the fruit buds.

Mr. MCKINNON: Will it injure the fruit buds of other than peach trees?

Mr. FISHER: Well, I put some on my own trees last winter and the buds were not injured at all on apple trees. I have some apple trees that bore a good crop of fruit, and did not seem to be any the worse for the application of oil.

E. D SMITH: Does the oil damage the tree as badly one season as another?

Mr. FISHER: I think not. I think it is a great deal better to apply the oil in April. I would apply anything in April, no matter what it is you are using. For a winter application I would apply it in April. A question has been asked me very often that I have not been able to answer until I came back: how would the trees be if treated with crude petroleum for a succession of years? And I found one or two instances of that in the course of my trip through the United States, and it all goes to show that when the application is properly made the trees will improve under it. There is an instance in New Jersey where I had some very badly infested pear orchards, that were exhausted through the Scale, that he had been using remedies a long time, and that since the advent of crude petroleum as an insecticide he had so reduced the Scale in his orchard that the trees had recovered their vigor, and last year had borne a good crop of fruit, and are now giving promise of another crop of fruit next year. I think you may accept that. It does not really make any difference whether you use the petroleum diluted or undiluted, because when you use it diluted the water is soon gone and the oil remains. The advantage of the water is merely to assist in distributing the oil so that you can entirely cover the tree with a smaller quantity than you would probably do if you were using the undiluted oil; but those people down in New Jersey, where they have used the oil the longest, say that they prefer to use the undiluted oil because they know what they are doing; they have no pump that they can rely on to give certain results, and most of them have been using the oil undiluted lately.

E. D SMITH: But now you say that there is a pump that will give a perfect mixture?

Mr. FISHER: I think that pump will give good results, and with the use of water you can use a smaller quantity of oil, and it is certainly safer to use a smaller quantity of oil, and a very small quantity appears to be all that is necessary to destroy the Scale, and that would make the operation cheaper. At Washington I met Professor Johnston, who has been using hydrocyanic acid gas in the orchard on an extensive Scale. He uses a box tent, and claims to have entirely cleaned up 2,000 four-year-old peach trees at an expense of six cents per tree for material and labor. Now, this is not expensive, and if the work can be done at this expense I think it very desirable that fumigation should be carried on here, for the reason that fumigation is much more destructive to insect life and is more searching than any remedy that is in use. It is the last live Scale we are after; that is the chap—(A voice—"That is it")—the one that remains to re infest the tree, and the trouble with the soap is that it leaves too many alive—that is the only trouble. It is a beautiful thing on the trees wherever it is used; the trees look 50 per cent. better; the foliage is large and fine and the fruit is good You almost ensure a crop of fruit. It may be looked upon as a perfect remedy against this leaf curl, and I certainly like soap. But

when it comes to San Jose Scale it certainly appears from our experience that it leaves too many alive. The hydro-cyanic acid gas gets after the Scale. Some people claim that in some cases it does entirely clean up orchards, but I do not think we can be very sure about that, though it is altogether the most certain to destroy Scale of the remedies that are in use, and if it can be used at an expense of 6c per tree on four-year-old peach trees it is not by any means expensive. (Hear, hear). Possibly Professer Johnston is a little premature in claiming that he has done this. I met an old gentleman down in New Jersey who said he had no trouble at all to kill the Scale, he said it was nothing to kill the Scale, but he wouldn't say dead. (Laughter). Now, that remark may seem a little out at first, but it is so singularly in keeping with our experience, when we have extreme difficulty in say a month after the application is made to find a single specimen of Scale remaining alive; you may look a long time before you will find them, but they are always there, and at the end of the season they have re occupied the tree, so that thorough work in treating every Scale is very desirable. At Lakeside, Ohio, I found an orchard of 165 plum trees that was very badly infested with Scale ; in fact I never saw so many trees together so badly infested. They had been treated with crude petroleum in April, and there was very little live Scale remaining on those trees. I saw them in November. I think it would be impossible to have a better example of the efficiency of the oil treatment than what was shown on those trees. From correspondence I have had I know that the oil that was used on those trees was a low grade, and I think that possibly we may be able to use our own oil if we use it with due care. A heavy oil indicating below forty is reckoned as low grade. An oil that has a specific gravity of 45, or more, is looked upon by Professor Smith as being safe. You could not have it any better no matter how light it is ; it would not be any better if it registered at 45. At Titusville, Pa., there is a light oil field, I understand, where the oil all shows a specific gravity of 50, and that would be a very nice thing if we had it here. I think we could use that oil with perfect safety on our trees, but it is not here. I think the addition of refined oil to crude oil serves the purpose. I have discussed that matter with some of our chemists and they tell me that that could be done. It would be a question of expense, however. The mixture would probably cost more than it would to import oil from Titusville. I was very grateful indeed to the Minister for allowing me to make this trip down there to the United States, because it enabled me to settle some points, which I had not been able to satisfy myself upon. One point was the effect of crude oil upon trees if applied year after year, another was the result from the use of hydro-cyanic acid gas in the orchards, and another was that I might have an opportunity to consult with some gentlemen who could give me information of the existing conditions in California. I met Dr. Howard and asked him these questions, and he told me that in California so far as he knew the people were just as much afraid of the Scale as ever they were ; that they have a remedy over there—salt, sulphur and lime—which is useful in their dry climate, but it would not be useful in this country because of our frequent rains, and they have learned that they can rely on this remedy to help them out, and they can control the Scale if they use it ; but he said that if they relaxed their efforts for a single year the trees will soon get back to their old condition.

Mr. WHITNEY : Is the Scale there the same as this ?

Mr. FISHER : Well, there are a great many different kinds of Scale. Last evening I received a letter from a gentleman in Redlands, Cal., who says that one reason why the Scale is not quite as bad in Southern California as it used to be is that they have abandoned to a very great extent the cultivation of deciduous fruit trees, and that the room has been replanted to citrus trees. Now, the citrus tree is infested with an entirely different Scale, it is a red Scale. It is very similar in appearance to the San Jose Scale, but it is different.

Mr. MORDEN : I have understood that there is a parasite that is operative in California, but that does not care to come so for north to help us.

Mr. FISHER : I will now deal briefly with a few other features of our work. We have already referred to the effect of soap on the trees. As to the effect of oil on the trees, I may say that where the oil has been applied freely the trees will not leaf out for from one to two weeks after they would have leafed out, and we are very apt to think that we have finished them ; but they will come on shortly after that, and the leaves will be very large and rank in color, very much in excess of the usual size of the foliage, and they remain through their holes and the perforations of insects that have been killed by

the oil that has been put on the trees. I have found on several occasions the bud moth and the case bearer in considerable quantity on trees that had been treated, and the leaves on those trees remained entirely free from the mutilations which would have otherwise occurred. This foliage, too, will be retained much later in the fall. The leaves do not come off the trees quite so soon at the end of the season. The injury that the oil occasions to the trees is almost invariably the result of excessive application, as far as I could understand. In regard to the fumigation of trees, I understand that Professor Forbes, in Illinois, has declared against this in orchards as being impracticable. Well, in the last Bulletin that I have seen from California, they say that is altogether the most thorough and satisfactory way of treating trees, and in a letter that I received yesterday reference was made to the fumigation as being the only way that you can satisfactorily treat badly infested trees. It is my wish that there should be some fumigation done here in Ontario that we may see with our own eyes what results can be accomplished by gas. I have been frequently asked what a person can do to protect his orchard that is not infested—what an owner can do to strengthen his position. I think it is very desirable indeed that as great a degree of fertility be maintained in orchards as is possible to have, and in this way you can make your orchard very much more resistive to the attack of Scale than they otherwise would be. The limit between what a peach tree and a Japan plum tree will stand, and what is necessary to kill the Scale, is narrow compared with that in the case of apple and pear trees, consequently these varieties of trees are more hard to treat, and there should be special pains taken to keep up the vigor of a peach orchard, in an infested section especially. This is good practice in any case, but especially in the case of Scale. I have had several examples of the desirability of doing this in orchards, parts of which were so badly infested that the trees were encrusted. The Scale went on increasing all through the fall. An applicatien of crude petroleum, 25 per cent. in water, was made the following February, and almost every tree that was encrusted with the Scale was killed by the oil, while the balance of the orchard which was not badly infested by the Scale was not injured by the oil, but bore a full crop of fruit. One row along one side of this lot was sprayed with undiluted oil and it did not differ in the least from the rows that were treated with 25 per cent. That is, the pure crude petroleum did no harm. I think it is very important that there should be no trees allowed to become badly infested. This is one way in which I would hope to maintain vigor in a peach orchard. The principal breeding season is during the two months from the middle of August to the middle of October, and especially during September. You can readily understand that fruits that ripen before this time in treated orchards are not likely to be infested with Scale, while those that have to remain on the trees until after the principal breeding season is over are likely to be attacked by the Scale; those late ripening fruits are the fruits that the Scale get on, and as early in the season as it is practicably to do so I would like to fumigate those infested trees, whether they be many or few. This is done with a tent made in the form of a box. It is not practicable for very large trees. The size of Prof. Johnson's tent is 5 x 5 x 7 feet. They are square boxes—canvas tacked to a frame; and then there is a hood that rolls up to the top so that if the branches at the top reach up higher than seven feet this hood will allow of it going up and still confining the gas above them. He uses the gas process in destroying the Scale in Maryland to a considerable extent. Prof. Lowe of Geneva, has another kind; it is just the same style of a box, and one side is open. The box is much larger, made in the same proportions, and he gets it over the trees by removing the open side and slipping the tent up and against and around the tree, and then setting in the side and fastening it to its place by buttons. I think that this can be done very nicely. and I will urge the Minister to allow a certain amount of fumigation here in Ontario, that we may understand whether it is for our advantage or not. I am sure that you are all assured of the interest that the Minister feels in this work. I have myself been frequently surprised at the remarks that he has made, and I am in a position to say that he takes a very deep interest in the Scale work. He feels that the interests of the fruit growers are threatened materially, and he would like to do anything he can to assist them, as is evident in many ways, and the pains that he has taken to get information of what is being done in other sections, so that what we do may be right along the most up-to-date lines, and the manner in which he has responded to the call of this Association from the first agitation that there was on account of the Scale.

Mr. MORDEN: Are there any hopes of any parasites that will be useful in Canada? We know the lady-bug will do something.

Mr. FISHER: I am afraid not. Wherever I have been they told me there does not seem to be any material advantage from either rapacious or parasite insects. Trees in Ontario were very well supplied with the lady bird last fall; some trees were swarming with them.

Mr. CASTON: But those do not keep over the winter?

Mr. FISHER: No, they have been so reduced that they do not become plentiful until late in the season again, and by this time the scale has recovered and has far exceeded the condition in which the lady bird left them at the beginning of the previous winter. In regard to these parasitic insects, Prof. Johnston, of Maryland, seems to think that he has found one there that is likely to be useful. It is a fly, a regular parasite, and he suggests that the trees should be pruned before they are fruited, the brush should be covered up and removed but not destroyed until immediately before the scale begin to breed, so as to give these parasites an opportunity to get back on to the trees. The treating of trees after this brush is removed will destroy all of those parasites that remain on the trees, and the only hope of retaining any is by holding the brush as long as possible so as to give them an opportunity to go back on the tree. I understand that in California where they have trusted to insects they have lost their trees; and the further north you go the less hope there is from preying insects; we are not so well situated here as they are in California.

The PRESIDENT: Does this parasitic fly that you would save by pruning, live over winter?

Mr. FISHER: It lives over winter on the trees, like the Psylla, and there is likely to be some of it on the brush, and he wants the trees pruned and the brush removed before the trees are sprayed, and left as long as it is safe to leave it. They breed very rapidly and at different points in Maryland It becomes a winged insect and has much the appearance of the male Scale.

The PRESIDENT: Mr. Fisher has purposely abbreviated his remarks in order that you may ask questions.

Mr. MORDEN: He has not given us just the appearance of this to a good eye, or to the ordinary magnifier, that we might distinguish it from other Scales.

Mr. FISHER; Well, I do not think that it is possible to distinguish the larva of one Scale from the larva of another, only perhaps by the color. The Forbes Scale is a little bit like it—a light lemon color—and I do not know of any other Scales that have quite as much color as the San Jose. They are very small of course; it takes about 110 or 111 of them to measure an inch when they are put end to end, but you can see them quite distinctly with the naked eye. They run around upon the trees about five or six or seven days according to circumstances. They may fix it sometimes in a shorter time than that, and when they put in their little beak and begin to suck there is a wax starts out from their body, and that, in connection with the cast off skin of the several moultings, forms their home. This is called the cover Scale. Now, the cover Scale of the San Jose Scale differs from the cover Scale of other insects in the distinct dot and ring; you will not find so distinct a ring and nipple in any other Scale as you will find in the San Jose. This in itself is a sufficient guarantee, almost, of the species.

MURRAY PETTIT: Under ordinary conditions how long from the time a tree is first infected until the fruit is of no value?

Mr. FISHER: Well, we have not had experience in that. The badly infected orchards were all destroyed at the beginning of the scale work. The Minister was so anxious that the Scale should be destroyed, that there should be no distribution, that the first thing we did was to go right at it and we burned it up, and there was not any evidence left, and the people did not believe that it could do any harm. I believe the greatest mistake we made was to burn up all of that Scale. If we had left a bad orchard to die before our eyes it would have had a very good effect. The people did not believe the Scale would destroy the trees, so that we really have not a great deal of evidence. But I have seen trees that were not known to be infected in the year 1898; in August, 1899, there was one limb found to be infested on a peach tree, and in August, 1900, half of that tree was dead, the leaves were off on one side and we changing color on the o her, and the peaches remained on the limbs and shrivelled and dried. Here is an instances of a tree in which

Scale was first found in August, 1899, and during the season of 1900 that tree failed to mature its crop of fruit. It blossomed, and the fruit was in the early season just as good as it was on the adjoining trees; but now that tree is made into firewood, and the trees all around there as early as the middle of last summer were infested, and badly infested all round this tree, and in going through the orchard I could find Scale on every tree I looked at. That gives you an illustration of the great disposition to spread. An orchard down through the Niagara District that was known to contain from 5 to 7 per cent. of infested trees, according to an examination made in 1899, has Scale on every single tree in the whole orchard to-day. That seems to be the way that the Scale is spreading. People were surprised on every side by finding their fruit infested with Scale when they came to pick their fruit. Up to this time they did not suspect that there was such a thing as Scale around their premises. I don't wish to make a specialty of the Niagara District. It was just the same in the West. About the end of July in 1899 we counted the apple trees than were infested or that were exposed in one orchard that was reported to be very slightly infested, but upon which Scale could be found at that time; now you can look down the rows from the road as you are driving along in a rig and see the Scale on the trees; and in the orchard first mentioned in which there were Scale in 1898 you can not only see the Scale on the outside of the trees, but away down the road you can see scaly trees, and tell them by the difference in the color of the bark.

MURRAY PETTIT: Does the fruit on those trees show the effect?

Mr. FISHER: Not yet.

MURRAY PETTIT: How long had it been in Mr. Wigle's pear orchard in Essex before those trees were taken out?

Mr. FISHER: I think he said it was four or five years since he bought the trees

Mr. WHITNEY: I do not know of any Scale in the east. I would like to know how far east it has been discovered.

Mr. FISHER: In the neighborhood of Belleville there were a number of affected trees sold at low prices and distributed throughout that neighborhood. We got a list of the sales of those trees as far as we could and followed them up and destroyed the Scale in quite a number of places in the neighborhood of Belleville, in the County of Hastings, and also in the County of Prince Edward. We have not known it farther east.

The SECRETARY: I think it would be very interesting just in this connection to hear a word or two from Mr. Thonger, because it was in his orchard that we first discovered it, or it was called to our attention, and some of us are present who went down to Mr. Thonger's and found the Scale at his place, and this must have been five or six years ago.

Mr. THONGER: I have listened with very great pleasure to Mr. Fisher's lucid and systematic address, and I believe there is not a word in it but what I can agree with. Mr. Fisher is not a man to jump to conclusions at all, and I am glad to find that after three years' time he has come to about the same conclusion I came to in about three weeks with the practical experience I had. (Laughter.) He is quite right in not jumping to conclusions. When a man has not evidence to come to conclusions on he had better crawl. I do not wish to refer to the past more than I can help, except in its bearings on the present. The question is divided into two distinct issues. There is the physical difficulty in dealing with the Scale, and there is the moral difficulty in dealing with the people who think they have not got the Scale, and those that know they have got it. I think that the great mistake that has been made in this question is that the grounds of equity were not considered in dealing with the matter. I may have spoken very harshly of some people. I have suffered considerably by this issue, and I have laid the blame of the action that has been taken particularly on the officers of the Ontario Fruit Growers' Association. I think they jumped to a hasty conclusion. They thought that they had got the scale in a few places, and it was all in their hands, as it were, and all they had to do was to destroy it. I do not think sufficient attention was given before that Act was passed to see how far the scale had spread in the country. The conclusion I came to before the Ontario officials came out there at all was that the condition of my orchard was very likely to be the condition of every orchard in the country. I had no reason to believe otherwise. I could not trace the introduction of the scale to any particular trees in my place. They were just as prominent on the old trees as the young trees, and I came to the conclusion that it must have been imported in

trees in orchards that were far older than mine were, and the owners had never noticed it. I should not have seen it but I was going through an orchard of pear trees which I pass almost daily, and on one of them I noticed something like a fungus growth which did not look very nice, but I did not take particular notice of it. I passed again and found it was spreading, but I was not thinking about the San José Scale at all. I thought we were so amply protected by the knowledge of that Scale that was threatening us that it could hardly settle on my place without the officers catching it by the ears. (Laughter.) It looked like ashes on the trees, on the trunks mainly. If the trees had been infested from the nursery it is very apt to be infested on the trunk, but on other trees I should say it was infested on the branches. These trees were infested on the trunk, I think, but I did not look carefully into it. I did not know it was so excessively small. The next spring it was badly spread again and I asked the men who were working among the trees if they had recognized the thing at all, and they said no; and when two people did not know it I thought it must have been the San José Scale. I sent it to Niagara and they sent it to the *Rural New Yorker* to see what it was. A great many people censured me for saying anything about it. In a few days I heard from Mr. Fletcher at Ottawa. He wanted to know how many trees I had infected. I knew very little about it. I did not know how it spread. I did not know whether it had eggs or how it did, and I sent him a few samples and things I found on the trees that I thought might be it. Well, they were not it. I examined the trees the year after this and found it had spread considerably more than the year before. I pruned my trees considerably, and after that I made a systematic examination through the orchard, beginning on the west side and going up and down the rows. I spent three days at it and marked every tree on which I discovered Scale, so as to decide where the centers of infection were and what the state of infection was, and that would be the state of things when the committee came down to see it. I had a great deal of experience with Professor Fletcher. I destroyed some of the worst infected trees according to the recommendation. I came to the conclusion that the professor had made rather a mistake in advocating the destruction of the trees. I feel that if we cannot deal with the worst infested trees by manual treatment we cannot deal with it at all, and if we begin to burn in one corner of it we must burn in the other. I think the remedy of burning is perfectly fallacious. I think the scientists should have made the distinction that it is far better the trees should be burned than not treated at all, and I think if a person knows his trees are infested they should do everything to cure the evil for their own interests as well as that of other people. When people indulge the mania of destruction in the interests of their neighbors it is quite another thing. I wanted to get rid of the infested trees. I did not like to destroy them because I thought they were valuable property. The scale was there and known to be there, and sure to be investigated and treated and made the best of. I should have felt I was doing the Province an injury to deprive them of the advantage of treating this terrible pest. I said to Mr. Fletcher that if they did not do something soon I should have to destroy the trees. I asked Mr. Fletcher that they should place a good brand of soap on my trees at once, but they were able to do nothing. I saw the thing was so serious that Mr. Fletcher or someone ought to have come almost immediately to my orchard to see what it was and that means were taken to suppress it, and I thought the Ontario fruit growers, when they found it was in the country, would look after it at once. Their anxiety would be to know what means I was going to use to get rid of it, and if I had means to get rid of it. I think the great question is whatever measures are decided upon they must be founded in equity. The mistake was made by the fruit growers in thinking that I was among the very small minority and that it was perfectly safe to neglect my claims for recommendation of right dealing.

Mr. MORDEN: Was the twenty-five per cent. payment equitable?

Mr. THONGER: No; no percentage is equitable.

The SECRETARY: You think the whole thing should be paid for?

Mr. THONGER: Yes; the best thing would have been to leave the matter to the courts of justice, where disinterested parties would decide what the real value of the property destroyed was. The mistake of the fruit growers was that they made their societies courts of justice. They complained against the people who had property lost or destroyed, and they judged their own case when they should have left it to a court of justice to settle what the damages should be.

APPLE BARRELS.

The SECRETARY read a letter from S. C. Parker, Secretary of the Nova Scotia Fruit Growers' Association, and introduced to the notice of the meeting two barrels, one which has been used by apple shippers for years in Ontario, the other proposed by the Nova Scotia Fruit Growers' Association, which is a smaller one, and which has been adopted by the American Apple Shippers' Association, which has declared they will not use any other barrel in foreign shipment. The Nova Scotia shippers use the American barrel, because they ship it to Boston and thus compete with the American barrels, and last year they united with us in asking that it be made the legal barrel of the Dominion. Some of us in Grimsby have been using that barrel this year, expecting it was to be made a Dominion barrel The dimensions of the barrel are : Staves, 28½ inches long ; head, 17¼ inches ; circumference at bilge, 64 inches. This barrel holds 96.51 imperial quarts or 100 American quarts, while the flour barrel we have been using measures as follows : Staves, 30 inches long ; head, 17 inches long ; holds 103 imperial quarts.

E. D. SMITH : Can you tell us whether this barrel is the only legal barrel to be used by the United States ?

The SECRETARY : I do not think the Government has ever established it, but the apple shippers are the controlling factor there.

E. D. SMITH : The Canadian barrel holds about two bushels and three pecks. If the stave manufacturers don't make any trouble about it and are willing to furnish these new sizes of staves at the same price as the old ones, I should say we should use the barrel that is used by the United States and in Nova Scotia.

A. H. PETTIT : I want this barrel, on the ground that it is a better barrel. When you pile up those barrels you will find that the bilge scarcely touches. This will rest more on the bilge. Now when you pile your barrels three or four in a car and they have to teeter through to the port of shipment, they have got to be put down in the boat and run that way across the ocean, I want to know which has the prospect of getting the most damaged ; fruit in the shorter barrel that rests on the quarter hoops, or the one that rests on the bilge ? What are we doing in all the branches of the fruit trade to-day ? We are getting smaller packages. What for ? Better condition of arrival. If this barrel will give us a better condition of arrival, that is what we want. I am inclined at the present time to use the smaller barrel. I believe we will find it to our advantage in the end to do so. I notice in the reports of the Nova Scotia barrel they have not the amount of slacks that the Ontario people have. Is this the remedy ? I will move "That in the opinion of this meeting it is wise to adopt the uniform standard of barrel as used in Nova Scotia and the United States."

Mr. WHITNEY seconded the motion, which was carried.

Before the meeting adjourned the following committee of the Association was appointed to consider the sizes of fruit packages that should be adopted in order to secure uniformity throughout Ontario, namely : Grimsby, D. J. McKinnon, A. H. Pettit, L. Woolverton ; Winona, E. D. Smith, M. Pettit, T. H. P. Carpenter ; Burlington, Wm. Fisher ; Fruitland, W. M. Orr ; Beamsville, S. M. Culp ; St. Catharines, W. H. Bunting, Robert Thompson.

The meeting then closed.

REPORT OF THE FRUIT EXHIBIT COMMITTEE, 1900.

Your Committee on Fruit Exhibits begs to make the following report :—The fruit exhibit this year was a creditable one and the specimens shown were, most of them, of good size and shape for the varieties they represented. The apples from Niagara Peninsula were not as well coloured as usual, owing to unfavourable weather, and while those from Eastern Ontario were better coloured they also were not as highly coloured as usual. A good collection of fruit adds greatly to the interest of the meeting, and it is hoped that this good pratice will be kept up. This is a good opportunity of having the merits of new or little known fruits discussed and brought before the notice of the prominent fruit growers of Ontario.

One of the largest collection of apples was shown by Mr. E Morris, of Welland, Ont. Most of the varieties were comparatively new to this country, which added much interest to the exhibit. Honsley's Winesap is an apple of fine appearance and good size, but cannot compare with the ordinary Winesap in quality. The specimens of Gano shown were very fine and well coloured. There was also an exceptionally good plate of Ben Davis. One hardly recognized Salome, it was so pale, there being only slight traces of red. The specimens were, however, of good size. York Imperial and Sutton Beauty, two apples much thought of in United States, were also good. Other varieties, of not particular merit, were Dickinson, Matamusket, Clayton, Huntsman, Western Beauty, Red Riches. There were also specimens of Bottle Greening, Winesap, Swayzie Pomme Grise, Limber Twig, and Cooper's Market.

Mr. Harold Jones, of Maitland, Ont., brought some fine Fameuse and Scarlet Pippin. The latter variety does particularly well with him. It is a very handsome apple and is said to sell well. He also had some good specimens of Ontario, Ribston Pippin, McIntosh Red, and Milwaukee, the latter being a new variety of promise for Eastern and Northern Ontario.

Some fine apples from Bruce county were shown by Mr. A. E. Sherrington, Walkerton, Ont., his Ontarios, Kings, Northern Spys and Manns being all fine. They offered very good evidence of Mr. Sherrington's contention that Bruce county is the best apple growing county in Ontario.

A curiosity in the form of a seedleess apple was shown by Mr. W. A. Whitney, Iroquois, Ont. The apple was quite normal in appearance and of a good size. Mr. Whitney says that none of the apples contain seeds. Some very fine specimens of Wolf River apples were also shown by Mr. Whitney.

A collection of thirteen varieties of apples was brought by Mr. W. T. Macoun from the Central Experimental farm, Ottawa. Those of most interest were La Victoire, Spencer, Milwaukee, and Kinnaird. The first mentioned is a fine looking apple which originated near Calumet, Que. It is of good size and very regular. The quality is rather good also. Spencer is a very handsome apple but rather coarse. Kinnaird is a late keeping variety of good quality which is quite hardy at Ottawa. Milwaukee is a seedling of Duchess ; a large, handsome apple bearing early and heavily and keeping until February or March.

Mr. W. C. Reid, Belleville, Ont., had some good specimens of Akin Red, Winter Banana and an other variety thought to be Rome Beauty.

An interesting collection of apples and pears was shown by Messrs. Smith and Reid, St. Catharines, Ont. Among the pears were Anjou, Kieffer, Josephine De Malines, Lawrence, Beurre Diel, Mount Vernon. Mr. A. M. Smith nearly always has some fine specimens of Princess Louise apples. Owing to the unfavourable autumn they were not as well coloured as usual this year.

The President, Mr. W. M. Orr, as usual, had some fine Vergennes grapes. Mr. Orr makes a specialty of packing these grapes in cork dust for winter use, and they are certainly good. He also had some immense specimens of Kieffer pears and some fine Idaho pears as well, likewise some fine quinces. Included with his exhibit were some exceptionally late peaches grown by Mr. Morrison.

Mr. P. McCullough, Burlington, exhibited a collection of well shaped and well coloured apples. Those which were particularly good were Ontario, King, Esopus Spitzenburg, Gano, Pewaukee, Hubbardston Nonsuch, Mann, Blenheim Orange, and Baldwin. The apples shown by Mr. McCullough were very creditable to him.

A very highly coloured and fine specimen of McIntosh Red was brought by Mr. Macoun, which had been grown by Mr. David Tait, Iron Bridge, Algoma. If such fine apples can be grown in abundance it will be a great boon to that part of Ontario.

Mr. C. L. Stephens, Orillia, sent a yellow apple for name which very much resembled the Porter. Another variety, sent by Mr. E. Powell, through Mr. Stephens, grown on the grounds of the late John Cuppage, Orillia looked as though it were of Russian Origin, but was unknown to the Committee. A variety which resembled the Seek no-Further in outward appearances, but which was not that variety and evidently a seedling, was sent by Mr. Stephens. It was grown by J. W. Wainman of the Township of North Orillia, and said to be from a sucker grown from a dead Northern Spy, evidently the stock. It was a fine looking apple and a good keeper and is worth giving a thorough trial.

Some specimens of a dark coloured seedling apple were sent by Mr. H. Wartman, Kingston, Ont., to Mr. L. Woolverton, who brought them to the meeting. The apples were of medium size and unusually dark in colour, being very dark crimson. The flesh was white, tinged with red near skin, tender, and juicy and subacid, but slightly astringent. Quality, almost good. The tree is ten years old and growing along a public road, There were two barrels of apples on it in 1900. Season, midwinter.

The members of the Association were very much surprised by the fine specimens of Navel Oranges, and lemons which were grown at Victoria Park, Niagara Falls, by Mr. R. Cameron, Superintendent of the park, and sent to the Association by him. The oranges were as large as imported ones and were quite juicy and thought to almost equal the best in flavour. The lemons were also good. The trees were grown in half barrels which were kept inside in the winter. When such fine oranges and lemons can be produced in this country it is surprising that more persons do not produce them of the same quality as those grown by Mr. Cameron.

There were a few other collections, but as the name and address of the exhibitor was not attached they are not reported on.

W. T. Macoun, Chairman.
W. H. Dempsey
T. H. Race.

BY-LAWS FOR AFFILIATED HORTICULTURAL SOCIETIES.

Prepared by Mr. Thomas Beall and Mr. L. Woolverton, as ordered by the Board of Directors of the Fruit Growers' Association of Ontario.

This Society, known as the Horticultural Society of the of , organized under the provisions of the Agriculture and Arts Act of the Province of Ontario, Chap. 43, R. S. O. 1897, agrees to conduct its affairs in accordance with the several provisions of the said Acts, and with the following by-laws and regulations.—Sec. 13.

1. The members of this Society for any year shall be residents and ratepayers of this municipality to the number of at least fifty, and also others, who shall have paid one dollar into the funds of the society as membership fee for that year.—Sec. 7, s.-s. 1 (b).

2. The objects of this society shall be to encourage improvement in horticulture, and to secure to each member equal encouragement therein.—Sec. 9, s.-s. 2.

3. There shall be at least public meetings in each year for discussing local horticultural matters, and for hearing lectures on improved horticulture.—Sec. 9, s.-s. 2 (a).

4. At any public meeting there may be an exhibition of such plants, vegetables, fruits and flowers as may be in season; and wherever such an exhibition is held, there shall be present at least one expert gardener who shall give such information and instruction appertaining thereto as may be required; but no prizes of value shall be offered for competition by the society at such meetings.—Sec. 9, s.-s. 2 (e).

5. The annual meeting, and all other public meetings shall be open to the public free of charge. But members only shall have the right to vote at any meeting.

(*a*) When exhibitions are held at such public meetings, the public shall be invited to exhibit such horticultural products as may be thought suitable for the occasion by a committee appointed by the Board to superintend such exhibitions.

(*b*) This committee shall take such means as they think proper to secure exhibits for the occasion, and also procure proper conveyance for collecting and returning the same free of expense to exhibitors.

(*c*) These exhibitions shall be open to members and other exhibitors free of charge.

(6) A sum of money not to exceed dollars may be offered in prizes in any one year for essays on any question of scientific enquiry relating to horticulture.—Sec. 9, s.-s 2 (d).

7. Each member shall be given by this society a free membership in the Fruit Growers' Association.—Sec. 9, s.-s. 2, (b).

8. There shall be procured for each member, trees, shrubs, plants, bulbs, or seeds of new and valuable kinds in each year, sufficient in quantity to exhaust the funds of this society after allowing for necessary working expenses.—Sec. 9, s..s. 2, (a).

9. The annual meeting shall be held at half past seven in the evening of the second Wednesday in January, when there shall be elected a president, a first vice-president, and not more than nine directors, who together shall form the board of directors. At this meeting, the society shall also elect two auditors for the ensuing year.—Sec. 7. s.-s 1 (e).

(*a*) At this meeting, only those members who have paid their subscription for the ensuing year shall be entitled to vote.—Sec. 10, s..s. 1.

(*b*) At this and all subsequent public meetings, ten members shall constitute a quorum.—Sec. 10, s.-s. 1 (e).

10. The board of directors at its first meeting shall appoint a secretary and a treasurer, or a secretary treasurer.—Sec. 7, s.-s 1 (*f*).

(*a*) Five directors shall constitute a quorum for the transaction of business.—Sec. 14.

(*b*) Subject to these by-laws, the directors shall have full power to act for and on behalf of the society, and all grants and other funds shall be expended under their direction.

At each annual meeting the directors shall present a detailed statement of the receipts and expenditures for the preceding year, and also a statement of the assets an liabilities of the society at the end of the year, certified to by the auditors.—Sec. 11, s.-s. (c).

11. The said statements shall, when approved by the meeting, be placed on permanent record in the books of the society, and such portions thereof, together with what is further required by sub, sec. (a) of Sec. 11, shall be sent within one month to the Department of Agriculture.—Sec. 12.

12. The Director of the Fruit Growers' Association of Ontario for the Agricultural District in which this society is situate shall be considered an honorary member and receive notice of the meetings.

13. These by-laws and regulations cannot be altered or repealed except at an annual meeting, or at a special meeting of the members of the society, of which two weeks' previous notice has been given by advertisement.

'ST OF AFFILIATED HORTICULTURAL SOCIETIES.

No. of members.	Name.	President.	Secretary.
51	Belleville	W. C. Reid	W. J. Diamond.
69	Brampton	C. M. French	Henry Roberts.
59	Cardinal	R. B. Dowsley	E. E Gilbert.
123	Chatham	Thomas M. French	George Massey.
72	Cobourg	John D. Hayden	H. J. Snelgrove.
....	Cayuga	J. E. Skeele	A. K. Goodman.
54	Clinton	Alex McKenzie	Wm. Coates.
96	Durham	Chris. Firth	Thomas Brown.
55	Elmira	S. Laschinger	C. W. Schierholtz.
67	Grimsby	Mrs. E. J. Palmer	E. H. Read.
94	Guelph	Dr. Dryden	Wm. Ross.
73	Hagersville	Wm. Harrison	S. W. Howard.
158	Hamilton	A. Alexander	J. M. Dickson.
58	Hespeler	John Fisher	D Rife.
50	Iroquois	W. A. Whitney	A. E. Overell.
88	Kincardine	S. W. Perry	Joseph Barker.
86	Leamington	J. L. Hilborn	E E. Mackay.
114	Lindsay	W. M Robson	F. J. Frampton.
119	London	J. A. Balkwill	R. W. Rennie.
81	Meaford	Oscar Boden	A. McK. Cameron.
57	Midland	F. R. Weston	Miss M. Tully.
60	Millbrook		George Sootheran.
72	Mitchell	A. D. Smith, M.D	T. H. Race.
64	Napanee	Mrs. W. H. Wilkinson	J. E. Herring.
68	Niagara Falls	W. P. Lyon	T. J. Robertson.
52	Norwich	J. D. Hogarth	Wm Fairley.
108	Oakville	A. D. Chisholm	W. W. Paterson.
83	Orangeville	John McLaren	Wm. Judge.
63	Owen Sound	Dr. Allan Cameron	James Vair.
76	Orillia	G. I. Bolster	C. L. Stephens.
....	Perth	W. A. Meighen	A. W. Goodman.
57	Paris	John Allan	Gordon J. Smith.
103	Picton	A. M. Terrill	W. T. Ross.
50	Port Colborne	A E. Augustine	O. C. Kanold.
81	Port Dover	James Symington	Mathew Hodge.
110	Port Hope	H. H. Burnham	A. W. Pringle.
85	Seaforth	Wm. Ballantyne	Valentine Knechtel.
79	Simcoe	H. H. Groff	Henry Johnson.
89	Smith's Falls	J S McCallum	W. M. Keith.
59	St. Catharines	G. W. Hodgetts	D. O. Hetherington.
58	Stirling	Mrs. James Boldrick	G. L. Scott.
59	Thornbury	John G. Mitchell	A. W. Walker (Clarksburg).
85	Toronto Junction	F. C. Colbeck	W. H. Post.
159	Waterloo	Andrew Weidenhammer	J. H. Winkler.
100	Woodstock	G. R Patullo	J. S. Scarff.
114	Windsor	Stephen Lusted	John R. Martin.

INDEX.

SEVENTH ANNUAL REPORT

OF THE

FRUIT EXPERIMENT STATIONS

OF

ONTARIO,

UNDER THE JOINT CONTROL OF THE

ONTARIO AGRICULTURAL COLLEGE, GUELPH

AND THE

FRUIT GROWERS' ASSOCIATION OF ONTARIO

1900.

(PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE, TORONTO.)

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TORONTO.

SEVENTH ANNUAL REPORT

OF THE

ONTARIO FRUIT EXPERIMENT STATIONS

1900.

To the Honorable John Dryden, Minister of Agriculture:

Sir,—We have the honor to submit to you the Seventh Annual Report of the Fruit Experiment Stations of Ontario. Experimental work requires much time to attain valuable results, and now that varieties planted at our various stations are beginning to produce fruit, our reports will become increasingly valuable year after year. You will observe that this report is much more adapted to guide the planter than any previous one.

We have tl e honor to be, Sir,

Your obedient servants,

Jas. Mills, M.A., LL.D., Chairman.
Linus Woolverton, Secretary.

BOARD OF CONTROL, 1901.

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THE ONTARIO FRUIT EXPERIMENT STATIONS.

	Name.	*Specialty.*	*Experimenter.*
1.	Southwestern	Peaches	W. W. Hilborn, Leamington.
2.	Niagara		
3.	Wentworth	Grapes	M. Pettit, Winona.
4.	Burlington	Blackberries and Currants	A. W. Peart, Freeman.
5.	Lake Huron	Raspberries	A. E. Sherrington, Walkerton.
6.	Georgian Bay	Plums	J. G. Mitchell, Clarksburg.
7.	Simcoe	Hardy Apples and Hardy Cherries.	G. C. Caston, Craighurst.
8.	East Central	Pears and Commercial Apples	R. L. Huggard, Whitby.
9.	Bay of Quinte	Apples	W. H. Dempsey, Trenton.
10.	St. Lawrence	Hardy Plums and Hardy Pears	H. Jones, Maitland.
11.	Strawberry station		E. B. Stevenson, Guelph.
12.	Gooseberry station		S. Spillett, Nantyr.
13.	Algoma	Hardy Fruits	Chas. Young, Richard's Landing.
14.	Wabigoon	Hardy Fruits	A. E. Annis, Dryden.
	Maplehurst	General collection of all kinds of fruits for descriptive work for "Fruits of Ontario"	L. Woolverton, Secretary.

FRUITS OF ONTARIO.

Described and Illustrated by Mr. L. Woolverton, Secretary of the Ontario Fruit Experiment Stations.

1900.

Fruit growing has become so important an industry in the Province of Ontario, that it deserves every encouragement at the hands of the Department of Agriculture. The Canadian farmer who contemplates growing fruit asks for information on two points in particular, viz., (1) What fruits shall I plant, and (2) how shall I cultivate them? The latter of these questions it is the province of the Ontario Fruit Growers' Association to answer through the Canadian Horticulturist and the Annual Report, while the former question is one that can be solved only by years of patient experimental work by our fruit experiment stations.

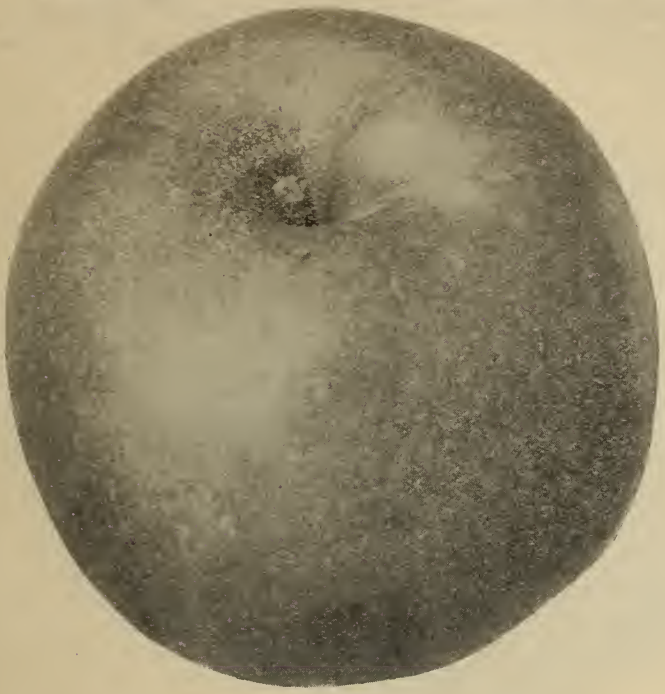
Of equal importance is some means of identifying all varieties now grown in our Province, and of knowing with some degree of exactness the size, color, general appearance and real value of these varieties aside from the catalogues of the nurserymen. To meet this latter need, the Secretary, with the advice and approval of the Board of Control, has begun the work of illustrating and describing the fruits of Ontario, and in this work he desires to acknowledge the valuable aid of the various fruit experimenters. The illustrations are all new and original, having been engraved from photographs made the exact size of the fruit samples, except where otherwise specified, and in this way there will in time be made accessible to the Ontario fruit growers a complete guide to all the fruit grown in the Province. Such a work necessarily must be slow and tedious, but it is all important that it should be characterized by scientific accuracy and the writer invites notes of criticism from pomologists generally.

Apple Packing at Maplehurst.

APPLES.

*MANN.

The Mann apple is not very highly recommended for extended orchard planting in Ontario, because of its rather unattractive green color in shipping season in October. The tree has the merit of being a productive variety and an early bearer, but the fruit is inclined to drop early, and to be small, when not thinned.



MANN.

ORIGIN, New York State, a chance seedling.

TREE, hardy, vigorous, spreading, with slender branches; an early and regular bearer, inclined to overload.

FRUIT, of large size when thinned and well cultivated, $2\frac{3}{4}$ x $3\frac{3}{4}$ inches; form, roundish, oblate, regular; skin, dull green, yellowing at maturity, nearly covered with light green dots; stalk half an inch long in a large slightly russeted cavity; calyx closed in a large plaited basin.

FLESH, yellowish, moderately firm, juicy, agreeable, sub-acid. SEASON, January to April.

SECTION OF MANN.

QUALITY, desert poor; cooking good.

VALUE. Good for home or foreign market, but its color is not favorable for best prices.

* Engravings of Mann and Spy are given correctly in this issue, because in our report for 1898 they were transposed by mistake.—ED.

PRINCESS LOUISE.

(*Woolverton.*)

ROM. An apple of great value for the home garden as a choice dessert variety, but probably not sufficiently productive to be profitable in the commercial orchard unless it should command a higher price than other apples on account of its excellence.

THE LOUISE.

ORIGIN, at Maplehurst, near Grimsby ; a chance seedling of the Snow. Samples were first exhibited by Mr. L. Woolverton at a meeting of the Ontario Fruit Growers' Association at Hamilton, where it was given the name Princess Louise, after Her Royal Highness, wife of the Governor-General, His Excellency the Marquis of Lorne.

TREE, of slender habit, fairly vigorous, hardy, moderately productive.

FRUIT, roundish, averaging $2\frac{3}{4}$ by $2\frac{1}{4}$ in length and breadth respectively ; skin, greenish yellow, of bright waxy lustre, with cheek of clear bright carmine ; stem, stout, $\frac{3}{4}$ inch long, in a narrow, moderately deep cavity; calyx, half open, in a broad, shallow, slightly plaited basin.

FLESH, pure white, texture tender, fine, somewhat crisp, juicy with rich aromatic flavor.

SEASON, November to February.

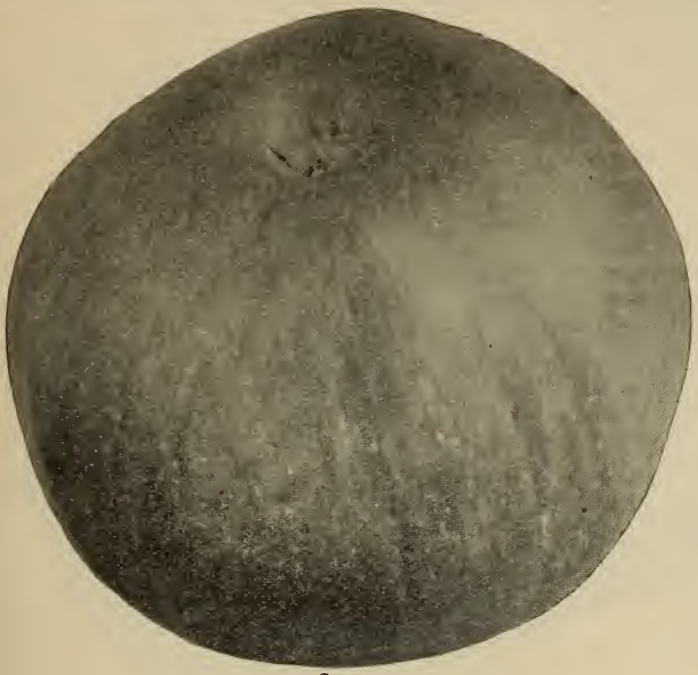
QUALITY, dessert, best ; cooking, fair.

VALUE, home market, very good.

SECTION OF LOUISE.

SPY. (*Northern Spy.*)

The Spy stands in the very first rank of Canadian apples, whether for home or foreign markets. Originating in New York State on the line with the southern portion of the Province of Ontario, it succeeds here to perfection. Its beauty of coloring, half shaded by its delicate bloom, and its great excellence of quality for all purposes, justly claim for it its wide popularity. In Chicago, Canadian Spys are more sought for than any other variety, but, owing to tenderness of skin, which shows the slightest bruise, it is less popular for export to Great Britain than some other varieties. The tree is late in coming into bearing, often being fifteen years planted before yielding a crop, and this renders the variety somewhat unpopular with planters. Probably for fancy packages, selected Spys would be among the best.



SPY.

ORIGIN, near Rochester, N.Y.

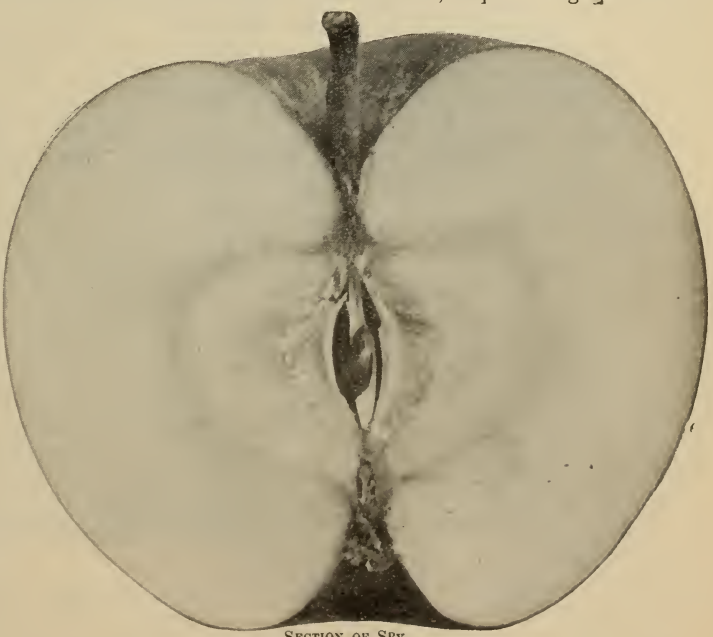
TREE, upright and spreading in habit; fruit spurs on interior boughs very vigorous, late in coming into bearing, but afterwards fairly productive in alternate years; blossoms late in spring and holds its fruit late in the autumn; requires high cultivation and good fertility.

FRUIT, large to very large; form, roundish, slightly conical; skin, thin, light green, or pale yellow, sprinkled with light pink, striped and shaded with pinkish red, and thinly covered with thin whitish bloom; stalk, slender, three-quarters of an inch long, in a wide, deep, sometimes russeted cavity; calyx, small, closed, in a narrow, moderately deep, abrupt, irregular basin.

FLESH, white, fine grained, crisp, tender juicy; flavor, rich, sprightly, subacid, fragrant.

SEASON, January to May.

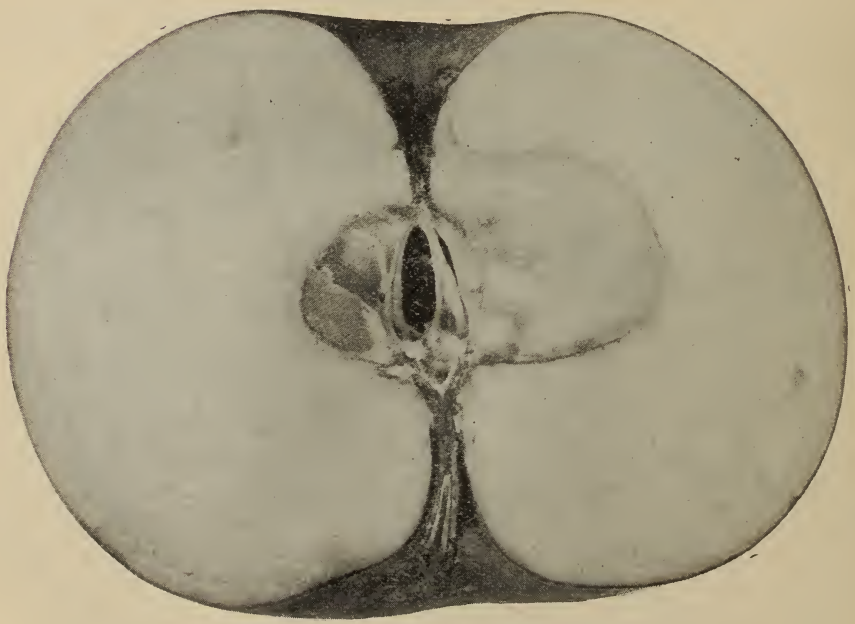
QUALITY, dessert and cooking, first-class; home market, first-class; a little tender for distant shipments.



SECTION OF SPY.

ADAPTATION, sandy or clay loams in southern and middle Ontario; found tender at Simcoe Experiment Station and at the St. Lawrence Experiment Station.

WOLF RIVER.



SECTION OF THE WOLF RIVER.

WOLF RIVER.

The Wolf River is an apple that might be included in a list for export. It is a little later in season than Alexander, and promises well as one of our fancy varieties for export.

It is a seedling of the Alexander, and originated in Wisconsin o the bank of Wolf river.

TREE, very hardy, vigorous and fairly productive ; an early bearer.

FRUIT, very large, 3 inches by 4½ inches, oblate, or roundish oblate, usually regular in size; skin light yellow, shaded with dark red or crimson in sun, with a few yellowish dots ; stem, three-quarters of an inch long, set in a narrow deep basin, of a green or russeted color ; calyx, open, in a narrow, deep, green wrinkled basin.

FLESH, yellowish white, moderately firm in texture, not fine-grained, juicy, with a pleasant sub-acid, spicy flavor.

SEASON, October and November.

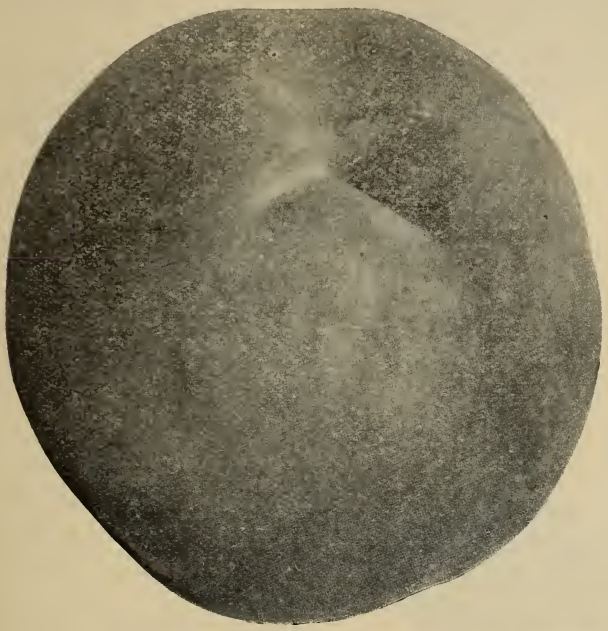
PEACHES.

ELBERTA.

The best peach of its season for all markets, and a variety especially suited for export by reason of its shipping qualities.

ORIGIN, Georgia ; a cross between Chinese Cling and Crawford's Early.

TREE, vigorous, hardy, and moderately productive, carrying as much fruit as a tree should, and if it were a heavier cropper the fruit would need thinning. The leaves are much subject to curl leaf, but this may be largely controlled by spraying.



THE ELBERTA PEACH.

FRUIT, medium to large, 3 x 3 inches, roundish oval, one side somewhat larger than the other, suture distinct ; skin, lemon yellow, with a fine red cheek ; stone free, deeply corrugated, pointed.

FLESH, yellow, tender, juicy, melting ; flavour, rich, agreeable and very good.

SEASON, September 20th to 25th, about a week later than Crawford's Early.

QUALITY, dessert, very good ; cooking, best.

VALUE, home market, very good ; foreign market, best.

SECTION OF ELBERTA.

BLACKBERRIES.

The Kittatinny.

THE KITTATINNY.

This has been the favorite blackberry in Ontario for both home use and market. Formerly the Lawton was our principal market berry, but though it turned black enough to sell on the market its hard core never seemed ripe enough for eating. It was therefore an agreeable change to grow the Kittatinny, with its large shining black berries, ripe through and through, and most excellent, either for eating fresh or with sugar and cream at the table, or in pies.

Unfortunately, it is very subject to Orange Rust, for which as yet there is no remedy, and in most places fruit growers have given up this variety on account of it.

Origin, Kittatinny Mountains, N.J.; found growing wild by a Mr. Woolverton in 1874 but not much desseminated until many years later.

Plant, very vigorous, but tender outside of the peach belt productive; propagated by suckers, and by root cuttings; very susceptible to the Orange Rust.

Berry, large averaging about 1½ inches in length; oblong, slightly conical; shiny black when ripe, becoming gradually duller after gathering; flesh, moderately firm, sweet, rich and excellent.

Season, July 25th to August 25th.

Quality, Good for dessert; very good for cooking.

Value, First-class for home market.

CURRANTS.

BLACK VICTORIA.

BLACK VICTORIA.

An early black.

BUSH, upright, of medium vigor, healthy, hardy and productive.

BERRY, large, half inch, firm, sweet.

QUALITY, fine.

SEASON, July 10th to August 5th.

BELLE DE ST. GILES.

Supposed by some to be the same as Red Dutch, but as we have grown it, larger berries and finer bunches. It is a large berry of fine quality, but not productive enough for the commercial plantation.

ORIGIN, Europe.

BUSH, upright, spreading; vigor, medium; hardy, not very productive.

BUNCH, large and compact.

BERRY, red, large, half-inch diameter; sub-acid; quality excellent.

SEASON, medium, July 8th to August 1st.

BELLE DE ST. GILES.

BRAYLEY.

ORIGIN,—

BUSH, upright, spreading, vigorous, healthy, hardy and productive.

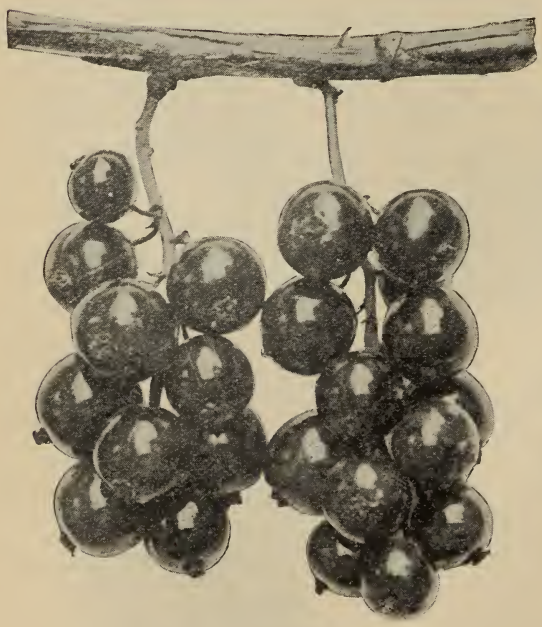
BUNCH, long, straggling, loose.

SEASON, medium, July 10th to August 1st.

BRAYLEY.

CHERRY.

(*Red Imperial., Fertile d'Angers*—"*LeRoy.*")



The principal red currant grown in Southern Ontario for commercial purposes. Its large size, fine color and earliness, combine to make it the most satisfactory of all varieties for market, and many acres have been set out for this purpose. When well cultivated and well pruned back, a plantation of Cherry currants will continue very productive for at least twelve or fifteen years.

ORIGIN, Europe.

PLANT, vigorous, a stout stocky grower; productive; begins bearing the second year after planting; foliage thick, dark green.

BUNCH, usually short, but sometimes long and tapering; average length, two inches.

BERRY, very large, globular, ½ inch in diameter; bright red in color; acid.

SEASON, June 26th to July 25th.

QUALITY, fair.

CHERRY.

VALUE, first-class for market and for jellies.

ADAPTATION, general, but succeeds better on clay loam than upon light sand.

CRANDALL.

This interesting currant is of very doubtful value for the currant plantation, for it ripens so unevenly and its culinary uses seem not well defined.

ORIGIN. Kansas.

BUSH, upright, spreading, hardy, healthy, vigorous, rampant and very productive.

CRANDALL.

BERRY, variable in size, diameter $\frac{3}{8}$ to $\frac{3}{4}$ inch ; bluish black ; flavor, sprightly sub-acid.

SEASON, July 15th to September 1st.

It is of the Ribes aureum type, or flowering currant, and was produced from seed of that variety by Mr. Crandall.

FAY.

A variety that has been much advertised as superior to the Cherry, but, as a matter of fact, is very similar in fruit and in productiveness.

ORIGIN, New York State.

BUSH, vigorous, but sprawling, and somewhat subject to the borer where the shoots are not frequently renewed

BUNCH, moderately close, loose toward the base ; length 2 to 3½ inches.

BERRY, very large, globular, ½ inch in diameter ; bright red ; juice, sub-acid.

QUALITY, good.

SEASON, June 25th to July 25th.

VALUE, first-class for market.

ADAPTATION, General.

FAY.

LEE'S PROLIFIC.

A good commercial variety.

ORIGIN, England.

BUSH, moderately vigorous, healthy, hardy and very productive.

BERRY, black, very large, ½ inch to ⅝ inch ; flavor, sub-acid ; quality, very good.

SEASON, July 15th to August 10th (in 1900.)

LEE'S PROLIFIC.

HOLLAND.

HOLLAND.

White Holland, Long Bunched Holland.

The best bunched and the most showy of the white currants.

BUSH, vigorous, healthy and quite productive.

BUNCH, four to five inches in length; loose at base of racemes, close toward apex.

BERRY. $\frac{3}{8}$ inch long by $\frac{1}{2}$ inch broad; globular; skin, thick, white; flavor, mild acid.

SEASON, July 10th to 30th.

LONDON.

(London Market.)

One of the most promising of the new varieties for all purposes.

ORIGIN, England.

BUSH, very vigorous and healthy, not as subject to leaf spot and twig borer as some other varieties, very productive.

BUNCH, about three inches long, comparatively compact.

BERRY, $\frac{1}{2}$ inch, in diameter, color red, quality fair.

VALUE, very good for both kitchen and market.

SEASON, middle of July to middle of August.

LONDON.

MIDDLESEX,

(*Saunders No. 12.*)

Among a collection of seedling black currants sent to Maplehurst by Dr. Saunders of Ottawa in 1896, we notice one which gives promise of greater productiveness than the others. Not only are the berries a good size, but, what is of greater importance with a black currant, the bunches are full and hang pretty closely along the branch. This is now known as the Middlesex.

ORIGIN, Dr. Saunders, Ottawa, Canada.

BUSH, very vigorous, healthy, very productive for three successive years, viz., 1896, 1897 1898.

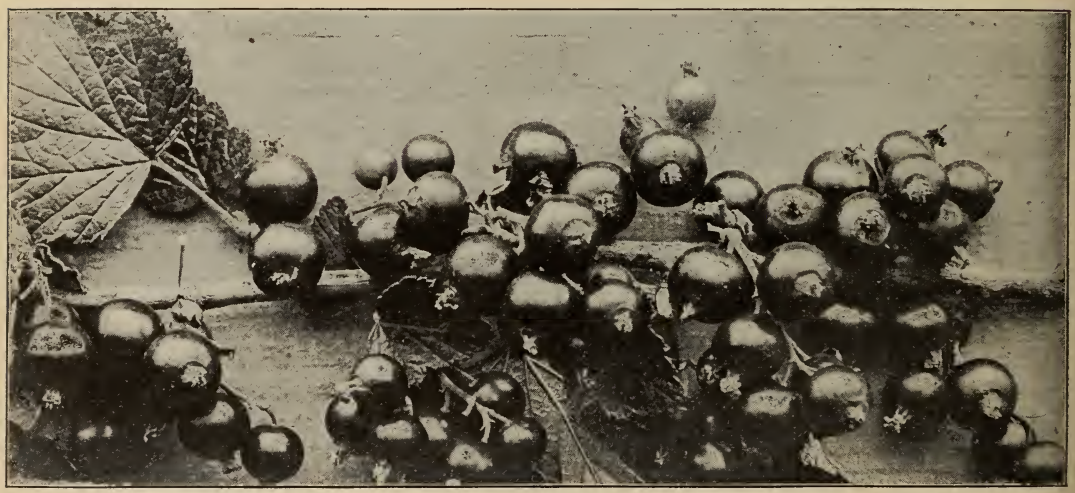
BUNCHES, about 1¼ inches in length, compact.

BERRY, round, about half an inch in either diameter ; skin, jet black, thick ; flavor, good.

SEASON, July 8th to 16th, or later in Southern Ontario.

VALUE, first-class for cooking and market.

ADAPTATION, general.



MIDDLESEX. (Slightly reduced).

NAPLES.

NAPLES.

One of the best market varieties of black currants.

ORIGIN, Europe.

BUSH, upright, strong, vigorous, hardy, healthy and very productive.

BERRY, large, ½ inch in diameter, black, sub-acid, quality good.

SEASON, July 12th to August 12 in 1900.

NEW VICTORIA.

ORIGIN—

BUSH—upright, spreading, vigorous, hardy, but not very productive.

BUNCH—long, loose.

BERRY—red, small to medium, average size ⅜ of inch, flavor pleasant.

SEASON—medium, July 9 to August 1.

NEW VICTORIA

NORTH STAR.

NORTH STAR.

We have tried this variety since 1896 at Grimsby, and at first were inclined to condemn it as too small, but it has grown in favor each year, until, in 1899, it has surpassed most varieties in productiveness, in health and vigor of bush, and in keeping qualities. At date of writing, August 20th, the fruit still hangs as bright in appearance as it was a month ago. Possibly it would pay currant growers to hold the fruit for the latest market, for in the height of the currant season, the price is often very low.

ORIGIN, Minnesota.

BUSH, vigorous, healthy, very productive.

BUNCH, compact, three to four inches long, inclusive of about an inch of naked stem, which is convenient in gathering.

BERRY, round, ⅜ inches in diameter; skin, thin, bright red; subacid.

QUALITY, cooking very good.

VALUE, second rate on account of size, but, season and productiveness considered, it might be classed first rate.

SEASON, July 15 to September 1.
Adaptation, general.

RED CROSS.

Red Cross.

Very much resembles Cherry, but somewhat poorer in bunch.

Origin, New York State, probably a cross between the Cherry and the White Grape.

Bush, upright, vigorous and fairly productive.

Bunch, $2\frac{1}{4}$ inches long, $\frac{3}{4}$ inch of which is naked stem, compact.

Berry, $\frac{1}{2}$ inch, round, bright red, flavor fairly good, agreeably acid.

Season, last half of July.

VERSAILLAISE.

This variety closely resembles Cherry.

Origin, France.

Bush, healthy, hardy, fairly vigorous and fairly productive.

Bunch, medium, length $2\frac{1}{2}$ inches, and moderately compact.

Berry, round, $\frac{1}{2}$ inch diameter, bright red, milder in flavor than the Cherry.

Season, July 7th to August 1st.

Valuable for market.

Versaillaise.

WHITE IMPERIAL.

ORIGIN,—

BUSH, vigorous, hardy, healthy and fairly productive.

BUNCH, loose, 2¼ inches long, with half an inch of stem.

BERRY, white, diameter 7-16 of an inch; flavor, mild; quality fine.

VALUE, dessert very good.

SEASON, at Burlington Station, July 8th to August 1st.

WHITE IMPERIAL.

WILDER.

WILDER.

This is one of the best of the red currants and has given an excellent record at our Burlington station. It is highly recommended in the recent report of the American Pomological Society.

ORIGIN, New York State, named in honor of the late Marshall P. Wilder.

BUSH, healthy, hardy and very productive.

BUNCH, four inches in length, with one inch of stem, compact.

BERRY dull red, form uneven, diameter half inch, mild in flavor, of good quality.

SEASON, July 8th to August 1st.

VALUE, first-class for market.

RED DUTCH.

RED DUTCH

Too small for the commercial plantation, but of fine flavor for dessert.

ORIGIN, Europe.

BUSH, dwarfish, slender, hardy and productive.

BUNCH, medium, $2\frac{1}{2}$ inches long, with $\frac{1}{2}$ inch naked stem, compact.

BERRY, small, $\frac{1}{3}$ to $\frac{3}{8}$ inch, oblate, red; flavor, sprightly, sub-acid, pleasant.

VALUE, second rate for market.

SEASON, July.

WHITE GRAPE.

(White Antwerp-White Transparent)

This is esteemed the finest of all the white currants, when its many good points are taken into consideration, viz., quality, beauty and productiveness. For market, its white color is against it, but for the home garden in is one of the best.

ORIGIN, Europe.

BUSH, moderately vigorous, very productive.

BUNCH, $2\frac{1}{2}$ to 3 inches long, somewhat straggling.

BERRY, $\frac{7}{16}$ to $\frac{9}{16}$ of an inch in diameter, skin white, transparent, flavor mild acid, sprightly, agreeable.

VALUE, best for dessert, fair for market.

SEASON, July 15th to Aug. 10th.

NOTE.—The single bunches were grown at the Burlington Station, and the clusters by Prof. Hutt at the O.A.C., Guelph.

WHITE GRAPE.

White Grape Currant.

Grapes.

THE EARLY VICTOR.

The Early Victor Grape colors very early, fully two weeks ahead of Concord, and is fit to gather about ten days before, along with Hartford and Moore's Early.

The early Victor was originated by John Burr, of Leavenworth, Kansas, in 1870. A seedling of the Delaware.

THE EARLY VICTOR GRAPE.

Vine—Very vigorous, very productive and healthy.

Bunch—4 inches long by 3½ broad, shouldered and very compact.

Berry—Medium, round, black, with thick blue bloom, adheres well, pulp tender, juicy, sweet and agreeable ; seeds, two.

Season—August 25th (1899), and since it ripens so early is worthy of trial in northern sections.

Quality—Very good for dessert.

Value—Good for home market ; also very good for making claret wine.

FRUIT EXPERIMENT STATIONS.

BOARD MEETINGS.

The Board of Control met at the Railway Committee Rooms, Parliament Buildings, Toronto, on the 6th of March, 1900, when a resolution was passed urging that experiments be continued in the export of Canadian Rogers' grapes. It was further resolved to purchase such stock as was necessary to fully restock the stations in room of all vacancies. It was estimated that $2,600 would be required for our work during the year 1900.

On the 3rd of July, a meeting was held at the office of the Secretary. The morning was spent in inspecting the cherry, plum, peach, pear and grape plots, after which the meeting came to order for work. In the matter of the Industrial Fair, it was ordered that the exhibit should be set up in alphabetical order, and that only valuable varieties be shown in the collection. The experimenters are to set on one side those varieties which they have tested and found valueless.

The importance of the Pan-American Exposition was fully discussed, and the Secretary ordered to communicate with the Hon. John Dryden, Minister of Agriculture, giving him the views of this Board upon the importance of making a first-class exhibit of apples and other fruits at that Exposition, and that a fine collection of winter apples be placed in cold storage at Buffalo to go on the tables in the early summer.

On the 2nd of January, 1901, a meeting was held at the House of Parliament, Toronto, at which the estimates were considered, and it was decided to ask about the same amount for our work as has been allowed in previous years.

It was ordered that this Board recommend to the Minister of Agriculture the importance of an early decision with regard to the extent of the fruit exhibit at the Pan-American, and with regard to the superintendance of the same.

REPORT ON THE INSPECTION OF THE FRUIT EXPERIMENT STATIONS.

By Prof. H. L Hutt, Ontario Agricultural College, Guelph.

I have the honor to present herewith a brief report on my inspection of the Fruit Experiment Stations last summer. I am pleased to state that on the whole good progress is being made. The experimenters have taken great interest in the work from the start, and most of them are now in a position to give valuable information upon a large number of varieties of the different kinds of fruits they have under test. In the following notes the stations are mentioned in the order they were visited during the summer.

The Gooseberry Sub-Station, Nantyr.—Visited July 12th. Mr. Spillett has about two dozen varieties of gooseberries under test, most of which have been out four or five years. Red Jacket, Pearl and Downing have proved to be the most satisfactory varieties and are free from mildew. Most of the other varieties have mildewed more or less badly in spite of repeated sprayings with Bordeaux mixture, particularly on heavy soils, while the few on the light soils have escaped altogether. Of the English varieties, Green Chisel is the most promising. The bushes are small, but they are well loaded with beautiful large berries, quite free of mildew. Nearly all of his old bushes are mound layered to make plants for another year. Mr. Spillett is taking good care of his bushes, and they are well pruned, sprayed and cultivated.

The Simcoe Station, Craighurst.—Visited July 13th. This section of the country has had plenty of showers, and nearly all of the crops and fruits are looking well. Mr. Caston has an extensive collection of apples, pears, plums, cherries, and small fruits, all of which are well cultivated, pruned and sprayed. Some of the Japan plums, such as Wickson, have proven tender in this section.

There is only a fair crop of winter apples, as last year was the bearing year in his orchard. Of the Duchess, however, there is a grand crop, and Mr. Caston will probably have 100 barrels of this variety. Flemish Beauty pears are promising, although some of them are showing signs of scab. Cherry trees blossomed well in the spring but did not set fruit, and plums also will give little or no fruit this year. Russian Apricots have been wintered through for a number of years, and although they seem hardy enough and bloom freely, they have never yet borne fruit, possibly on account of frost injuring the early blossoms. Of the small fruits, raspberries, currants, gooseberries and blackberries, there is a fine crop. Strawberries also were a good crop, although the yield was somewhat lessened by early drought. For all of these fruits, Mr. Caston has a good local market and can sell much more than he can produce. He is planting more largely of the blackberries, of which Snyder and Agawam have proven the most hardy. Good work is being done at this station, and, as evidence of the confidence which the people of that neighborhood have in the results obtained, a number of the nursery agents have come to Mr. Caston to get him to mark the list of varieties which he would recommend for that section. This we consider one of the most practical results of the work of the station.

The Huron Station, Walkerton.—Visited July 17th. Mr. Sherrington has been testing a large number of varieties of raspberries, for a number of years and he is now ready to discard a great many of them and confine his attention to a few of the best. Cuthbert he finds to be still the most satisfactory of the reds, while Hilborn and Conrath have made the best showing among the blacks. For all of these fruits he has a good local market, and can sell at good prices much more than he is producing. The experimental trees of plums and cherries set out three years ago have made a fine growth and some of them began bearing last year. There will be little or no fruit on any of them, however, this year.

In his apple orchard Mr. Sherrington has a fair crop, although not nearly so large as last year, that being the bearing year. Mr. Sherrington's place is well managed, and his trees and plants receive good care.

Burlington Station, Burlington.—Visited July 24th. In previous reports I have referred to the fine collection of fruits growing at this station and the excellent work being done. This season the crop of nearly all kind of fruits, with the exception of plums, was all that could be desired. Mr. Peart has been giving special attention to raspberries, currants and blackberries and has given carefully prepared notes on these in his annual reports. Of the red currants he finds the Cherry and Wilder most satisfactory, while the Collins' Prolific has proven to be the best black, and White Grape the best white currant. In raspberries, the Marlborough, Cuthbert, Miller and Louden are the best red varieties to date. Kansas has made the best showing among the blacks. Among the blackberries, Mr. Peart finds Western Triumph, Agawam and Kittatinny the leading varieties so far.

A fuller account of all these fruits under test will be found in his annual report Mr. Peart is also making a number of experiments with commercial fertilizers on various kinds of soils, and for different fruits, and will be able to give some valuable data on these in the course of a year or two.

The Southwestern Station, Leamington.—Visited August 1st. During the severe winter of 1898-99 over 90 per cent. of the peach trees in this section of the country were destroyed. Plums suffered nearly as much ; and many other trees, such as pears and cherries, were also severely injured. Where ever trees escaped it was mostly on moist land or where the ground was covered with weeds or a cover crop. The most of the peach trees saved on Mr. Hilborn's place were in the experimental plots where there are now about 100 trees of 25 or 30 kinds fruiting this season. Mr. Hilborn is in no way discouraged but is planting again as quickly as possible and has about 80 acres re-planted. In the experimental plots he has a good collection of varieties started again.

The past season has been showery and favorable for newly planted trees, but many of these have failed or made a sickly growth. Whether this can be attributed to the injury of fumigagation, as is supposed by some, or whether it is due to the weakly stock planted, is hard to say, but it is quite noticeable that the young trees from some of the American nurseries have made much better growth than those from our home nurseries. Mr. Hilborn has a good collection of Japan plums, many of which are now coming into bearing and are quite promising, particularly some of Burbank's new seedlings. As a side line Mr. Hilborn has gone quite extensively into the growing of gladioli, and he hopes in time to work up a profitable trade in that class of ornamentals, his soil being very suitable for the production of the bulbs.

Wabigoon Station, Rainy River District.—Visited August 21st, 1900. A year ago last spring a few of the hardy apples, plums, pears, cherries and small fruits were sent to this station for the purpose of finding out what fruits could be grown in this northern section. Nearly all of the trees perished last winter, when it was unusually cold with but little or no snow on the ground. Among the small fruits the black currants have stood the best, while the red and white varieties have done poorly. The Downing gooseberry has made a fair growth but the Whitesmith and Industry have failed or made no progress. The black and purple raspberries have not been tried, but the red varieties, such as Marlboro', Miller, Loudon and Turner have made a good growth this season, although the tops were frozen nearly to the ground last winter.

The comparatively poor showing that the fruits have made here so far may be attributed to several causes—the severity of the weather, the lack of protection from drying winds, and probably also the impervious nature of the subsoil where they have been planted. There is a much more suitable soil for fruits a little further east from the house which Mr. Annis says might be used for this work, and we would recommend that another small collection be sent for planting next spring made up as follows :

Apples, 10 varieties, 2 trees of each—Duchess, Wealthy, Longfield, Whitney, Transcendent, Hibernal, Melinda, Anassim, Arabka and Charlamoff.

American Plums, 10 varieties, 2 trees of each—Aitkin, Cheny, Hawkeye, Hunt, Stoddard, Rollingstone, Wolf, Forest Garden, De Soto and Wyant.

Cherries, 4 varieties, 2 trees of each—Koslov Morello, Orel, Olivet and Early Richmond.

Currants, 4 varieties, 6 bushes of each—Fay, Cherry, Victoria and White Grape.

Gooseberries, 3 varieties, 6 bushes of each—Pearl, Downing and Red Jacket.

Raspberries, 4 varieties, 12 plants of each—Cuthbert, Golden Queen, Columbian and Older.

STRAWBERRIES, 4 varieties, 50 plants of each—Van Deman, Clyde, Saunders and Haverland.

THE ALGOMA STATION, RICHARD'S LANDING.—Visited August 24th. The progress made at this station has been remarkable and nearly all of the trees and plants sent for testing have lived and made a fine growth. About the only failures at all were among some of the Japan plums, which could hardly have been expected to stand the winter in this northern section, although some of the Japan varieties have come through the winter uninjured. In one case we noticed where the top had been frozen back, there was a strong growth from the root upon which the plum had been worked, which in this case happened to the peach. There is little danger of root killing in this district where the ground is usually covered with a deep snow for the whole winter.

Mr. Young has now a fine collection of fruits well started and some interesting results may be expected from this station in the near future.

THE GEORGIAN BAY STATION, CLARKSBURG.—Visited August 27th. At this station may be seen one of the finest collections of plums in the country but the crop this year is a total failure which Mr. Mitchell thinks was due to the unusually warm weather in February, when the buds were forced into growth and afterwards checked by severe weather. All of the trees, however, are vigorous and thrifty and promise well for a crop next year.

In the apple orchard there is a fair crop of fruit this year of most varieties such kinds as Ben Davis, Greening, Pewaukee and St. Lawrence being particularly well loaded. Many of the Northern Spys are also bearing a good crop. We noticed also a few trees of Flemish Beauty pears which would probably be 18 or 20 feet in height which were loaded with fine fruit. Last year Mr. Mitchell had a fine crop of pears off his orchard of dwarf varieties, among which are the Duchess, Anjou, Clapp, Goodale, etc.

There may also be seen at this station quite a number of peach trees which have not yet showed any signs of injury from winter killing. Some of them were fruiting this year. Mr. Mitchell is a thorough cultivator and his trees show that they have received good attention. No withstanding the severe drought for the greater part of the season, the cultivation given had retained the soil moisture and the trees showed but little injury from the drought.

THE EAST CENTRAL STATION, WHITBY.—Visited August 30th. Most of the apple and pear trees set out at this station were planted during 1896-97, and quite a number of them are now beginning to bear. In the older trees there is a goodcrop of fruit, but plums are a failure, as in most other sections this year.

Mr. Huggard does not allow his ground to stand idle, and has been cropping freely between the rows with hoed crops, such as corn, roots and potatoes, although he has hardly been careful enough to keep these from encroaching upon the trees. The cultivation given has stimulated a strong growth, necessitating the heading back of upright kinds, such as pears and plums. This has been somewhat neglected in the past, although Mr. Huggard now sees the necessity for it since the older trees have come into bearing. All of the trees have been sprayed three or four times and are fairly free of insects and fungous diseases.

THE BAY OF QUINTE STATION, TRENTON.—Visited September 1st. Mr. Dempsey's orchard is well cultivated and thoroughly sprayed; and this year he has a fair crop on his bearing trees which he expects will yield about 2,000 barrels. The fruit is somewhat undersized because of the extreme drouth, but all of the apples are clean and free from worms and scab. The young trees set out in the experimental orchard in 1896 have done well, and several are this year bearing fruit One of these, Western Beauty, is loaded with fine large apples, much like Wealthy in appearance. Many of the scions grafted on bearing trees during the past three or four years are now bearing, and fruit from many of these was shown this year at the Toronto Exhibition.

Mr. Dempsey has in all about 170 varieties of apples in bearing, 100 of which were shown this year at Toronto. Valuable reports are now being received from this station.

THE ST. LAWRENCE STATION, MAITLAND.—Visited September 3rd. The soil upon which Mr. Jones has planted his experimental orchard is a deep, rich, black, sandy loam and most of the trees have made a remarkable growth, some of the new growths measuring five and six feet in length. Most of the kinds planted have done well and are now beginning to show signs of fruiting. Some varieties show signs of being worthless for this section and have been injured by sun scald. In the young orchard, planted in 1896, there will no doubt be many kinds of apples, pears, and plums in fruiting next year. In Mr. Jones' bearing orchard he has his usual fine crop of Snows and Scarlet Pippins. The fruit is of good size and free from scab and worms. In this section they have not had the severe drought which has so reduced the crop farther west. From this orchard of four acres, Mr. Jones has sold fruit during the past three years to the value of $3,682. Last year his crop was about 500 barrels, which brought him in round figures $1,300. The crop this year will be quite as heavy. These facts alone speak for the care and attention which the trees at this station receive.

THE NIAGARA STATION, ST. CATHARINES.—Visited September 13th. Mr. Burrell has sold out his fruit farm and removed to British Columbia. Since his removal, the experimental plots of peaches and tender fruits had been planted with corn and were sadly neglected. A number of

the trees had been killed during the past two winters, and were torn out without saving the labels, and there is no record of the trees left. This station has therefore been discontinued.

Maplehurst.—Visited July 2nd and September 14th. The fruit to which Mr. Woolverton has been asked by our board to give special attention is the cherry. He has now in his collection 62 varieties, and most of these being planted five years ago are now coming nicely into bearing. The orchard is on dry sandy loam, which is well cultivated and has been fertilized with wood ashes.

There is a great difference in the habit of growth of the different varieties of cherries, but all look thrifty and vigorous, and some of the sweet varieties have made remarkable growth. At the time of our first visit in July, most of the trees were loaded with fruit, and they presented a sight well worth going to see. An excellent illustrated article on the trees and fruits in this orchard was given in the August number of the *Canadian Horticulturist*, and a full report on the different varieties will appear in Mr. Woolverton's annual report.

Mr. Woolverton has also an extensive collection of grapes, pears, apricots, apples, peaches, European and Japanese plums, and tender fruits, and since we need look for no more reports from Mr. Burrell, I have thought it might be well to ask Mr. Woolverton to report also upon peaches, plums, and the tender fruits in the Niagara District. In all, Mr. Woolverton has now over 600 varieties of fruits, for purposes of study in connection with the preparation of the work assigned him by this Board, viz. : "The Fruits of Ontario," described and illustrated.

The Wentworth Station, Winona.—Visited September 14th, 1900. During the last six years, 150 varieties of grapes have been planted at this station. All have been trellised and are well cared for. Since they have come into bearing, Mr. Pettit has had a good opportunity of studying the varieties, and has found that many of them have not been sent true to name, and out of the whole lot there are but few new ones of value for commercial planting. Mr. Pettit says that eight or ten varieties at the most would be all that are worthy of a more extended trial. We would suggest, therefore, that those varieties which are of little or no value be grafted with some of the better kinds and thus save Mr. Pettit the expense of continuing the work with varieties known to be useless. In a new vineyard set out last spring, Mr. Pettit considered it advisable to plant only such old standards as Agawam, Lindley, Wilder, etc.

There are at this station also about 40 varieties of plums, set out in 1894, which have made fine growth and are now nicely into bearing. A full account of these and of the grapes will appear in Mr. Pettit's annual report.

The Strawberry Sub-station, Guelph.—Visited Oct. 5th, 1900. Mr. Stevenson grows most of his plants at Guelph, where he has many kinds under test. He has made the strawberry a life study, and makes it a point to try nearly every new variety as soon as plants of it can be obtained. He is therefore up to date on strawberry matters, and probably more familiar with the hundreds of varieties of strawberries than any other man in Canada. His annual reports are always full of valuable notes for strawberry growers.

It was ordered that Prof. Hutt's recommendation regarding the Niagara Station for tender fruits be adopted, inasmuch as nearly all these varieties are growing on the grounds of the Secretary.

Ordered, that the experimenters be asked to eradicate varieties tested and proved useless, after reporting upon the same and obtaining the consent of the Board.

Ordered, that the exhibit to be made this season at the Industrial consist of only the most desirable varieties of each fruit, and that inferior varieties be not placed on the table by experimenters.

At this meeting there was also presented the reports from these various stations giving in detail the results of the work of the year. Every year these reports will be of increasing value to Ontario fruit growers, as the varieties planted begin bearing, the object being to guard them against purchasing new and much lauded varieties which, upon trial, prove to be worthless, or not equal to the older and well tried kinds.

GENERAL NOTES BY EXPERIMENTERS.

Algoma Station.

Apples.—There are now in test at this station eighteen varieties of apples, planted in the spring of 1899, all of which have done well and some varieties have made a remarkable growth. Among the latter I may mention Longfield, Wolf River, Stark and Gideon. Sweet Bough is the only tree so far that has made poor growth. All have received clean cultivation and a root crop was grown on the experimental plot ; the trees have been sprayed at different times for leaf aphis with different remedies, of which I have found tobacco water the safest and most effectual. I do not look for any fruit yet as the ground is rich in nitrogen and the trees are making heavy

growth ; although it is no unusual thing for trees to bear fruit two years from the nursery in this section. I think this tendency to early bearing should, for the good of the future tree, be checked. I have also in test several kinds top grafted on hardy stock, varieties which I know would be too tender here in their own roots. Some experimental work along this line will no doubt lead to some interesting results and we may find it possible to grow Spys, Kings, etc., yet in Algoma. Also I am a strong believer in the individuality of a tree, as much so as in an animal, and do not see why the same results should not be obtained in the one case as in the other. Given a good hardy, healthy stock, top-graft from healthy bearing trees, and we may yet get just what we are looking for—a first class, long keeping winter apple, such as Greening, Baldwin, etc. So far we have nothing better as a long keeper than Walbridge, the quality of which is not first class, but is better than when grown in eastern Ontario.

The result in the experimental work here confirms my previous opinion that 75 per cent. o loss among our fruit trees is caused by sun scald, that is, provided the tree has received proper attention otherwise, such as clean cultivation, etc., and some protection. The roots are never, and the terminal growth on the top seldom, affected by our severe winters. As to varieties, the money maker is the Duchess. Local demand is good yet for four times the quantity of bearing trees in Algoma. First class fruit—and a Duchess will bear more of that than any other variety I know of—can readily be sold at 25 to 30 cents a basket, about one-third of a bushel, and the supply not nearly equal to the demand. Wealthy and Gideon come next, among a host of others, but these two are possibly the most satisfactory all round. I do not know of anything better for late winter than Red Canada, or Walbridge, although many others bid fair to become valuable.

Insects.—The forest tent caterpillar was not much in evidence this year ; the bud worm, for the first time, has been noticed and in some instances has done considerable damage. The borer, especially in the close vicinity of poplar woods, requires a close looking after. The codling worm is unknown. The oyster shell bark louse is prevalent chiefly owing to the carelessness and inattention of the owners.

Cherries.—Thirteen trees of cherries planted in the spring of 1899 have done fairly well ; 5 varieties planted this spring, viz., Riga No. 18, Minnesota, Ostheim, English Morello, Russian Morello and Hortense, have made abundant growth. I may say that so far those on the experimental plot are apparently hardy, but from experience I would not advise any one to get nearer a sweet cherry than Reine Hortense, for the chances are the tree will never live long enough to bear fruit, and, if it does, the birds are sure to take them. Montmorency is by all odds the best. Richmond is a few days earlier ; these two, up to the present time, are decidedly the best. I am not aware of any insect pest attacking the cherry.

Black knot, formerly prevalent, has now disappeared and by keeping the head of the tree low in order to protect the trunk somewhat from the sun we may anticipate success in growing sour cherries.

Pears.—Four varieties were planted in 1899 and all are alive, Keiffer, has made the strongest growth, and Flemish Beauty comes next. Last spring I received and planted five varieties of Russian pears which have all made a remarkably strong growth. Some of the new wood on Baba and Bessemianka measured five feet. I would not like to say that we will be very successful in pear culture here, although they may be grown in a small way for home use. Perhaps we may get something worth cultivating among the Russian varieties.

Plums.—Of twelve varieties planted in 1899, the following are dead: two trees Smith's October, one Willard, one Abundance; of five varieties planted this spring, all are growing. From two years' experience with the Japan plums I am led to believe that they are just as hardy, if not more so, than the Domestica class. Some in fact make such a rampant growth that one might be in doubt whether it is a plum tree at all or some species of the willow family. We have no curculio here as yet, and the following kinds have borne fruit and do well in the order named : Moore's Arctic, Duane's Purple, Lombard, Abundance, Weaver. A very fair quality of plum is found growing wild here.

Strawberries.—Eight varieties planted in 1899 arrived here in such poor condition that I had difficulty in saving enough to propagate from. I encouraged what plants I could to make runners, with the result that I have 60 feet of rows of the different kinds. Judging from last season, Clyde comes first, with a close second in Haverland. Saunders was no good, and yielded a few poor berries with hard unripened ends, but none of the newer kinds in my opinion equal in flavor the old Jucunda, although they certainly yield a heavier crop.

I think we might make a specialty in strawberries here, they require no winter covering except the snow, and I do not recollect missing a full crop for the want of rain at the right time.

Raspberries and Blackberries.—Eleven varieties arrived here in poor condition, the larger portion of which did not survive until winter. This was supplemented by eight varieties this spring, all of which have done well. Those planted in 1899 were left uncovered but in a somewhat sheltered position, with no apparently bad results. I rather think it would be unnecessary to cover blackberries as the snowfall would be quite sufficient protection. Black Caps

uffer from the weight of snow breaking them down. I have fair Cuthbert and Louden bushes but would not advise any one to plant and care for them where the wild fruit is so plentiful.

Grapes.—Of ten varieties planted I may write failure. Some are alive but many are dead. Perhaps the soil has something to do with it as my old vines carry a heavy crop every year. I moved some of them this spring to what may be a more suitable location.

Gooseberries and Currants.—These have all done well. This is an ideal locality for all small fruits. I can see very little difference in the different varieties of currants so far as yield is concerned. Plenty of rotten manure forked in, makes all the difference in small fruits. Among gooseberries, Downing is the best, or Pearl, which is similar.

Chas. Young.

Bay of Quinte Station.

Nearly everything in the experimental grounds is doing well, and making a handsome top, except some that were not healthy and covered with moss; these should have found their way to the brush heap instead of being planted in the orchard. However, it makes a fine illustration for the visitor who is thinking of planting an orchard, for he at once makes up his mind to have the best trees that can be got, and will not accept of aged trees.

The fruit buds of nearly all the plum and cherry trees were injured last winter and gave no fruit this season. Some of the Japan plums were killed back and, strange to say, not a bud of the peach trees was injured. The latter have made fine growth this season, and I hope to have some fruit next year.

The apple crop has not been more than half a crop this season. The apple buyers went through the country telling the growers of the over-production, and saying that they would not be able to pay more than 40 to 50 cents per barrel for the fruit.

The growers became discouraged, allowed part of their fruit to go to waste, and finally sold for almost nothing. A few growers said, "No, we will ship," gathered their apples and forwarded them to the markets, and have done well, realizing from $1.50 to $4.00 per bbl. All growers should pack their own apples and ship them to the markets, realizing the profits themselves. In that case a better quality of apples would be shipped, the cider apples would not be put in by the grower, and he would put his own name on the barrel and the correct name of the fruit. Another evil was brought about through the influence of an agent of one of the best houses in Liverpool who persuaded the grower to ship his Greenings and Baldwins the last week in August to Liverpool. He received a small sum for his apples, and he was at the same time destroying the market for the future. People buying those apples would not want any more, as they were too green to cook, or eat, in fact, not good enough to feed to stock. The grower was made to believe there was an immense crop of apples in the country, which he has since learned was not the case, but it is too late, for his apples are all gone.

There is a marked difference in the management of the orchards in this district in the past few years. The average farmer is realizing that, to have fruit that will sell, he must give more attention to the orchard, to careful pruning, to better and more thorough cultivation, less cropping, more fertilizer, that he must keep the cattle out and spray the orchards thoroughly, several times during the season, if success is to crown his work. The tent and the forest tree caterpillars and canker worm have been very destructive to the forest, and, in consequence, the orchard of the careless farmer during the past three seasons does not furnish his table with such fruit as he had a few years ago. Such men will need to step out of the fruit business, giving place to the more careful grower.

W. H. Dempsey.

Burlington Station.

There are 242 varieties of fruit now under cultivation at this station, as follows: Currants, 22; blackberries, 22; pears, 44; plums, 50; grapes, 24; raspberries, 28; peaches 18; apples, 25; cherries, 7; quinces, 1; mulberries, 1.

The general fruit crop here was fairly good. Prices were average, leaving a fair margin of profit. Trees, plants and vines generally are going into winter in good condition. The work of the frost of February, 1899, is now pretty clearly defined, the plants, vines and trees thereby destroyed having been removed and their places refilled.

More and more attention is being paid to the care of fruit plantations, and the better handling and marketing of fruits. The question, too, of suitable manures for the various fruits is claiming the attention of progressive fruit growers. There has been very little fungus or mildew, but insect enemies were exceptionally troublesome. The Codling Moth, or Apple Worm, and the Apple Maggot were both very destructive. The latter works on both leaves and fruit, drilling microscopic holes into the apples in various directions. I used burlap bands for the former on about 100 apple trees, placed on them about the middle of June Under many of these, when removed, I found from 75 to 125 apple worms in their cocoons. I believe that the proper and careful use of bands would be the best way to keep these pests in check. I am also inclined to think that there were more than two broods here this season.

Apples were a fair crop of good quality. In the younger orchards about half of the fruit was wormy, but the apples were clean and well-formed. In the old orchards the fruit was small but not so wormy.

Pears were also a fair crop of excellent quality. While there were some worms, there was very little blight.

Plums were a very light crop. The quality was, however, good.

Peaches were a very light crop. Next year I hope to give some notes from the experimental peaches.

Grapes were a fair crop of fine quality. There was very little mildew. Of the 24 varieties in my vineyard, the Worden has proved the hardiest.

Cherries were a good crop of excellent quality and sold at very satisfactory prices.

A. W. Peart.

East Central Station.

I have not gone into details as I was requested, *i. e.*, I have not given paragraph notes on varieties. The young trees have made a very satisfactory growth and ripened their fruit and wood buds well. I have just finished sorting and packing my fruit and the result is I will have fully twenty per cent. more fruit this year than in 1896, or any other year, and the size and color of the fruit is very satisfactory. The high wind of September 12th blew off about ten per cent. of the crop, but afterwards the remaining fruit grew so fast that the late varieties made up the difference.

Our system this year in my bearing orchard has been to keep the one-horse scuffler going over the ground frequently until the trees were so loaded that the branches interfered. The result is 90 to 95 per cent. of the fruit clean and free from worms. In fact, in some varieties it was a rare occurrence to find a wormy apple. We commenced spraying April 14th; then on the 28th of April, 12th of May and twice afterwards. We top-dressed one part of orchard with Thomas' phosphate, another part with stable manure, and another part with bone dust, ashes and manure. The trees in the latter plot seemed to do the best, both in growth and fruit.

I feel fully persuaded that clean cultivation, thorough spraying and close pruning is the proper way to get good returns from an orchard, and unless these are attended to at the proper time poor returns will be the result, especially in a year like this, when apples are so cheap. I have no fear of a loss in an orchard well attended to.

This district has shipped more fruit this season than in any former year, although the price has ranged from 65 cents to $1.15 per barrel, the latter price being for a choice lot of Spys, and as the price has been good in Europe, our shippers ought to make up more than they lost last season. The summer has been very dry and the want of moisture has checked the growth of fruit till September when a few copious showers refreshed the ground, and the trees made a rapid growth both in wood and fruit. Pears were an immense crop and sold about 20 per cent. less than last year. We tried the process of thinning some Keiffer pears; the result was we had as many bushels on the thinned trees as on the unthinned, and the fruit was more than double the size and sold for $1.70 more per barrel, so it pays to thin. I usually took off five pears and left one on, and even at that some of my trees broke down. I have great faith in the new pear, Dr. Jules Guyot, and believe it will excel that excellent pear the Bartlett.

R. L. Huggard.

Lake Huron Station.

The report of this station must of necessity be short this season, owing to the non-fruiting of many varieties of plums and cherries and the very small yield of bush fruits. There was no planting done at this station during the present season, with the exception of eleven varieties (in all thirty-three trees) of French pears. These trees arrived here on the 21st of May and were planted on the 2nd of June. All the trees started and have done well, excepting one or two. This will be a very interesting experiment.

The apple crop in this district was a very small one, although the fruiting orchard at this station early in the season gave promise of as large a crop as that of last year, but, on account of the hot dry weather during June and July, the codling moth and the bitter rot was very prevalent especially on the russets, and the crop in consequence of this was only about half what it at one time promised to be.

The cherry and plum crop were a total failure. The yield of bush fruits was less than hal a crop owing to the extremely hot, dry weather. We had no rain during the whole period o the picking season. It will not be necessary for me to describe any of the plums or cherries as there was no fruit; only to say that all of the stock is doing well and has made the remark able growth of from twenty to sixty inches.

Spraying.—The plums, cherries and bush fruits were sprayed three times; first, before the buds opened, second before the bloom, and third, after the bloom fell. The apples were only sprayed twice; first before the bloom, and second after the bloom fell. They ought to have been

sprayed the third time but owing to the pressure of work it was neglected; however, we had very little of the black spot this season.

Insects.—The tent caterpillar was as numerous as last season but did very little harm, all dying off early in the season. The codling moth was very bad and other insects about as usual. On May 30, I found a few specimens of the cigar case bearer.

A. E. Sherrington.

Simcoe Station.

This year is what may be called an off year for this locality, so far as fruit is concerned. The trees apparently came through the winter in good condition, and there was a great profusion of bloom on all kinds of fruit trees, and the weather during the blooming period was all that could be desired. Yet the fruit failed to set in many cases, and in some cases set fairly well and fell off afterwards. So that, with the exception of early apples, tree fruits were almost a total failure in this section, this year. Cherries and plums may be described as a total failure. Early apples were a good crop, with fall apples far below the average and winter apples nearly a total failure. Strawberries, raspberries and blackberries yielded well. This shows the necessity of having different varieties of fruit, so that when one variety fails you have something else to depend upon, and in no one year do all kinds and varieties of fruit produce a fair, or average, yield.

The question may be asked here, what is the cause, and why, in a year when everything seems favorable, climatic conditions are, or seem to be, right and there is abundance of bloom, and yet the fruit is a failure. In my opinion it is owing to a combination of causes. Many varieties of apples are inclined to set a heavy crop one year and go barren the next. The maturing of a heavy crop exhausts the energies, or vitality, of the tree, so that it is not able to produce fruit buds for another crop the same year, and so must rest a year to recruit.

Last year we had a crop of winter apples considerably above the average. This year they were almost a failure, but the trees are now very full of strong looking fruit buds, promising a large crop next year. The early apples work much in the same way.

It is asserted that a systematic thinning of the fruit will remedy this. I have not yet tried it, but I purpose beginning with the year 1901 an experiment with a few trees. In the case of trees setting a very large crop, I propose a thorough thinning of the fruit, and with others a thorough pruning, along with high fertilizing, to see which will give the best results. Then in the case of tender varieties of fruits often the fruit buds are killed during a severe fall of temperature. The tree may bloom freely in spring, and yet the pistil or germ of the blossom may have been previously killed during a cold snap in winter. This does not prevent the petals of the blossom from unfolding and presenting a normal appearance. Much, I believe, depends upon the condition of the trees during fall and winter. Some years without a very severe fall of temperature during winter the fruit buds of tender sorts of fruit will be killed, and in other years, with a much lower temperature, they will come through unharmed. These facts suggest the idea of investigation and experiment to find out how far one may exercise any control over these conditions, by way of an early cessation of cultivation and the sowing of cover crops, to protect the roots, and to check late growth and induce an early ripening and hardening of the new wood, and by any other means that may suggest themselves.

Insect Pests.—The tent caterpillar has not been so destructive this year as formerly. Orchards that are properly sprayed are not at all troubled with it, and my own experience goes to show that it is easily controlled by spraying at the right time, and that is just as young caterpillars begin to feed on the leaves. But we must use more Paris green than that prescribed in the usual formula. Instead of four ounces to 40 gallons, increase it to eight ounces, using plenty of lime, and there will be no injury to the foliage. The worst insect pests we have here, in my estimation, are the oyster shell bark louse and the codling moth. The bark louse is easily removed from trunks of the trees by alkali washes, but the difficulty is to get at them when they are clustered among the small limbs and outer twigs. In fact, in trees of bearing age, it is on these latter they get in their work, as they cannot work on the trunks when the bark gets coarse and thick. Prof. Macoun, of Ottawa, reports that the spraying with lime early in spring is an effectual remedy. I have not yet tried it. With regard to the codling moth, I am convinced that, while Paris green may be effectual to some extent, the most effective remedies are trapping them by means of bands around the trees and allowing hogs to run in the orchard to pick up the infested fruit as it falls. I am satisfied, from the experience already gained, that these two plans together are the most effective. On account of the failure of cherries and plums and the almost entire failure of apples, I have not been able to make any comparative statement of yields that would be of any value.

Cherries.—With regard to the cherries, they are all healthy and making a good, thrifty growth. They are all under clean cultivation. Small fruits are grown between the rows, and the fertilizers used are stable manure and hardwood ashes. From the experience gained so far

I would place the English Morello and Dyehouse ahead of all others that I have tried. However, there are a large number that are yet to come into bearing, and some of these may prove just as good.

Apples.—Some of the varieties of apples have borne a few specimens this year. One among them, named the *Peerless*, seems worthy of special notice. This variety originated in Minnesota, and is a seedling of Duchess of Oldenburg. It was introduced as a winter apple, but unfortunately it is not. Its season is about the same as the Colvert. It will average as large as the Colvert. It is in color a beautiful red, clean skin, even size, very good dessert quality, and for cooking has no superior. The tree is of an open habit of growth, bears quite young, and is apparently very hardy. This apple ought to take well in the British market. It is the most promising of the new varieties I have yet tested. *Gano* has fruited for two years. This, like the Peerless, has been planted five years, and like it began to bear three years after planting. The fruit may be called a compromise between the Ben Davis and Baldwin. It is not of first rate quality, but is handsome in appearance and a great keeper. It ought to be a splendid shipper. *Shiawassee Beauty.* This apple fruited this year. Also the *Scarlet Pippin.* Both of them have the flavor of the Fameuse, from which they originated, showing that the Fameuse must fertilize its own blossoms, must be a strong pollenizer, as it stamps its individuality on all its seedlings.

The McIntosh Red, from the same origin, however, excels its parent. It is larger in size and superior in flavor, and has few equals and no superiors as a dessert apple. But like all the progeny of the Fameuse is a little inclined to scab. It grows to great perfection here, and if it can be kept clean by persistent spraying will be a profitable variety, for there is always a good demand in the home market for dessert apples of the Fameuse type. None of the Russian apples, other than those that have been described in former reports, have fruited this year. So far, the Russians that have fruited are all early varieties, none of them having any merits for dessert, they are fairly good cookers but coarse in the flesh. They are clean skinned, however, and some are of fine appearance. The trees appear to be very hardy, and make very fine stock for top grafting other varieties on, and in this I believe will be found their chief value.

The *Russian apricots* are simply cumberers of the ground. They do not bear, do not blossom even. They just come through the winter alive and that is all. Their fruit buds seem to perish in winter. When warm weather comes they seem to recruit and make a fair growth and look healthy, but the winter nearly kills them. Several have died, and I have little doubt the rest will fail ere long. I would not advise anyone in this district to plant them.

Plums.—The *Red June* fruited this year and it is a very fine plum, and quite up to Burbank, and it bears early and ripens fully three weeks ahead of any variety I have except the Early Botan which comes in about the same time. But the latter, though a very dainty little plum, is too small and has the fault of dropping prematurely from the tree. *Weaver* and *Black Hawk*, among the American varieties, fruited, and they are little, if any, ahead of the old fence corner plums of early days. My experience of plums leads me to the conclusion that the better class of plums are an uncertain crop in localities where the temperature falls more than 20 degrees below zero in winter.

Raspberries.—We need a hardier market berry than Cuthbert. The tips kill back so far in winter there is too much waste of canes, and the outer clusters of berries, next the frozen wood, are small and often fail to mature. The Louden will, I think, pretty nearly fill the bill. I have been very successful in checking the anthracnose, by a thorough spraying with the Bordeaux mixture, in spring when the canes are bare.

Blackberries.—Of a dozen varieties tested here the Agawam is the only one I would recommend for this section. I had a fair crop of very fine berries this year of this variety, which competed successfully in the local market with the berries from the south.

Spraying.—My experience in spraying leads me to the conclusion that Fusicladium or apple scab is more easily prevented on some varieties of fruit than others, and this I believe is owing to the quality and texture of the skin of the fruit. This suggests an experiment with a much stronger solution on some varieties. The Baxter apple and Flemish Beauty pear took on the scab this year while the leaves and young fruit were covered with Bordeaux mixture, made according to the usual formula, and while the sprayed trees showed much better fruit than the unsprayed ones, and held their foliage after the others were bare, yet so far as preventing the scab. it was far from successful. The Golden Russet will often be more affected in the leaves than in the fruit ; while the Baxter and Snow and others will have healthy clean foliage and scabby fruit. I am therefore inclined to the belief that one uniform formula is not applicable to all kinds of tree fruits, and that while spraying, as now practiced, improves the fruit, and the health and vigor of the tree, there is much to be learned yet by experiment in connection with it.

Top Grafting.—This practice cannot be too strongly recommended for this district, and the best and most successful orchards of the future will be those where the most valuable varieties have been top grafted on hardy stock. I have seen Northern Spys, five years from the graft,

laden with fruit. To get the best results the grafting must be done while the trees are young, and it only then requires a few grafts (often three or four will do) to form a new top. I know of no better stock for the purpose than Tallman Sweet, though I am having good success with many others, and especially the hardy Russian varieties.

The experiments in top grafting pears are also proving successful, using Russian and Flemish Beauty stocks, and grafting on them Bartlett, Duchess, Lawson, Lawrence, Anjou, Clapp and others.

The following list of apples are too tender for this section and should always be top grafted on hardy stock :—King, Grimes' Golden, Red Canada, Greening, Baldwin.. The following are half-hardy :—Ben Davis, Mann, Spy.

These lists will have to be added to from year to year. Many varieties grow and thrive well while young and fail soon after they begin to bear, so one cannot judge of the hardiness of a variety, or its suitability to a locality, from its appearance while young.

Humidity.—Though no very long interval occurred between showers yet the summer was a most decidedly dry one. The rainfall was not sufficient to penetrate the soil far enough to do much good. Yet, all the experimental stock made a satisfactory growth, as it was all under cultivation, and received clean culture all through the summer, thereby retaining the moisture. Cherries and plums have made an average growth of 18 inches, pears 18 to 20 inches, and apples 16 inches of new wood.

Quite a large amount of correspondence is now necessary during the year in answering letters of enquiry in matters pertaining to fruit, giving advice as to best varieties to plant, etc.

Some nursery agents have come for advice as to suitable varieties for the locality, and I take very much pleasure in giving them a marked list of the varieties of fruit which I can, from my own experience, recommend for planting in this district. The following fruits have failed as too tender, and intending planters are warned not to waste money on them :—*Apples*, Red Canada, Sweet Bough, Grimes' Golden, Early Strawberry ; *Plums*, Wickson, Shense, Grand Duke.

As already stated I expect to be obliged to add to these lists from year to year. And intending planters would consult their own interests by asking advice as to varieties before investing their money, and advice of this kind will always be cheerfully given.

G. C. Caston.

St. Lawrence Station.

The spring of 1900 will long be remembered as illustrating the great resisting power of buds to cold, even after they have swollen and commenced to burst. The last days of April were warm and bright, and on the 2nd to 4th of May buds were bursting in many cases ; on the 5th and 6th frost, the 7th frost and ice three-eighths of an inch thick in a wooden trough, 8th and 9th rain, 10th and 12th frost and ice five-sixteenths of an inch thick. On the 18th and 19th the blossom was showing, and on the 20th some of the plums were in bloom. And after all the severe frosts, with the buds about bursting, there was practically no injury except in very few cases, such as the Ostheim cherry and the pistil of the central blossom in the cluster on some Fameuse trees. At the blossoming period we had ideal weather for the fertilizing of all perfect bloom, and a fair crop of well formed fruit followed.

In the plot of apples the trees are making very satisfactory growth, and a few varieties produced a few specimens, but the gales of September destroyed the most of them. The most promising varieties in winter fruit that have borne with me yet are Milwaukee and Ontario. These were the only varieties that brought fruit to maturity, and they give promise of being valuable as winter apples for this section.

In plums I had 16 varieties blossom, but of these only about 14 developed fruit, a description of which will be found below. Insects and fungi gave me very little trouble this year, and I had only one case of black knot, on a Montreal plum, that I removed successfully by cutting the knot away and pasting over the wound a mixture of lime and copper sulphate, which treatment I have never had fail during the last five years.

Pears are succeeding fully as well as, or better than I expected. All my trees look healthy and I have had no blight, except in the Russians, to amount to anything. Since pears give promise of succeeding with me, and such varieties as Dempsey and Howell have proved hardy for the last four years, I intend top-grafting varieties such as Bartlett and Anjou on Flemish Beauty stock, to find out if those varieties will succeed grown in that way. I beg to acknowledge the receipt of 33 pear trees from France, which came rather late for successful planting, but I have been able to save enough to give me trees of each of the eleven varieties.

Insects were not very numerous and fungi were kept under control by five sprayings with Bordeaux and Paris green. The dates of spraying were May 2nd and 18th, June 4th and 18th, July 6th. I have had very satisfactory results spraying with pure lime and water during the winter months to remove oyster-shell bark-louse, but I will require another year's experience before being able to determine the cause of partial failure in some cases.

Harold Jones.

Wentworth Station.

Many of the vines planted at this station for experimental purposes were so badly injured by the winter of 1898 that a fair comparison of growth or productiveness cannot be made, or even hardiness, as vines of the same variety, standing quite near each other, have been destroyed, while others appear to be only slightly injured.

In our report of last year we described the following varieties as promising to be of value :— Amber Queen, Brilliant, Colerain, Cambridge, Dr. Collier, Early Ohio, Early Victor, Moore's Diamond, Opal, Presley, Watt and Woodruff Red. These have all done well this season, except Colerain and Early Ohio, both having proved failures, either from lack of vigor or being root killed by the frost of 1898.

Mills and Winchell, which have been reported as promising, are failures this year ; Mills is a fine, large, black grape of good quality and a very long keeper, but it lacks vigor. When bearing a crop of fruit, it makes no growth of wood for next season's crop.

To sum up the experiments with about one hundred varieties that have been fairly tested at this station : Those of good quality, hardy and productive, are *Black*, Worden, Early Victor, Concord, Wilder (Roger's No. 4), Aminia (Roger's No. 36), Herbert (Roger's 44) ; *Red*, Delaware, Brighton, Catawba, Lindley (Roger's No. 9), Agawam (Roger's No. 15), Requa (Roger's No. 28); *White*, Moore's Diamond and Niagara. With a prospect of growing grapes for export the black and red Rogers will no doubt take the lead.

The plums planted at this station have grown well, but few varieties have borne good crops, Abundance, Burbank, Grand Duke and Reine Claude have borne well and consequently have so far been most profitable.

The canker worm made its first appearance here this season. The trees infested were sprayed with the Bordeaux mixture, four ounces Paris green to the barrel, which destroyed a small proportion of them. A few days later they were sprayed with eight ounces of Paris green to the barrel of Bordeaux mixture which destroyed them entirely.

The codling moth is one of the most destructive insects we have to contend with in this locality. A by-law was passed in this township (Saltfleet) enforcing the Noxious Insect Act, which obliges every owner of pear and apple trees of bearing age to bandage the trees with "Burlap" or "Sacking" and to have these bandages removed and all larvæ destroyed every two weeks during the months of June, July and August. By this means an average of about thirty-eight to the tree were destroyed in an apple orchard of over four hundred trees at this station, and yet the crop was badly damaged this season. If the Act is enforced for a few years in any municipality it must certainly help to relieve us of this pest.

Tests with three kinds of commercial fertilizers have been made for two years on grape vines, pear and plum trees, with very little if any results either in wood growth, quantity or quality of the fruit. This may be partly owing to the very dry weather during the growing season. These tests have been made on dry, heavy land where I believe to grow fine large fruit the great requirement is moisture.

M. Pettit.

APPLES.

Notes by W. H. Dempsey.

(Bay of Quinte Station.)

Bismark.—A very small tree planted in 1896, made very, very little growth ; inclined to fruit, and has fruited two seasons ; foliage good. Fruit, 3 x 2½ inches, round, somewhat conical. Skin, greenish yellow, nearly covered with streaks and splashes of bright red. Calyx open, set in a broad, moderately deep basin. Stem short, set in a narrow cavity. Flesh white, coarse grain, juicy, crisp, mildly acid ; quality medium. Season, December, January.

Duffey's Seedling.—Top grafted in 1896, made a good growth and has had a good crop for two years of very attractive apples. Fruit oblong, conical, five faint ribs ; 2¾ x 3½ inches. Skin whitish yellow, nearly covered with a lively red, with streaks and splashes of a darker red, numerous small white dots. Calyx large, partly open, set in a narrow plaited or ribbed basin. Stem short, ⅜ inch, slender, set in a narrow cavity. Flesh white, breaking, juicy, sub-acid, medium. Kept good till March.

Domine.—Top grafted 1895 ; made good growth, foliage healthy. Fruit large, 2½ x 3 inches, roundish oblate. Skin greenish yellow, nearly covered with streaks and splashes of bright red and numerous small russet specks. Calyx small, closed, set in a broad, moderately deep basin. Stem ⅝ inch, slender, set in a wide, moderately deep cavity. Flesh white, tender, juicy, sprightly, pleasant, flavor good, core small. Fruited first in 1898, kept good till April, productive. I think it would take well in market.

Haskell Sweet.—Top grafted 1895. Made good upright growth; fruit 2½ x 3½ inches, oblate. Skin greenish yellow, with a blush on side next the sun. Caylx closed, set in a broad, medium deep basin; stem ½ inch, inserted in a rather broad, deep cavity. Flesh yellowish, tender, juicy, sweet, rich, with aromatic flavor. Very good. October, November.

Isham.—Top grafted in 1896, made good growth. Fruit round, conical, 2¾ x 2½ inches. Skin bright yellow, nearly covered with streaks and marbled red. Caylx closed, set in a narrow, uneven basin. Stem ½ inch, medium, set in a narrow, deep cavity. Flesh yellowish, white, coarse, breaking, not juicy, almost sweet, of medium quality. October, November.

Longfield.—Planted in 1894. Tree slow grower, caused by early and heavy fruiting. Fruit medium size, conical. Skin yellowish, with a pale blush on side next the sun, with a little russet. Caylx closed, set in a narrow basin; stem slender, set in a narrow, moderately deep cavity. Flesh white, juicy, mildly sub-acid, pleasant. October, November. Not a good apple for shipping.

Malinda.—Top grafted in 1896, made a medium growth; fruit 2¼ x 2½ inches, oblong; skin, lemon yellow, with a little blush on side next the sun. Caylx small, closed, set in an uneven basin. Stem ¾ inch, slender, set in a narrow, deep russet cavity. Flesh white, tender, crisp, pleasant. Flavor sweet; kept well till April.

Missouri Pippin.—Top grafted 1895, made good growth; fruit 2 x 2¾ inches, roundish, oblate, somewhat flattened at the ends; skin pale whitish yellow, shaded, striped, and splashed with light and dark red, quite dark on side next the sun, with large and small gray dots. Calyx partly closed, set in a slightly corrugated basin; stem short, ⅜ inch, small, set in a deep cavity; flesh whitish, a little coarse, crisp, breaking, moderately juicy, sub-acid, good; core small. Kept good last year till April. Fruited heavy this year and very even in size, would no doubt make a good commercial apple.

Red June (Carolina seedling).—Top grafted 1895, made good growth; fruit 2¼x2, conical; skin yellow nearly covered with deep red, darker on side next the sun with a thin bloom; caylx closed, set in narrow plaited basin; stem slender, inserted in a small narrow cavity; flesh white, brisk, tender, juicy, pleasant, sub-acid very good; July, August.

White Pippin.—Top grafted in 1895, upright, good grower; fruiting some for the past three seasons; fruit 2½x3, roundish, oblate, slightly oblique; skin greenish white, sprinkled with numerous green dots, becoming pale yellow at maturity: caylx small, nearly closed, set in an abrupt, furrowed basin; stem, 7¼ inches set in a large cavity; white, tender, crisp, juicy, fine rich sub-acid; very good; core small; not attractive in appearance; very subject to fungi; March and April.

Notes on Vigor and Habits of Newer Varieties by A. E. Sherrington.

(*Lake Huron Station.*)

American Pippin.—Strong, upright, spreading, forming round close head; growth 20 inches; two years planted.

Barry.—Strong, upright, spreading, good straight branches; growth 12 inches; three years planted.

Bismark.—Upright, spreading, strong clean branches; growth 12 inches; early bearer; three years planted.

Canadian Baldwin.—Tree upright and spreading, inclined to make an open head; growth 16 inches; three years planted.

Cranberry Pippin.—Strong, upright, spreading, inclined to form a good round head; growth 16 inches; three years planted.

Fannie.—Upright, spreading, slender branches; growth 18 inches; two years planted.

Gano.—Upright, spreading, clean small willowy branches; growth 12 inches; three years planted.

Hurlburt.—Strong grower with spreading top; growth 16 inches; three years planted.

Milding.—Strong, upright; growth 12 inches; two years planted.

Northwest Greening.—Strong, upright grower, inclined to fork; growth 15 inches; three years planted.

Newtown Pippin.—A poor, slow grower; growth 12 inches; three years planted.

Ontario.—Strong, upright, spreading, clean limbed with inclination to form good round head; growth 14 inches; three years planted.

Palouse.—Of rather spreading habit, clean willowy branches; growth 14 inches; two years planted.

Peter.—Upright, spreading, clean, small branches inclined to form a one-sided lop; growth 15 inches; three years planted.

Salome.—A clean, straight, strong upright grower with close round head; growth 17 inches; three years planted.

Scarlet Pippin.—Straight, vigorous upright grower; growth 19 inches; two years planted.

Star.—Strong, upright, spreading; growth 12 inches; two years planted.

Wealthy.—Upright, spreading, vigorous; growth 25 inches; three years planted.

Winesap.—Spreading, with open top, vigorous ; growth 17 inches ; three years planted.

Yellow Transparent.—A clean, upright, vigorous and hardy grower, early and productive, season July and August, quality good ; growth 25 inches ; two years planted.

BLACKBERRIES.

DESCRIPTIVE NOTES BY A. W. PEART.

(*Burlington Station.*)

Blackberries were only a fair crop. The varieties that suffered the most from the severe cold of February 1899 are now apparent. From an experimental standpoint the frost probably served a useful purpose as it carved out a tolerably clear line of demarcation between the hardy and tender varieties. Of those mentioned below, the following may, I think, be fairly classed as too tender for this district : Early Cluster, Early Harvest, Maxwell, Minnewaski.

Of varieties, Agawam, Early King, Gainor, Kittatinny, Snyder and Western Triumph stand at the head. While the four former varieties withstand the drought better, the two latter are more productive.

Agawam.—Plant, upright, spreading, healthy, hardy, vigorous and productive ; berry, oblong, round, medium size $\frac{7}{8}$ x $\frac{3}{4}$ inch, sweet, but rather insipid ; season, medium to late, July 23 to August 15, a profitable blackberry.

Ancient Briton.—Plant, upright, spreading, hardy, fairly vigorous, but not productive ; berry, oblong, conical, medium size $\frac{7}{8}$ x $\frac{3}{4}$ inches, flavor good ; season, medium, July 21 to August 10.

Child's Tree.—Plant, upright, spreading, hardy, moderately vigorous, but not very productive ; berry, ovate-round, small to medium $\frac{3}{4}$ x $\frac{1}{2}$ inches ; sweet and sprightly in flavor with firm flesh ; season, medium, July 20 to August 10.

Dorchester.—Plant, upright spreading, very vigorous, hardy and moderate bearer ; berry, large, $1\frac{1}{8}$ x $\frac{3}{4}$ inch ; oblong-round, firm, sweet and sprightly in flavor ; season, medium, July 23 to August 12.

Early Cluster.—Plant, upright and vigorous, but tender and unproductive ; berry, medium size, $\frac{7}{8}$ x $\frac{3}{4}$, oblong-round, of good quality ; season, medium to late, July 25 to August 10.

Early Harvest.—Plant, upright, moderately vigorous, tender, but very productive ; berry, medium to large, 1 x $\frac{3}{4}$ inch, oblong, conical, of fair flavor ; season early, July 12 to August 1.

Early King.—Plant, upright—spreading, medium vigor, hardy and productive ; fruit, small to medium, $\frac{5}{8}$ x $\frac{5}{8}$, oblong-round, of good quality ; season, early to medium, July 12 to August 5. A promising variety.

Eldorado.—Origin, Ohio ; plant, upright, spreading, vigorous, hardy, and moderately productive ; berry, oblong-conical, medium to large, $\frac{7}{8}$ x $\frac{3}{4}$, sprightly, good in flavor ; season, medium, July 23 to August 10.

Erie.—Plant, upright, speading, vigorous, hardy and fairly productive ; berry, medium size, $\frac{7}{8}$ x $\frac{3}{4}$ conical, round, excellent in quality ; season, medium, July 23 to August 10 ; good commercial variety.

Gainor.—Plant, upright, vigorous, hardy and productive ; berry, very large, roundish-ob'ong ; $1\frac{1}{4}$ x $\frac{7}{8}$, of fine quality ; season, medium, July 23 to August 10 ; a promising commercial variety.

Kittatinny.—Plant, upright, very strong and vigorous, productive and hardy here so far ; berry, moderately firm, large to very large, $1\frac{1}{8}$ to $\frac{3}{4}$, ovate-conical, rich, juicy and sweet ; withstands the drought better than many other varieties ; season late, July 25 to August 20 ; a fine commercial variety where hardy.

Lovett's Best.—Origin, New Jersey ; upright, stiff, moderately vigorous, hardy, but not productive ; berry, oblong-round, small $\frac{3}{4}$ x $\frac{3}{8}$; of fair quality ; season, late, July 25 to August 15.

Maxwell.—Plant, very weak and spreading, tender and not productive ; berry, oblong-round, large to very large, 1x$\frac{3}{4}$, of good quality ; season, medium, July 20 to August 10 ; too week for commercial purposes.

Minnewaski.—Plant, upright, spreading, vigorous but tender and unproductive ; berry, medium to large, $\frac{7}{8}$x$\frac{3}{4}$, oblong-round, of good quality ; season, medium, July 20 to August 10.

Ohmer.—Origin, Ohio ; plant, upright, spreading, moderately vigorous, hardy and fairly productive ; berry, very large, $1\frac{1}{4}$x$\frac{3}{4}$, oblong-conical, good quality ; season, medium, July 23 to August 10.

Snyder.—Plant, upright, moderately vigorous, hardy and very productive ; berry, medium, $\frac{7}{8}$x$\frac{3}{4}$, oblong-oval, good in quality ; season, early to medium, July 18 to August 5 ; one of the best market varieties.

Stone's Hardy.—Plant, upright, spreading, moderately vigorous, hardy and productive; berry, medium, $\frac{3}{4}$x$\frac{5}{8}$, oblong-conical, of fine quality; season, medium, July 23 to August 10; this variety promises well.

Taylor.—Plant, upright, vigorous, hardy and moderately productive; berry, medium, $\frac{7}{8}$x$\frac{3}{4}$, oblong-conical, of fine quality; season, medium, July 23 to August 10; a valuable commercial berry.

Wachusetts.—Plant, upright, vigorous, hardy but not productive, very few thorns; berry, medium, $\frac{3}{4}$x$\frac{5}{8}$, oblong-round, sweet, of fine quality; season, medium to late, July 23 to August 15.

Western Triumph. –Plant, upright, very strong and vigorous, hardy and very productive, very thorny; berry, medium, $\frac{7}{8}$x$\frac{3}{4}$, oblong-round, good quality; season, medium, July 23 to August 10; a good market variety, but requires thorough cultivation.

Wilson's Early.—Plant, upright, rather weak, hardy but not very productive; berry, large, 1x$\frac{3}{4}$, oblong-round, good in quality; season, medium, July 20 to August 12.

Wilson Junior.—Plant, spreading, vinous, trailing on the ground, some canes 11 feet long; propogates partly by tips and partly by suckers; hardy but not very productive; fruit, medium, $\frac{7}{8}$x$\frac{3}{4}$, oblong-conical, sweet; season, medium, July 20 to Aug. 10.

Notes on Blackberries by A. W. Peart.

(Burlington Station.)

The bushes are banked up in the fall, and cultivation in the spring begins as soon as the soil is dry enough, but before the moisture has left it. Some varieties, as the Agawam, Kittatinny, Gainor and Early King, stand the drouths better than others, such as Early Harvest, Snyder and Western triumph. While thorough and frequent cultivation is desirable for all, the latter sorts particularly require it, as they are apt to dry up and shrivel on the bushes.

Pruning is done in the summer and early spring. In late July or early August, the new canes are cut back to 3$\frac{1}{2}$ to 4$\frac{1}{2}$ feet long, according to the vigor of the variety. In March or early April, the old wood is cut out and the laterals of the new wood shortened. Fertilizers are applied in the spring before the rains are over; nitrate of soda at the rate of 200 lbs. per acre. This is strewn along each side of the row near the canes, but not touching them, and afterwards worked in with the hoe or cultivator. It should not be applied before growth starts, as otherwise it might leach away and be lost to the plants. We find stable manure too awkward to handle in blackberry, raspberry and currant plantations, and prefer some highly concentrated fertilizer that is easily and rapidly applied by hand.

Prices ranged from 7 to 11 cents per quart, according to size and quality, Kittatinny and Gainor selling the highest.

Agawam.—Planted '95; full bloom, June 10th; season, July 21st to Aug. 10th; growth of cane, 6 feet; yield per hill, 1 quart.

Ancient Briton.—Planted '97; bloom, June 10; season, July 21 to Aug. 10; growth, 4 feet; yield, $\frac{1}{4}$ quart.

Child's Tree.—Planted '97; bloom, June 10; season, July 20 to Aug. 10; growth, 4 feet; yield, $\frac{1}{4}$ quart.

Dorchester.—Planted '96; bloom, June 9; season, July 23 to Aug. 12; growth, 6 feet; yield, $\frac{1}{2}$ quart.

Early Cluster —Planted '95; season, July 25 to Aug. 10; was completely destroyed by intense cold of February, 1899; it failed to be an early variety here.

Early Harvest.—Planted '95; season, July 12 to Aug. 1st; was also wiped out by the same cold; it however had done well previously, having a decided place as an early commercial blackberry.

Early King.—Planted '96; bloom, June 10; season, July 12 to Aug. 5; growth, 4$\frac{1}{2}$ feet; yield, 1 quart; this early variety has stood the test well.

Eldorado.—Planted '96; bloom, June 8; season, July 22 to Aug. 10; growth, 5 feet; yield, $\frac{2}{3}$ quart.

Erie.—Planted '95; bloom June 15; season July 23 to August 10; growth 6 feet; yield $\frac{2}{3}$ quart.

Gainor.—Planted '95; bloom, June 15; season, July 23 to August 10; growth 6$\frac{1}{2}$ feet; yield 1 quart.

Kittatinny.—Planted '95; bloom June 12; season, July 25 to August 20; growth, 7 feet; yield $\frac{3}{4}$ quarts.

Lovett's Best.—Planted, '95; bloom June 13; season July 25 to August 15; growth 5 feet; yield $\frac{1}{4}$ quart.

Maxwell.—Planted '97; bloom June 13; season July 20 to August 10; growth 2$\frac{1}{2}$ feet; yield $\frac{1}{3}$ quart; too weak, tender and speading a plant to be of value.

Minnewaski.—Planted '97; season July 20 to Aug 10; frozen out in February '99.

Ohmer.—Planted '97; bloom June 13; season July 23 to August 10; growth 6 feet; yield $\frac{1}{2}$ quarts.

Snyder.—Planted '97 ; bloom June 11 ; season July 18 to August 5 ; growth 4 feet ; yield ¾ quart.

Stone's Hardy.—Planted '97 ; bloom June 10 ; season July 23 to August 10 ; growth 5 feet; yield ¾ quart.

Taylor.—Planted '97 ; bloom June 10 ; season July 23 to August 10 ; growth 6 feet ; yield ¾ quart.

Wachusetts.—Planted '97 ; bloom June 10th ; season July 23 to July 15 ; growth 6 feet ; yield 1-5 quart.

Western Triumph.—Planted '97 ; bloom June 8 ; season July 23 to August 10 ; growth 6 feet ; yield ¾ quart.

Wilson's Early.—Planted '96 ; bloom June 15 ; season July 20 to August 12 ; growth 4 feet ; yield 1-5 quart.

Wilson Junior.—Planted '97 ; bloom June 6 ; season July 20 to August 10 ; growth spreading, trailing like the black cap canes, sometimes 10 to 11 feet ; yield 1-6 quarts.

Notes on Blackberries, by A. E. Sherrington.

(Lake Huron Station.)

Agawam.—Plants vigorous, strong, hardy and healthy. Berry, oblong, conical; medium size ; quality good. Yield, 5 quarts. Ripe, August 3rd.

Ancient Briton.—Plants upright, spreading, hardy and vigorous. Berry oblong, conical ; size medium ; quality very good. Yield 1¼ quarts. Ripe August 7th.

Childs.—Plant upright spreading, very tender and weak, freezes back to the ground every winter and has never fruited here yet.

Eldorado.—Plant upright, spreading, strong, hardy and fairly vigorous. Fruit large and of good quality. Yield 7¾ quarts. Ripe August 3rd.

Erie.—Plants spreading, fairly hardy, but not as vigorous as it ought to be. Fruit medium ; fair quality ; not productive.

Early Cluster.—Plants upright, strong but tender, freezes back to the ground every winter. No fruit.

Gainor.—Plants fairly vigorous but tender ; fruit large to very large ; quality very good. Only a few berries to the bush.

Maxwell.—Plants very weak and tender, not productive, of no use here.

Ohmer.—Plants weak and about half hardy, have done nothing here

Rathbun.—Plants half hardy, medium vigor. Berry, very large ; quality good. Yield, 1¾ quarts. Ripe August 1st.

Snyder.—Plants upright, vigorous and hardy. Berry medium size ; quality very good. Yield 12 quarts. Ripe August 3rd A safe variety to plant.

Stone's Hardy.—Plants upright, spreading, vigorous and hardy, fruit medium of good quality. Yield 5¾ quarts. Ripe, August 7th.

Stone's Early.—Plants very vigorous and hardy ; berry large. Quality of the best. Yield 5 quarts. Ripe August 3rd. A good one.

Taylor.—Plants half hardy, medium vigor ; berry medium. Quality good, but not productive. Yield ¼ quart. Ripe August 7th

Wilson Junior.—Plants spreading, weak and tender, of no use here.

Wachusetts.—Plants weak and tender , berry small to medium, quality good. Yield 2 quarts. Ripe August 3rd.

Western Triumph.—Plants hardy but rather weak, of spreading habit. Fruit medium of fair quality. Yield 5 quarts. Ripe August 3rd.

CHERRIES IN 1900.

By L. Woolverton

(Maplehurst.)

Figure 1 shows a view of the cherry plot at Maplehurst, five years planted. These trees are on dry sandy loam, have been given clean cultivation and fertilized with wood ashes. The result of this treatment shows the absurdity of the common notion that the proper place for cherry trees is the fence row, and that cultivation is unnecessary. They have grown with double the vigor of trees not cultivated, many of the sweet cherry class being over 14 feet in height and four inches in diameter of trunk ; also at this early age many of them are well laden with fruit. One of the Early Purple trees, a variety not usually very productive, has so responded to our treatment that it has been fully loaded now for two years in succession, but, ripening early in June, it is generally harvested by birds and boys.

Fig. 1. Maplehurst Cherry Plot, Five Years Planted.

Fig. 2. Fruiting Branch of Reine Hortense Cherries.

The total number of varieties of cherries under test at Maplehurst is 62, and the different habits of growth are an interesting study. For example, Fig. 3 shows a Morello tree, a good type of the habit also of the Kentish cherries, for these differ from each other more in fruit than in tree; this class of trees forms a round head with slender branches, and never attains much height. These five-year-old trees are only about nine feet in height and three inches in diameter of trunk. The Montmorency is a great favorite as a market cherry in New York State, and certainly is a productive kind of pie cherry, far less subject to curculio than the old common red. It ripens about the 1st of July, while the early Richmond can be used for pies about the middle of June. For pies, the Early Richmond, Montmorency and Wragg or English Morello, would cover the season completely. Figs. 4 and 5 shows the bearing habit of the Empress Eugenie and of the May Duke, two varieties of Dukes which so nearly resemble each other that they

Fig. 3. Morello Tree.

are not easily distinguished. Both bear in thick clusters all along the branches, and their mild acid makes them more desirable for pies than the Kentish varieties, at least to the taste of many people. They have one fault, viz., that of uneven ripening, often showing very green samples and very ripe ones on the same bunch. The Duke cherries may well be classed separately from all others, and Fig. 6 shows a good type of the tree. This is a May Duke in our experimental plot, but the Royal Duke, Late Duke and the Empress Eugenie are so similar in habit that one tree will represent them all. They grow upright and attain a considerable height with little spread of branches. The leaves hang down in somewhat fastigiate habit, and the fruit is borne all along the branches, well hidden among the leaves. The Reine Hortense is by far the finest Duke, but it is so different in habit and so immensely superior in size and appearance to the others named, that it cannot be called a typical Duke; indeed, all these divisions are more or less arbitary and shade more or less into each other. Fig. 2 shows the bearing habit of this variety; the cherries do not hang in bunches, but in ones and twos, an excusable fault in a cherry so large and fine as this one.

The members of the Board of Control of our fruit stations visited our orchard on the 3rd of July, and the general verdict was that the Hortense with its load of fruit, was alone worth a

FIG. 4. EMPRESS EUGENIE (REDUCED).

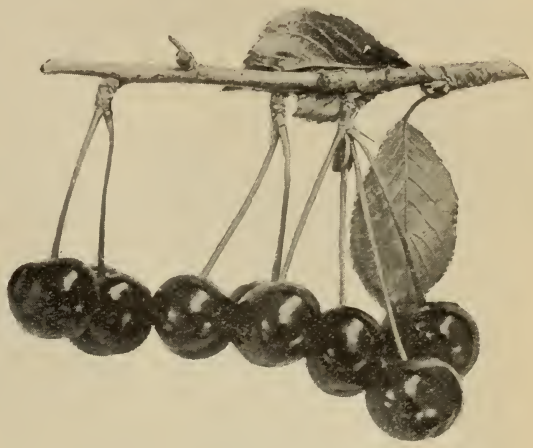


FIG. 5. MAY DUKE (REDUCED).

journey to see. Fig. 2, from a photograph on the 6th of July, well represents a fruiting branch from one of those five year old trees, and will give our readers a good idea of its productiveness this season. The fruit is too soft for long shipments, but for the amateur we know of no equal to it for cooking purposes.

The bearing habit of the sweet cherries is shown in Fig. 7. These trees are very vigorous in growth and form very large trees. Governor Wood and Cleveland, (Fig. 8), very much resemble each other and are of the same origin, but of the two, we think the latter is the finer cherry both in beauty and in flavor. Fig. 8 shows a branch of Elton cherries from one of our five year old trees and for productiveness it certainly leaves nothing to be desired, while Fig. 9 shows a bunch of Cleveland. Hearts and Bigarreaus are both included under the Sweet Cherry class, and the latter are much the more productive. The Black Tartarian well represents the former, while the Napolean Bigarreau is a good example of the latter. These often overload and rot badly from contact with each other in wet seasons unless sprayed after every rain with Bordeaux mixture. Fig. 10 shows a five year old sweet cherry tree in our experimental plot.

FIG. 6. MAY DUKE TREE AT MAPLEHURST.

Nearly all varieties of cherries blossomed profusely and promised a wonderful crop, but a frost just after setting so weakened the vitality of the fruit that much of it dropped, leaving the fruit quite thin on many varieties.

Fearing the appearance of cherry aphis, I applied whale oil soap in a fine spray, using about one pound to five gallons after the foliage appeared, but this was probably too weak, for about the 1st of June the younger leaves were very badly curled with aphis. I then tried spraying with Gillett's concentrated lye, using a small ten cent package, about half a pound, to five gallons of water, an application which has cleared my roses of both aphis and

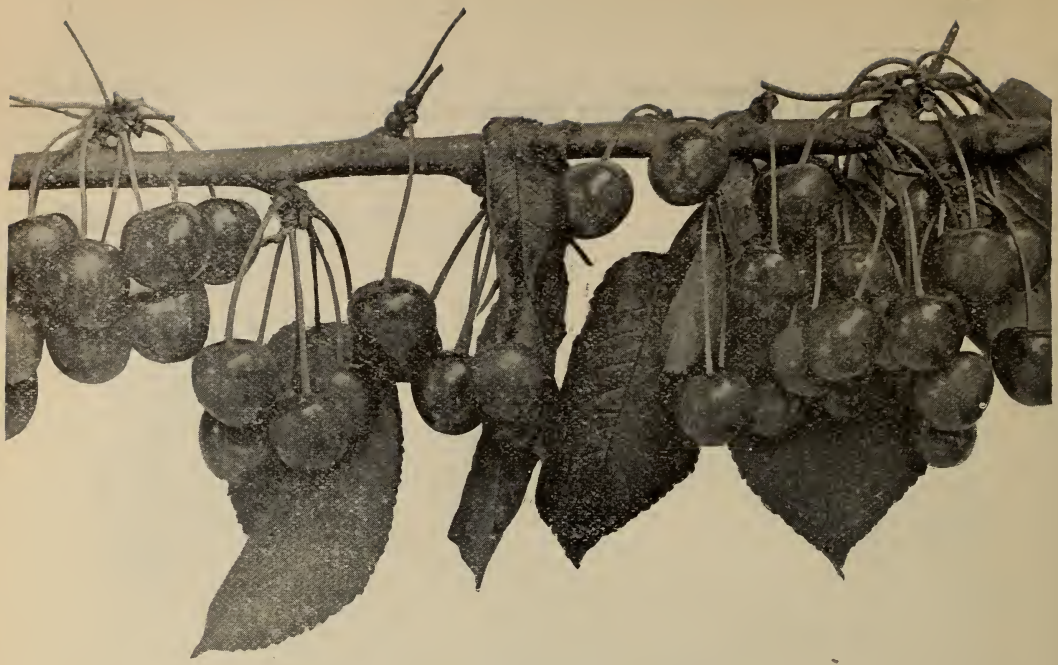


Fig. 7. Bearing Habit of Sweet Cherries.

Fig. 8. Bearing Habit of Elton.

Fig. 9. Bearing Habit of Cleveland.

thrip, with little damage to the foliage. This seemed to rout the aphis wherever it came in contact with it, but after a fortnight the leaves turned yellow and fell, showing that the lye had been applied rather strong

Fig. 10. A Five Year Old Sweet Cherry Tree.

Cleveland is the finest of the early varieties, being quite superior to the famous Governor Wood. We noticed the first ripe cherries about June 20th, and some fine samples were still hanging about the 5th of July. It is fairly firm, and has a brighter red cheek than the latter, and excels it in quality, in our opinion.

Eagle is an unprofitable variety at Maplehurst, being very unproductive. The quality is excellent, but the fruit is very scattered and thin on the tree, except in very rare seasons. The Michigan Agricultural Experimental Station gives it 8 for productiveness. We would not give it more than 4. No fruit this season ripened.

Early Purple is another unsatisfactory one for the same reason, although in some cases it gives fairly good crops. One of our sample trees gave a good yield, while the other two gave no yield to speak of. Ripe

Elton is also unsatisfactory for profit, though not so much subject to rot as usual. It is a good dessert cherry, but no improvement on Cleveland, which will hang until Elton is over. Ripe.

Maurie is a new cherry of great promise, earlier if anything than Early Purple. The quality is excellent, and though not large, it is of excellent quality, and much more desirable for the dessert table. This was its first yield, and we are anxious to watch its further behavior. Ripe 14th June ; crop over 30th.

Mezel has always been a great favorite with us, because of its fine size and good quality. It succeeds Black Tartarian. Ripe July 2nd ; crop over about 12th.

Montmorency is a magnificent cherry, which is also most prolific. This year where the trees were under good cultivation, they were very close upon the limbs, and almost every cherry was

perfect, scarcely a single curculio to be found; while the old Kentish pie cherry was badly infested, especially where grown in sod. For the commercial orchard it is just a question where to plant this or the English Morello, for profit. The season in 1900 was from July 8th to 15th.

Napoleon seems to be more subject to rot than any other variety, unless it be the Spanish. This season trees not sprayed rotted badly in spite of the dry weather. Season in 1879, June 25th to 30th, when free from rot, there is no cherry gives more fine fruit than Napoleon.

Early Richmond. Orel.

Royal Duke. May Duke.

Ohio Beauty is a nice cherry, but too small to be profitable. A four year old tree gave four quarts in 1899. The season in 1900 was June 28th to July 6th.

Purity, a fine little Kentish cherry, quite late, ripening in 1900, July 1st to 25th. A dark red cherry, almost sweet, very agreeable in flavor

Reine Hortense is the finest of all the Dukes for home uses. In 1900 it was ripe on the 28th of June and hung on the tree until July 6th. The crop was exceptionally fine and large, a five year old tree giving eight quarts of cherries of the largest size. This latter point is a great boon to the housekeeper, who hates pitting small cherries. It is too soft for shipping.

Schatten Amarelle, splendid cropper, much the same in appearance and season as Montmorency.

Strauss Weichsel.—In 1900 this cherry was dead ripe on the 6th of July. It is a Duke of fine flavor and dark colored skin.

Windsor.—This variety retains its reputation for general excellence, the tree being very vigorous and upright in habit, and the fruit large and fine; but at Maplehurst in 1900 considerably inclined to rot.

While the Duke and Kentish cherries resemble each other considerably in appearance, the stems of the former are usually longer as is shown in the accompanying photograph. The upper left hand is Early Richmond, and the right is Orel, both so called Kentish; while the lower left hand is Royal Duke and the right May Duke.

Notes by Harold Jones.

(St. Lawrence Station.)

Early Richmond.—Planted in 1899. Fairly vigorous, growth 15 inches, hardy; blossomed May 24th and set a few specimens that nearly matured on June 25th, when they were destroyed by birds.

English Morello.—Planted in 1899. Vigorous, spreading, growth 20 inches; blossomed May 26th; fruit set, ripening July 26th; destroyed by birds: hardy.

Governor Wood.—Planted in 1899. Made a good growth of 10 inches, upright, no bloom, foliage and tree healthy.

May Duke.—Planted in 1899. Made a very vigorous, healthy growth of 26 inches, upright; foliage and tree very healthy; blossomed May 23rd; set some fruit, ripe June 26th. This variety gives promise of being desirable for this section; hardy.

Montmorency.—Planted in 1899. Made a vigorous growth of 24 inches; spreading; foliage and tree healthy; no bloom; hardy.

Olivet.—Planted in 1899. Made a vigorous growth of 20 inches; spreading; foliage and tree healthy; no bloom; hardy.

Ostheim.—Planted 1897. Made a fairly vigorous growth forming a close, compact head; foliage and tree healthy; blossomed May 24th, most of the blossoms were injured in the pistil by frost, but some fruit set, ripe about July 1st; hardy.

Reine Hortense.—Planted 1899. Made a very vigorous growth of 28 inches, upright, spreading; foliage and tree very healthy; blossomed May 24th, set a few specimens, ripening July 1st, destroyed by birds; hardy; gives great promise.

Vladimir.—Planted 1897. Made a medium growth of over 12 inches, forming a compact head; blossomed May 24th: fruit ripe July 1st; foliage and tree not very healthy, one tree dying; fruit poor, not desirable.

CURRANTS IN 1900.

NOTES BY L. WOOLVERTON,

(Maplehurst Station).

For a few years past currant growing has gone somewhat out of favor, owing to the low prices prevailing. Fortunately for the grower a more encouraging state of things prevails and instead of three cents a quart they are now worth in our best markets five cents which leaves a good margin to the grower, even after expenses of sale are deducted. The acid of the currant is counted very wholesome. and in summer season the free use of currants, either fresh, spiced or in jelly, is worth far more to the human system than most people imagine.

In our grandfather's gardens currants were usually grown against the fence and often left unpruned or uncultivated, and the old Red Dutch was almost the only variety known. The variety was excellent, for it had a brisk, sprightly, mild acid flavor, which gives it first rank; but its small size made it a poor market berry, and slow of harvesting.

Now a great change has come over currant cultivation. With the advent of the cherry currant, so large in berry that it captivated the buyer, and so easy to gather as to reduce the cost of harvesting, there came a great impetus to planting, some asserting that $200 an acre was a common return for the crop. Then came Fay's Prolific with a wonderful flourish, and everybody planted it, and now several others contest the first place for the commercial garden.

To determine the best variety of each color for our Ontario fruit growers to plant was the purpose of the Provincial Department of Agriculture in starting a Small Fruit Experiment Station at Burlington, in charge of A. W. Peart, who has now sixteen varieties of red and white currants in bearing. On the 23rd of July the writer visited this station and found Mr. Peart quite ready to leave the interests of his four hundred acre grain farm to take us through his experimental plots of plums, pears, peaches, grapes and small fruits. In looking over his currants we found his Fays very fine, with bunches about four inches in length. The bush is not equal to that of the cherry in vigor or endurance. The illustration shows excellent fruiting habit, in which there is little to choose between the two varieties, the latter of which is of European and the former of American origin. Very similar to these two popular varieties is the Versaillaise, from France, differing from the two former in having berries of less uniformity in size, and on the whole, averaging smaller. Some of the bushes at Mr. Peart's were a marvel of productiveness, and we thought it worth while to take a snap to show their manner of fruiting. Belle de St. Giles is a magnificent looking currant, so large and fine, but it does not appear to be so productive as the varieties mentioned above. The Wilder, in Mr. Peart's opinion, is the finest market currant in his collection. The bunches are of the largest size, larger than either Fay or cherry, and quite equal to those of the St. Giles, and in his opinion it is more productive than any of them and better in quality.

FAY (REDUCED).

The illustration below shows a fruiting branch of the Red Cross currant, one of the newest varieties which was originated by Mr. Jacob Moore. It has little to distinguish it from the Fay or cherry in its size and appearance. Mr. Green, the introducer, says, "It makes twice the

White Imperial (reduced).

Red Cross (reduced).

growth that these varieties make; the fruit is often so dense on the stalk as to hide the leaves entirely from view. Color, bright red; berries set in a compact cluster, with long stems, convenient for picking." Mr. Peart, in his report for 1899 says the bush is medium in vigor and moderately productive. Another season's trial of this variety may settle its character with greater certainty.

Belle de St. Guiles (reduced).

Of the white varieties, the long bunch Holland has impressed us most favorably at Maplehurst, the bush is so healthy and the bunch and berry so large. But Mr. Peart places the White Imperial at the head of his list of white currants. It is not quite so large a berry as the Holland and shorter in bunch, but perhaps it is more productive, and it has a mild pleasant flavor. There is no use planting white currants for profit, as there is little demand for them in the market, so that we can only recommend them for home use.

The pruning of the red currant is so important that we add a few remarks thereon. The old method of training in tree form has been long given up by us, because the borer often destroys the old stem, and new shoots are needed to take its place. We always allow a half-dozen shoots to grow from the roots, cutting out the older stems from time to time. Those that remain we spur-prune, cutting back all laterals to two or three buds, a treatment that will result in the formation of fruit spurs along the whole length of the main branch.

NOTES BY A. W. PEART.

(Burlington Station).

The currants are plowed to in the fall and cultivated from during the next season, thus levelling the ground during the summer as much as possible. We aim to commence cultivation early enough in the spring to find moisture in the soil, and afterwards to retain it by frequent cultivation until the fruit is nearly ripe. During the past three summers we had to devise something to set-off as far as possible the severe droughts, and the above method is the nearest practical solution of the problem we have found.

Pruning is done in March or early April, the branches of red and white currants being shortened so as to throw out laterals and fruit spurs. Some thinning is also done. The shoots and branches of the black currants are not shortened, but the old wood is thinned out to the extent of about one-third.

Two hundred pounds of nitrate of soda were used per acre, applied when growth started and worked in with a hoe.

Prices of red currants, 4 to 5c. per quart ; of black, 7 to 8c.

Belle de St. Giles. Planted 1896 ; in full bloom May 12th ; season, July 8th to August 5th ; yield, 4 lbs. per bush; growth, 6 inches.

Black Victoria Planted 1896. Bloom May 20th ; season, July 10th to August 5th; growth, 7 inches; yield, 4½ lbs. per bush.

Brayley's Seedling. Planted 1896. Bloom May 16th ; season, July 10th to August 1st, growth, 8 inches; yield, 5½ lbs. per bush.

Champion. Planted 1895. Bloom May 20th; season, July 25th to August 15th; growth, 10 inches; yield, 4 lbs. per bush.

Cherry. Planted 1896 Bloom May 12th; season, July 6th to August 31st; growth, 8 inches; yield, 5 lbs. per bush.

Collins' Prolific. Planted 1896. Bloom May 20th; season, July 20th to August 10th; yield, 5 lbs. per bush; growth, 12 inches.

Crandall. Planted 1897. Bloom May 18th ; season, July 15th to September 1st; growth, 18 inches ; yield, 8 lbs. per bush.

Fay's Prolific. Planted 1896; bloom May 12th; season, July 8th to August 1st; growth, 8 inches; yield, 3½ lbs per bush.

Lee's Prolific. Planted 1896; bloom May 20th; season, July 15th to August 10th; growth, 9 inches; yield, 3 lbs. per bush.

Naples. Planted 1895; bloom May 20th; season, July 12th to August 10th; growth, 9 inches; yield, 4 lbs. per bush.

New Victoria. Planted 1897; bloom May 16th; season, July 9th to August 1st; growth, 7 inches; yield, 3 lbs. per bush.

North Star. Planted 1896; bloom May 12; season, July 12 to August 15; growth, 9 inches; yield, 3½ lbs. per bush.

Pomona. Planted 1897; bloom May 16; season, July 11 to August 5; growth, 8 inches; yield, 4½ lbs. per bush.

Prince Albert. Planted 1895; bloom May 12; season, July 17 to August 20; growth, 9 inches; yield, 1 lb.

Raby Castle. Planted 1896; bloom May 15; season, July 12 to August 5; growth, 10 inches yield, 6 lbs. per bush.

Red Cross. Planted 1896; bloom May 16; season, July 12 to August 1; growth, 8 inches; yield. 5½ lbs. per bush.

Red Dutch. Planted 1897; bloom May 15; season, July 5 to August 1; growth, 6 inches; yield, 3½ lbs. per bush.

Red Victoria. Planted 1896 ; bloom May 16 ; season, July 9 to August 1 ; growth, 9 inches; yield, 6 lbs. per bush.

Saunders. Planted 1897; bloom May 20; season, July 15 to August 10; growth, 9 inches; yield, 4 lbs.

Versaillaise. Planted 1896; bloom May 12; season, July 7 to August 1; growth, 7 inches; yield, 3½ lbs. per bush.

White Grape. Planted 1896; bloom May 14; season, July 14 to August 7; growth, 7 inches; yield. 5½ lbs. per bush.

White Imperial. Planted 1896; bloom May 12; season, July 8 to August 1: growth, 7 inches; yield, 4½ lbs. per bush.

Wilder. Planted 1896; bloom May 12; season, July 8 to August 1; growth, 9 inches; yield, 7 lbs. per bush.

Descriptive Notes by A. W. Peart.

(Burlington Station.)

Currants were a good crop of fine quality. There was little or no mildew, but the currant worm was exceptionally troublesome, there being two broods here. By the judicious use of hellebore and Paris green, they were, however, kept pretty well in check. Neglected bushes were completely stripped of their leaves.

Prices also were good, leaving a fair margin of profit. Of the newer varieties the Wilder still takes the lead, bidding fair to take a place alongside the Cherry and Fay's Prolific. Pomona also promises well. Collin's Prolific, a new black currant, has also come to the front, having fruited exceptionally well this season.

Belle de St. Giles.—Bush, medium in vigor, healthy and hardy, but not very productive; bunch, long and compact; berry, red, large, ½ inch in diameter, sub-acid, of excellent quality; season, medium, July 8th to August 1st. A large berry of fine quality, but not productive enough for a commercial plantation.

Black Victoria.—Bush, of medium vigor, healthy, hardy and productive; berry, large, ½ inch, firm, sweet, of fine quality; season, July 10th to August 5th. An early black variety.

Brayley's Seedling.—Bush, vigorous, healthy, hardy and productive; bunch, long, straggling, loose; berry, red, medium size, ⅜ inch, very acid; season, medium, July 10th to August 1st.

Champion.—Origin, England; bush, vigorous, healthy, hardy and moderately productive; berry, very large, ⅜ inch, black, somewhat acid; season, late, July 25th to August 15th; a late black variety.

Cherry.—Origin, Europe; bush, strong, upright, vigorous, hardy, healthy and very productive; bunch, somewhat short, compact; berry, dark red, firm, large, ½ inch, acid, of fair quality; season, medium, July 6th to 31st. One of the most profitable of the older commercial currants.

Collin's Prolific.—Bush, a very rank, strong grower, healthy, hardy and productive; berry, large to very large, ½ to ⅝ inches, black, firm, acid; season, July 20th to August 10th. The productiveness of this currant seems to increase with its age, its early years being more devoted to growth.

Crandall.—Bush, hardy, healthy, vigorous, rampant and very productive; berry, variable in size from ⅜ to ¾ of an inch in diameter, bluish-black, of a sprightly sub-acid flavor; season, July 15th to Sept. 1st. It ripens by degrees, some berries being green while others are quite ripe. Its commercial value requires further test.

Fay's Prolific.—Origin, New York, probably a cross between Cherry and Victoria; bush, a fair grower, hardy, healthy and productive; bunch, very long, somewhat loose; berry, large to very large, ½ to ⅝ inches, red, firm, sub-acid; season, medium, July 8th to August 1st. A profitable commercial currant in many localities.

Lee's Prolific.—Origin, England; bush, moderately vigorous, healthy, hardy and very productive; berry, black, very large, ½ to ⅝ inches, sub-acid; season, medium, July 15th to Aug. 10th. A good commercial currant.

Naples.—Origin, Europe; bush, strong, vigorous, hardy, healthy and very productive; berry, large, ½ inch, black, sub-acid; season, medium, July 12th to August 10. One of the best market varieties.

New Victoria.—Bush, vigorous, hardy, but not very productive; bunch, long, loose; berry, red, small to medium, ⅜ inch, acid, but pleasant in flavor, season, medium, July 9th to August 1st.

North Star.—Origin, Minnesota; bush, medium vigor, hardy, healthy and moderately productive; bunch, medium length, compact; berry, red, medium to large, ⅜ to ½ inch, acid, but sprightly and of good flavor; season, medium to late, July 12th to Aug. 15th. Has a commercial value as a late red currant.

Pomona.—Bush, vigorous, healthy, hardy and productive; bunch, long, compact; berry, red, large, ½ inch, acid, but of good quality; season, July 11th to Aug. 5th. This currant promises well.

Prince Albert.—Bush, vigorous, healthy and hardy; leaves large and deeply cut; bunch, short to medium; berry, small to medium, ⅜ inch, red, acid; season, late, July 17th to August 10th.

Raby Castle.—Origin, Canada: bush, vigorous, hardy, healthy and very productive; bunch, short and compact; berry, red, small to medium, ⅜ inch, firm, acid; season, medium, July 12th to August 5th. An old commercial variety that is giving place to larger currants.

Red Cross.—Origin, New York, probably a cross between the Cherry and White Grape; bush, medium vigor and fairly productive; bunch, short and compact; berry, small to medium, ⅜ inch, red, firm, sprightly sub-acid; season, medium, July 12th to Aug. 1st.

Red Dutch.—Origin, Europe; bush, strong, healthy, hardy and productive; bunch, medium length, loose; berry, red, small, ⅓ to ⅜ inch, sub-acid, of fine flavor; season, early to medium, July 5th to August 1st.

Victoria.—Bush, strong, hardy, healthy, vigorous, and very productive; bunch, long and loose; berry, large, ½ inch, bright red, tenacious, firm, acid, but of good quality; foliage, dark green, coarsely cut; season, medium, July 9th to August 1st. A good commercial currant.

Saunders.—Origin, Ontario; bush, strong, vigorous, hardy, healthy and productive; berry, black, large, ½ inch, of a good sub-acid flavor; season, medium to late, July 15th to August 10th.

Versailles.—Origin, France; bush, moderately vigorous, healthy, hardy and fairly productive; bunch, medium length and moderately compact; berry, red, medium size, ⅜ inch, not so acid as the cherry; season, early to medium, July 7th to August 1st.

White Grape.—Origin, Europe; bush of medium vigor and productive; bunch, long and straggling; berry, white, large, ½ inch, sub-acid, pleasant in flavor; season, medium to late, July 14th to August 7th.

White Imperial.—Bush, vigorous, hardy, healthy and moderately productive; bunch, long and loose; berry, white, large, ⅜ to ½ inch, of fine quality; season, medium, July 8th to August 1st. A fine dessert currant.

Wilder.—Origin, New York; bush, vigorous, hardy, healthy and very productive; bunch, medium length, compact; berry, red, large, ½ inch, sub-acid of good quality; season, medium, July 8th to August 1st. This variety has the best record of any of the red currants noted above.

Notes by A. E. Sherrington.

(*Lake Huron Station.*)

Champion.—Bush, strong and vigorous; berry black, large, flavor acid; yield 12 oz; two years planted.

Cherry.—Bush, strong, fairly vigorous, spreading; berry, very large, dark red; bunches short; quality good; yield 12 oz; three years planted.

Fay—Bush, strong and vigorous grower; bunches short, compact; berry red, large to very large; quality of the best, yield 18 oz; three years planted.

Naples.—Bush, strong and vigorous, productive, berry large, black; quality good; yield 34 oz; two years planted.

Prince Albert.—Bush, strong, upright, vigorous; bunches small; berry red, medium; quality fair; yield 9 oz; one year planted.

Pomona.—Bush, strong, fairly vigorous; bunches, small; berry, red, large, quality good; yield 9 oz; two years planted.

Raby Castle.—Bush, strong; bunches long; berry, red, small and acid; yield 28 oz.; three years planted.

Versailles.—Bush, apparently vigorous; bunches, long; berry red, large; quality very good; yield 6 oz.; one year planted.

GOOSEBERRIES.

Notes by S. Spillett.

(*Gooseberry Sub-station*).

Of the English seedling, Autocrat, Ontario and Columbia deserve special mention. Autocrat gave a large crop of large, green, sweet berries as usual, but mildewed so early in the season that they were useless. Ontario and Columbia also gave a large crop of very large, yellow berries, but were destroyed by mildew. The foliage of these varieties suffered less from mildew than the other foreign seedlings and so have made a fair growth of wood.

Crosby's Seedling and Carnie's Golden did fairly, but, while the former is fairly vigorous, the latter makes wood slowly and is low and creeping in habit.

Queen, Chautauqua, Dominion, Triumph, Golden Prolific and Large Golden Prolific gave a little fruit which mildewed badly, as did the foliage, so they made little wood.

Of the pure English varieties, Whitesmith, taken all round in wood and fruit, is one of the best, if not the best. This season it bore as usual a large crop of fruit which was destroyed by mildew, but it is more vigorous than any of the others.

I may remark here that on light loamy soil this year I had no mildew either on fruit or foliage, while on heavy clay both English varieties and English seedlings mildewed badly. The same difference was apparent in the foliage of the young bushes in the nursery rows.

Keepsake, Lancashire Lad, Crown Bob, and Mrs Whittaker made very little wood as the foliage mildewed badly early in the season.

Of the pure *English varieties* imported in 1895, Green Chisel is by far the most vigorous and prolific. This variety this year yielded one and one half quarts to the bush, of large, greenish-white berries, of good quality: indeed this was all the bush could hold. Cook's Eagle, Ingram's Ocean, London, Lancelot, Red Champagne and Whinham's Industry hardly grow wood enough to keep alive. These all bore all they could carry this year of very large berries and were perfectly free from mildew. They are set in light, loamy soil, made rich and did not mildew.

The *American varieties* Red Jacket, Champion and Pearl, seem to me to fill the bill for culinary purposes; of these three, Red Jacket is the largest berry and the most vigorous. It gave four quarts to the bush and three quarts to the bush upon the ground, this year. This falling is caused by a small fly depositing an egg in the berry which develops into a grub, causing the berry to ripen prematurely and fall off. When picked just as the berry begins to color red we have no better fruit in our cellar. This fly never attacks the English varieties, they being too thick in the skin.

Champion is about as large as Downing but of the Houghton type, it is very vigorous and immensely prolific. Our bushes gave five quarts each, with from one to two quarts on the ground. This variety is very valuable for picking green as it is fully grown ten days or two weeks before any other variety. It never mildewed but once with us in ten years; this year it was perfectly clean, but it was picked off early, as it comes in at a season when nothing except rhubarb is obtainable.

Pearl is now too well known to need any description. Our bushes this year gave five quarts with from two to three on the ground, no mildew.

Spraying was practised this season with Bordeaux and Liver of Sulphur without any apparent good result. I shall thin out my bushes severely this fall and spray; and spray again during some mild day in winter with pure Bluestone water; besides spraying in spring before the leaf opens if possible. This cannot always be done, as a few warm days bring out the leaves while the soil is still soft. We have been canning English gooseberries for some years, or rather preserving them, and we prefer the Red Jacket and Pearl to the English varieties

Our fruit is pulled just as the fruit commences to ripen or when the seeds get dark colored. Of course if the fruit is used green for this purpose all varieties would be about alike; that is, very acid. No doubt the English varieties are larger, but the skin is very much thicker. Many people have sampled our preserved Red Jackets and Pearls and all have declared that they had no idea gooseberries were so fine. Several have declared that no more green gooseberries should be canned at their place. We would sell our English kinds any year and keep Red Jackets for our own use.

The Oregon Jumbo I am satisfied is a Red Jacket, and the Success a Downing.

Notes by A. E. Sherrington.

(Lake Huron Station.)

Crown Bob.—Bush, rather slow grower; not productive; fruit large and hairy; never yielded sufficient to record.

Downing.—Bush, strong and vigorous; productive; fruit, green and large; qualty good; yield four quarts per bush; three years planted.

Pearl—Bush more spreading than Downing; strong and vigorous fruit, large, green; quality good; resembles Downing; yield two quarts; three years planted.

Red Jacket.—Is making a fine strong growth and yielded a few specimens; fruit medium to large, color red; quality good; one year planted.

Whitesmith—Bush rather spreading, not as vigorous as it might be, subject to mildew; fruit large to very large, oblong, green; quality good; two years planted.

The yield of gooseberries would have been much larger had it not been for the extremely hot weather, which scalded the fruit so that one-half dropped off the bushes.

PEACHES.

Notes by W. W. Hilborn.

(South-western Station.)

In my report for 1899 I stated that the loss of peach trees in this district by winter killing would be from 90 to 95 per cent. I now believe this estimate to be rather under, than over, the truth. Most of the trees that survived were more or less injured, and quite a number are gradually dying. The centre, or heart wood, of the trunks and larger limbs of most of them, was injured to such an extent that they are not capable of bearing a heavy load of fruit, or withstanding strong winds, without sustaining considerable damage from broken limbs. From this cause also, the fruit on many of the trees did not properly develop and in many cases dropped prematurely. It was quite generally predicted that there would never again be as much land devoted to the peach as before the freeze out. Present indications, however, go to show that the area planted will soon be as large as ever. The orchards will not be as uniform as in the past, on account of such a large proportion of the young trees having been injured last season, as well as this, by fumigation.

It has been stated by many orchardists that a young tree would not grow well if planted in the same spot where the old one had been taken out. This is usually found to be true where we fill in here and there a tree in an old orchard. In resetting our orchards we have planted the trees, in some of the blocks, the same distance apart as they were previously; hence, the

young trees come in the same place previously occupied by the old ones. In other blocks, where all the trees were killed, we re-planted farther apart, therefore only a few were re-set in the place occupied by the old tree. I have not been able to see any difference whether the tree has been planted right where the old ones stood or half-way between.

Three trees each of 80 varieties were obtained last spring and planted. Most of these have lived and made a good growth. Those that came from the United States succeeded best. Very few of them died and most of them made a growth of from two, to three and a-half feet. The Canadian-grown trees were not as good ; I think they were injured more or less by the winter and by fumigation. It is my opinion, based on observation, that peach trees that have been slightly injured by the winter, may be ruined by fumigation, while those which have not been thus injured will not be materially affected, and show no injurious results.

Three trees each, were planted last spring of the following :

Alexander,	Foster,	Niagara,
Amsden,	Family Favorite,	Orleans,
Ameliaberta,	Globe,	Orange Free,
Banner,	Geensboro,	Picquett's Late,
Bowslaugh's Late,	Garfield,	Reed's Early Golden,
Barnard's Early,	Hale's Favorite,	Smock,
Bokara,	Hance's Golden,	Sneed,
Beer's Smock,	Hill's Chili,	Smithson,
Brunson,	Holdenbaum,	St. John,
Beauty Blush,	Horton Rivers,	Stewart,
Bray's Rareripe,	Jacques' Rareripe,	Stephen's Rareripe,
Carlisle,	Klondike,	Scott's Nonpareil,
Carpenter's Seedling,	Keyport White,	Susquehanna,
Cline's,	Lee's Choice,	Snow's Orange,
Captain Ede,	Lemon Cling,	Stump,
Crosby,	Lemon Free,	Salway,
Connecticutt,	Late Crawford,	Tyhurst,
Carman,	Longhurst,	Townsend,
Chair's Choice,	Late Admirable,	Triumph.
Dewey,	Mountain Rose,	Troth's Early,
Elberta,	Millionaire,	Victor,
Essex Mammoth,	Marshall,	Wager,
Early Rivers,	Matthew's Reauty,	Wonderful,
Engol (Mammoth),	Morris White,	Wheatland,
Early York,	McIntosh,	Willett,
Early Crawford,	Moore's Favorite,	Yellow Rareripe.
Fitzgerald,	New Prolific,	

The following kinds fruited this season, but on account of the injury done by the winter of 1889, I cannot make the notes on varieties as complete as I desire.

American Apricot Peach.—Fruit medium size, round ; color, yellow slightly blushed ; good quality ; pit free ; ripe last of August ; tree vigorous and moderately productive.

Brunson.—Fruit, medium to large : yellow with slight blush ; quality good ; pit free ; ripens middle of September ; trees, strong, vigorous and productive ; promising for market.

Connecticut.—This variety is of the Early Barnard type, of which it is probably a seedling ; not equal to that old standard sort in size or quality. The tree is hardy and productive and would no doubt be valuable for planting farther north where most kinds fail. The fruit is yellow, nearly covered with red ; quite good in quality ; pit free ; ripens middle of September.

Crosby.—Fruit medium to large, roundish ; yellow with cheek shaded red where exposed to the sun ; flesh juicy, mild ; quality very good ; pit free. The tree is vigorous, hardy and very productive ; as it gets aged it is apt to over-bear and the fruit run too small. If given good soil, well cultivated and severely thinned when required, it is a profitable market variety.

Champion.—Fruit large, roundish, creamy white with red cheek in the sun ; quality very good ; flesh juicy, adheres to the pit ; ripe first of September ; tree vigorous and moderately productive.

Crane's Yellow.—Fruit rather large, roundish, bright yellow with bright red cheek ; quality 1st class ; pit free. The fruit ripens about a week earlier than Early Crawford, or about the 25th of August ; one of the most profitable varieties for home use and market ; trees vigorous and productive.

Early Crawford.—Fruit large, roundish, slightly enlongated : color bright yellow with red cheek ; quality very good ; pit free ; season last of August ; trees vigorous and productive ; buds rather tender and on this account not as reliable a cropper as many other kinds.

Elberta.—Fruit large to very large, oval, skin yellow with red cheek ; quality very good ; a splendid market sort. It is a good shipping peach, better in this respect than most varieties ; trees only moderately vigorous, quite productive, not quite as hardy as most sorts. Perhaps its greatest drawback for this locality is that it suffers more from *leaf curl* than most other kinds.

Engle (Mammoth).—Fruit large nearly round, suture slight, skin yellow with red cheek ; flesh yellow, sweet and juicy ; quality very good ; stone small, free ; ripens early in September or between the two Crawfords ; keeps well after picking ; very promising for market and home use ; trees vigorous, healthy and productive.

Early Michigan.—Fruit medium to large, round ; color creamy white, mostly overspread and marbled with red ; flesh creamy white ; quality good ; pit nearly cling ; season middle of August ; trees hardy and productive but subject to *leaf curl.*

Early Rivers.—Fruit large, roundish ; skin creamy white, with faint blush where exposed to the sun ; flesh creamy white, quality good, very juicy, adhers considerably to the pit, rather soft for market ; quite subject to *fruit rot ;* tree vigorous, hardy and productive.

Fitzgerald.—Fruit large, roundish ; skin bright yellow with red cheek ; flesh yellow ; quality 1st class ; pit free, small. Ripens 1st of September ; tree quite vigorous, hardy and productive. Valuable for home use and market.

Foster. –Fruit large, of the Early Crawford type but more highly-colored ; quality very good, yellow, free stone; ripens 1st of September ; tree vigorous but not productive.

Great Western.—Fruit medium to large, roundish ; color creamy white ; flesh white, juicy ; quality fair; pit cling ; ripe second week in October ; trees only moderately productive ; of no special value here.

Greensboro.—Fruit medium to large, oblong, usually flattened ; skin green to creamy white, cheek slightly blushed in the sun ; flesh greenish white, juicy ; quality fair ; pit nearly cling ; ripe first week in August ; tree vigorous and apparently productive ; this, its first year of fruiting here, has not made a very favorable impression.

Golden Drop.—Fruit medium in size, round, skin a bright yellow, usually light red cheek where exposed to the sun ; quality very good ; a splendid canning peach ; pit small, free ; ripe after the middle of September ; tree hardy, vigorous and very productive ; fruit often requires thinning.

Kalamazoo.—Fruit medium to large ; skin yellow, considerably overspread with red in the sun ; flesh yellow ; quality very good ; pit free ; ripe last of September ; tree vigorous and productive ; promising for market and home use.

La Grange.—Fruit quite large, oval, skin creamy white ; flesh creamy white ; quality very good ; pit free ; ripens about the 10th of October ; trees quite vigorous, moderately productive while young

Lorentz.—Fruit medium size, roundish ; skin yellow, blushed in the sun ; flesh yellow ; quality good ; ripens after the middle of October ; rather late for this locality as it comes in after Salway and will not always ripen ; tree vigorous and moderately productive.

Late Crawford.—Fruit large to very large, roundish, somewhat enlongated ; color yellow, with red cheek ; flesh yellow, quality very good ; pit free ; ripe middle of September ; tree very vigorous but only moderately productive.

Lemon Free.—Fruit medium to large, oval ; color lemon yellow, sometimes a faint blush where exposed to the sun ; flesh yellow, quality good to very good ; one of the best for canning ; pit free ; ripens just after the middle to last of September ; tree very hardy, vigorous and productive ; this variety sometimes has the fault of dropping its fruit too readily at the ripening period.

Longnurst.—Fruit medium to large, oval ; color dark yellow with a dull red blush ; flesh deep yellow, quality good, rich ; pit free ; ripen middle of September ; tree very hard, quite vigorous and very productive ; liable to overbear, requires thinning, otherwise the fruit is apt to run small and the quality poor.

Marshall —Fruit medium to large, roundish, slightly oblong ; skin bright yellow, slightly shaded red ; flesh yellow, red at the pit ; quality good, slightly inclined to acid, quite firm ; pit free ; trees vigorous but only moderately productive while young.

Mountain Rose.—Fruit medium to large, roundish ; color creamy white, considerably blushed and sprinkled with red ; flesh very juicy, creamy white, tender, melting, with a mild vinious flavor ; quality very good ; pit free ; ripe latter part of August ; trees quite vigorous and productive ; good for home use and near market, but not firm enough for distant market.

New Prolific.—Fruit large, roundish, slightly oval, skin yellow with red cheek ; flesh yellow, juicy ; flavor delicate, sprightly, vinous ; quality very good ; pit free ; tree vigorous and very productive ; a very promising market sort.

Namaper.—Fruit large, oval, about the size and form of Elberta, which it very much resembles also in color and quality ; ripens about a week later ; the tree however is much more vigorous and not subject to *leaf curl ;* very productive ; one of the most promising varieties for market among the newer kinds.

Oscar's Black Prince.—Fruit about the size and character of Alexander, much darker red in color, a little better in quality and ripens a few days later.

Pool's Large Yellow.—Fruit large, roundish oval, skin yellow, blushed red ; quality very good ; pit free ; ripe middle of October ; tree quite healthy and vigorous ; should it prove to be productive, on a more extended trial, it will become a profitable late market sort.

Piquett's Late.—Fruit medium size, roundish, skin yellow with red cheek, flesh yellow, red at

the pit ; quality poor to fair ; pit cling ; trees vigorous and very productive ; not valuable on account of poor quality and clinging so tenaciously to the pit.

Pearce.—Fruit large, golden yellow with slight blush where exposed to the sun ; quality very good ; pit free ; ripe about the middle of September ; tree vigorous and productive ; this sort promises to be a valuable market variety.

Piquett's Free.—Fruit medium to large, roundish, skin yellow, blushed red where exposed to the sun ; flesh yellow, quality very good ; ripens about the 10th of October ; pit free ; tree vigorous and only moderately productive while young.

Roser.—Fruit small to medium, roundish ; skin, white ; flesh white ; pit free ; quality poor ; tree vigorous and productive ; of no value on account of small size and poor quality.

Red River.—Fruit large, roundish, oval ; skin, creamy white with fine red cheek ; flesh creamy white, juicy, fine grained with pleasant vinous flavor ; pit nearly free ; quality, good : ripe early in August ; tree hardy, vigorous and very productive ; it resembles Early Rivers in every respect, except that it is much more highly colored.

St. John.—Fruit large, roundish, slightly oval ; skin, bright yellow with bright red cheek ; flesh yellow, juicy, very fine flavored, quality 1st class ; pit free ; ripens middle of August ; tree vigorous and productive The first good yellow freestone peach to ripen ; one of the best for home use or market.

Salway.—Fruit large, roundish ; skin yellow with a red cheek in the sun ; flesh yellow, red at pit ; quality very good ; pit free ; ripens middle of October ; tree vigorous and very productive ; nearly always ripens in this locality ; perhaps the best late market sort ; too late to plant farther north.

Summer Snow.—Fruit medium, roundish ; skin white ; flesh white ; quality poor to fair ; pit, cling ; ripens middle of October ; tree vigorous but not very productive ; I do not consider it of any value for Ontario.

PEARS.

Notes by Harold Jones, Maitland.

(*St. Lawrence Station.*)

Bergamot --Planted in 1896 ; made a fairly vigorous growth, healthy ; blossomed May 25th set no fruit.

Bessemianka.—Planted 1896 ; made a fair growth ; one tree died of blight and another is going the same way ; blossomed May 25th ; set no fruit.

Baba.—Planted 1897 ; all trees have died in spring of 1899 and 1900 of blight.

Dempsey.—Planted 1896 ; makes a fairly vigorous, upright growth, healthy ; blossomed May 24th ; no fruit.

Goodale.—Planted 1896 ; makes a good strong growth, healthy ; blossomed May 23rd ; no fruit.

Japan Golden Russet.—Planted 1897 ; makes a slow growth ; fairly healthy ; blossomed May 25th ; ripe October 10th, first crop, two pears ; fruit small, $1\frac{3}{4} \times 1\frac{1}{4}$, oblate, stem $1\frac{1}{2}$; color, bright yellow ; quality, poor.

Keiffer's Hybrid.—Planted 1896 ; a strong, healthy grower, tree upright, foliage healthy ; blossomed May 25, ripe October 10th ; second year of bearing about 30 pears ; quality fair to good ; one of the most successful varieties and worthy of planting where less hardly varieties fail. Season of use November.

Petite Marguerite — Planted 1898 ; a good, healthy grower, making a close upright head ; foliage healthy ; blossomed May 24th, fruit set and almost came to maturity when blown off in a severe storm ; crop two pears.

By A. W. Peart, Freeman.

(*Burlington Station.*)

The pear trees planted in 1896 and subsequently have made a reasonably good growth, very few have died. The orchard is ploughed in the spring and tomatoes, potatoes or some other vegetables will be grown in it until the trees require all the soil.

The land is kept in good heart by using stable manure which is ploughed under, also muriate of potash and bone meal, each at the rate of 125 lbs. per acre. The two latter manures are applied for the benefit of the trees solely, being sown around them after the ground is ploughed and then harrowed in. The stable manure is used for the vegetable crop.

Pruning is done in March or April, cutting the young shoots back so as to make the trees stout, stocky and lower. There was very little blight and the pear slug was not as plentiful as usual. Prices were fair, ranging from $3 to $6 per bbl., according to variety and quality.

Anjou.—Planted 1880 ; in full bloom May 16th ; season, November-December ; growth, 14 inches ; yield, 48 qts. per tree ; when picked too soon this pear shrivels up and does not properly mature. It also drops too easily from the tree and when you go to pick them at the proper time you find too many on the ground. It is a good export pear. Picked Oct. 1st , selling price, $3.50 to $4.50 per barrel in Montreal.

Bartlett —Planted 1880 ; in bloom May 19 ; season, September ; growth, 12 inches ; yield, 64 qts.; somewhat subject to blight. When picked, packed and shipped properly it is our best export pear. It, however, requires efficient cold storage. Picked Aug. 25 ; price, $4 to $5 per barrel.

Bartlett-Seckel.—Planted 1898 ; growth, 16 inches ; tree an upright grower.

Beurre Bosc.—Planted 1896 ; bloom, May 17 ; growth, 16 inches ; no fruit yet ; tree an upright grower.

Beurre Giffard.—Planted 1896 ; bloom May 16 ; very vigorous grower, 24 inches ; tree spreading in habit ; has not fruited.

Buffum.—Planted 1897 ; bloom May 16 ; growth, 18 inches ; upright ; no fruit.

Clairgeau.—Planted 1896 ; bloom May 19 ; season, November ; growth, 12 inches : yield, 3 qts.; tree upright grower ; picked Oct. 15.

Clapp's Favorite.—Planted 1889 ; bloom May 19 ; season, late in August to early September ; growth, 18 inches ; yield, 32 qts.; a strong upright grower, very subject to blight ; a large, valuable pear for home markets ; picked August 20th ; price, 50c. per basket.

Dempsey.—Planted 1898 ; growth, 12 inches.

Doyenne Boussock.—Planted 1896 ; bloom May 19 ; growth, 14 inches.

Duchess.—Planted 1889 ; bloom May 15 ; season, October-November ; growth, 10 inches ; yield, 18 qts. Duchess pears are grown here both as standards and dwarfs, the latter on the quince root. The dwarfs do very much better. This variety is also subject to blight. A fine export pear. Picked Sept 15th ; price, $3.50 to $4.50 per barrel.

Easter Beurre.—Planted 1897 ; bloom May 16 ; growth 20 inches ; spreading.

Flemish Beauty.—Planted 1880 ; bloom May 19 ; season, September, a week to 10 days later than the Bartlett ; growth, 10 inches ; yield, 64 qts. The leaf and fruit generally spot badly. This year, however, there was very little scab. Fine for export when the fruit is clean. Picked Sept. 5th ; growth, 10 inches ; yield, 64 qts.

Howell.—Planted 1896 ; bloom May 18 ; season, September-October ; growth, 18 inches ; yield, 2 qts.; picked Sept. 20th ; price, 45c. per basket.

Idaho.—Planted 1896 ; no bloom yet ; growth 14 inches ; some blight.

Josephine De Malines.—Planted 1896 ; bloom May 18 ; growth, 16 inches ; spreading.

Keiffer.—Planted 1899 : bloom May 16 ; season, October-November ; growth. 24 inches ; yield, 8 qts ; a very rapid, strong grower and bears young. It appears to be well adapted to lighter soils. Not subject to blight. Picked, Oct. 1st ; price, 40c. per basket.

Lawrence.—Planted 1896 ; bloom May 16 ; season, December ; growth, 24 inches ; spreading ; yield, 1 qt.

Lawson.—Planted 1896 ; no bloom yet ; growth, 20 inches.

Lincoln.—Planted 1898 ; growth, 22 inches.

Louise Bonne.—Planted 1897 ; bloom, May 16 ; growth, 10 inches ; no fruit yet ; spreading habit.

Osbands' Summer.—Planted 1897 ; growth 16 inches ; upright ; some blight.

Petite Marguerite.—Planted 1899 ; bloom, May 17 ; season, August ; growth 20 inches ; yield 3 quarts

President Drouard.—Plated 1897 ; bloom, May 16 ; growth, 18 inches. upright ; no fruit yet.

Seckel.—Planted 1897 ; growth, 16 inches.

Sheldon.—Planted 1889 ; bloom, May 15 ; season, Oct.-Nov.; growth, 14 inches ; yield, 32 quarts ; a pear of fine quality and brings good prices in home markets ; appears to be useless for export, going to pieces in transit. Like the Anjou it drops too easily from the tree ; price, 45 cents per basket.

Souvenir de Congres.—Planted 1896 ; bloom, May 18 ; season, Aug-Sept., growth 24 inches ; upright.

Sudduth.—Planted 1897 ; growth, 12 inches ; spreading in habit.

Summer Doyenne.—Planted 1896 ; bloom, May 16 ; growth, 18 inches ; upright ; no fruit yet.

Tyson.—Planted 1897 ; growth, 18 inches, upright.

Vermont Beauty.—Planted, 1896 ; bloom, May 18 ; growth, 16 inches, upright.

Wilder.—Planted 1896 ; bloom, May 18 ; growth, 24 inches, upright.

Winter Nelis.—Planted 1896 ; bloom, May 18 ; season, December ; growth, 16 inches ; spreading ; yield, 1 qt.

French Pears.—Received in June and planted at once the following pear trees : Bergamotte Esperen, Bonne de Malines, Citron de Carmes, Dr. Jougré, Dr. Jules Guyot, Figue d'Alencon, Marguerite Marillard, Nouvelle Fulvie, Olivier de Sevres, Souvenir de Venérable, De La Salle, Triumphe de Jodoigue. These were cut back severely, and all lived and made some growth. Dr. Jougré and Bonne de Malines made over one foot each of new wood.

PLUMS.

Notes by John Mitchell.

(Georgian Bay Station.)

This has been the most complete "off" year in the fruit business ever experienced in the history of this district. In plums there is nothing new to report. Only six baskets, mostly Red June and Chabot, which are Japan plums, with a few scattered specimens of other kinds, were gathered from twelve hundred trees.

The cause for this, in my opinion, and that also of the most experienced fruit growers here, was not the cold, but the high temperature in February, which caused the sap to start and swell the buds, which froze later on, thus bursting or practically bursting them, as was apparent by the weak blossom made, buds and all falling from the trees in a few days without setting fruit. The trees, however, are looking exceptionally fine this fall, having made splendid growth and ripened their wood well.

American Plums.—These plums will be of no commercial value here, but might be of some use in home gardens farther north, where European and Japanese varieties will not succeed. The best of this class so far tested are Cheney, Weaver and Pottawattomie.

Japan Plums.—These plums are proving sufficiently hardy for the Georgian Bay district, but are of such indifferent quality compared with our best European varieties that it would not be wise to plant them extensively. The best so far tested are Abundance, Burbank, Red June, Orient and Chabot. The Ogon and Willard have also been tested, but are of very poor quality, not worthy a place in any Canadian orchard.

Peaches.—Of the few peaches tested at this station, Triumph, Tyehurst, Bowslaugh's Late, and Bokara are proving hardy. The three first mentioned bore quite full crops the past season. They are freestone, yellow flesh and very good quality, and I think will succeed well here.

Insects and Fungi.—Of all the insects that gave trouble during the season none were so destructive as the tent caterpillar of the forest, or more properly called the forest caterpillar, as it seldom spins a true tent, although they have a habit of leaving a thread of silk wherever they go and drop themselves to the ground thereby. Various remedies have been tried, such as destroying the eggs, which is good as far as it goes. Spraying the caterpillars when in bunches with coal oil will kill them, but in about a year there will be found a patch of dead bark about the size the bunch of worms were when sprayed. Better crush them with an old broom or any other thing: it is about as quickly done as any method. We have killed them quite effectively by spraying with Paris green perfectly, saving our orchard when other orchards were almost destroyed.

The apple scab seems to be completely controlled by spraying with Bordeaux mixture, as we have had none for two years.

It is also a remedy for shot hole fungus. Our trees are carrying their foliage healthy and green up to November.

Notes by Harold Jones.

(St. Lawrence Station.)

Abundance.—Planted 1896; made a vigorous growth, forming a compact, upright head foliage and stem fairly healthy; one tree died this summer, cause unknown; blossomed May 20th, blossoms were all injured in the pistil by spring frosts; no fruit set; this variety has up to the present proved undesirable for this section.

Burbank.—Planted 1899; made a fair growth, spreading; foliage and tree healthy; blossomed May 23rd, fruit ripe August 31st, size $1\frac{1}{2}$x$1\frac{1}{2}$, color bright red over yellow, stone small cling, suture distinct, quality good.

Communia.—Planted 1896; made a fairly vigorous, spreading growth; foliage shows signs of shot hole fungus; tree healthy; blossomed May 23rd, ripe September 10th; size $1\frac{1}{4}$x$1\frac{1}{8}$, color purple, suture obscure, stone medium, cling, flesh pink, flavor good.

Col. Wilder.—Planted 1898; tree healthy and vigorous, compact, spreading; blossomed May 25th, ripe September 20th; fruit round, small 1x1; color, red; cling stone; of inferior quality and not desirable where the European plums will succeed.

Chas. Downing.—Planted 1896; makes a fair spreading to drooping growth; foliage subject to plum pocket and fungi; blossomed May 26th, a few blossoms set; ripe September 30th; size $1\frac{1}{4}$x$1\frac{1}{2}$; color bright red; suture obscure; stone medium cling; thin skin; flavor sweet, no astringency; an improvement over the wild type, but not desirable.

Forest Rose.—Planted 1897; makes a very vigorous growth; blossomed May 24th; ripe September 25th; size $1\frac{3}{4}$x$1\frac{1}{2}$; color red, some greyish bloom; suture obscure; stone, medium cling; flavor sweet, no astringency; skin tough; flesh pink, tough, not desirable.

Forest Garden.—Planted 1897; made a vigorous growth upright; blossomed May 24th; ripe September 25th; color red, with greyish bloom; suture obscure; stone medium, cling; not desirable.

Genii.—Planted 1896 ; makes a very vigorous strong growth ; upright ; blossomed May 21st ; ripe September 4th ; size 1½x1⅜ ; suture distinct ; color blue ; stone medium, semi-cling ; flesh yellow, tender, good ; skin thin ; one of the best that has fruited with me.

Grand Duke.—Planted 1896 ; makes very healthy, strong growth ; foliage a beautiful dark green and very healthy and free from insect and fungi pests ; so far the healthiest of all plums grown at the station ; blossomed May 23rd ; ripe October 6th ; size 1⅝x1¼ ; color, purple, covered with grey bloom ; suture visible ; stone, medium cling ; flesh, sprightly acid ; skin, thin ; quality, good ; keeps well after picking.

Hammer.—Planted 1896 ; makes strong vigorous growth ; foliage healthy, some injury from aphis ; blossomed, May 25th ; ripe, September 24th ; size, 1¾x1¼ ; color red, covered with greyish bloom ; suture obscure ; stone medium, cling ; flesh, sweet ; skin, tough and acid ; a very good plum of its class, but not desirable where the Europeans can be grown.

Lombard.—Planted 1896 ; makes a strong vigorous growth ; foliage healthy, subject to aphis ; tree subject to black knot, but generally clean and healthy ; blossomed May 20th ; ripe, September 12th ; size, 1½x 1 7-16 ; color, purple ; suture distinct ; free stone ; medium size ; fruit affected by plum rot, where borne in clusters ; a heavy and early bearer ; desirable.

Milton.—Planted 1896 ; a vigorous healthy tree ; foliage healthy ; blossomed May 26th ; ripe, August 20th ; size, 1½x1 ; color, red ; suture obscure ; stone medium, cling ; valuable on account of its earliness.

Tatge.—Planted 1896 ; a very vigorous healthy tree ; foliage healthy ; bloomed May 20th; ripe, September 15th ; size, 1⅝x1¼ ; color, purple ; suture distinct ; stone medium, cling ; good ; fruit badly affected by plum rot ; not equal to Lombard.

Whittaker.—Planted 1896 ; makes a very strong vigorous tree ; foliage healthy ; blossomed May 27th ; ripe, August 30th ; size, 1⅜x1 3-16 ; color, bright red and covered with yellow dots; suture obscure . slightly pointed ; stone medium cling ; quality inferior ; not desirable.

Weaver.—Planted 1896 ; makes a very strong growth, but subject to have limbs die ; foliage healthy ; blossomed May 23rd, but fruit did not mature.

Wyant—Planted 1898 ; tree a slow, compact grower ; blossomed may 25th ; ripe September 21st ; fruit round, small 1 x1 ; color red ; cling stone ; not desirable where Europeans can be grown.

RASPBERRIES.

Notes by A. W. Peart,

(Burlington Station.)

Under test at this station are : All Summer, Columbian, Conrath, Cuthbert, Eureka, Gault, Golden Queen, Gregg, Hilborn, Japan Wine, Kansas, Kenyon, Lotta, Loudon, Lovett, Marlboro, Miller Mills, Ohio, Older, Palmer, Phœnix, Progress, Redfield, Reliance, Shaffer's Colossal, Smith's Giant, Royal Church, Souhegan, Thompson and Winant.

Of these, the old Marlboro still takes first place as a commercial variety. It requires, however, careful manuring and cultivation to ensure good canes, as it is a light grower. Alongside of this the Miller, a new variety of the same season, seems to stand. The Loudon, a new variety here, of same season as the Cuthbert, competes with the latter as a late berry, although like the Marlboro it grows a somewhat light cane. So far the above four stand at the head of the red varieties.

Of the *Purple sorts* the Columbian leads, being both hardier and more vigorous than the Shaffer. Both are productive.

Among the *Black varieties* Smith's Giant, Kansas and Older take the lead in the order named. Kansas is slightly subject to the rust, otherwise it has a fine record. Smith's Giant is a very strong, vigorous grower, hardy and productive, ripening from a week to ten days later than the Kansas.

Of the *Yellow varieties* Golden Queen is without doubt, the best. All Summer is peculiar in that it fruits along from early in July until the first frosts come. That is a reason, however, why it has no commercial value, as at no time is there very much fruit on the bushes, and besides, "everything in its season." Japan Wine, while a curiosity on account of its striking appearance, is of no use commercially, since it is not productive, and freezes to the ground every winter. Japan Mayberry froze out as well as Eureka.

As with the blackberries, the raspberries are banked up with the plough in the fall. During the following season the cultivator should be kept going until the fruit ripens. Summer pruning is done in late July and early August, cutting the ends of the new canes back to make them stocky and throw out side branches. The annual pruning is made in March, removing the old canes, thinning out the new ones, and cutting back those left, as well as the laterals, where necessary. Nitrate of soda is applied in the spring, 200 pounds per acre, just after growth is started. It should be sprinkled adjacent to, but not in contact with the roots, as it is very strong and concentrated. My practice is to scatter it along each side of the row, fairly close, then work it in with the hoe and cultivator. Prices of reds averaged about 10 cents, of black and purple 8 cents, and of yellow 6 to 7 cents.

NOTES BY A. E. SHERRINGTON.

(*Lake Huron Station.*)

In this district the raspberry crop was a very disappointing one this season. The extremely hot and dry weather during June and July literally dried the fruit up before being fully matured, and a large number of varieties have failed entirely, showing a weakness in vigor and constitution. A new plantation will be set out next spring of such varieties as have shown by their vigor, hardiness and productiveness to be worthy of further trial, and all inferior varieties will be discarded.

All Summer.—Plants hardy and healthy, of dwarfish habit, very bad for suckering; fruit ripening all through the summer, making it impossible to keep record of yield; will be discarded.

Brandwine.—An early red variety, rather weak in growth; very small and soft; quality medium; yield 5¾ quarts; ripe July 8th.

Caroline.—Plants hardy, healthy and vigorous; fruit yellow, small and very soft, of the poorest quality; yield 12¼ quarts; ripe July 16th; will be discarded.

Cuthbert.—Canes strong, healthy, hardy and vigorous; fruit dark red, large, firm and of the very best quality; yield 8½ quarts; ripe July 16th; the best variety under cultivation.

Carpenter's Early.—A black cap of rather weak growth, and a little tender; berry medium to small; quality fair; yield 2½ quarts; ripe July 16th.

Conr ith.—Plants strong, vigorous and hardy; berry large; color black; quality good; yield 8½ quarts; ripe July 16th; a very promising variety.

Columbian.—Plants not so vigorous as represented; a little tender; fruit large, firm; fair quality; color purple; yield 4½ qts., ripe July 24th.

Golden Queen.—Plants strong, healthy and vigorous; fruit yellow, large, firm and of good quality; yield 4 quarts; ripe July 18th; the best light colour variety.

Marlboro.—Plants of dwarfish habit; canes strong, fairly hardy; fruit large, firm; color bright red; fair quality; yield 9 quarts; ripe July 8th.

Miller.—A red variety of great promise; plants hardy and quite vigorous; berry medium and large, firm of very good quality; yield 8 quarts; ripe July 12th.

Older.—Plants spreading, moderately vigorous and hardy; fruit large to very large, black and of good quality; yield 12¾ quarts; ripe. July 16th; very promising.

Ohio.—Plants half hardy, moderately vigorous; fruit, medium, black; quality good; yield 2¾ quarts; ripe July 16th.

Progress.—Plants medium in vigor, hardy; fruit, small; quality not good; yield 1½ quarts; ripe July 16th.

Phoenix.—Plants moderately vigorous, hardy and healthy; color bright red; berry medium to large, firm; quality good; yield 14¾ quarts; ripe July 18th; a good one.

Redfield.—Plants good growers and hardy; fruit small, soft and of the poorest quality; color purple; yield 1 quart; ripe July 16th; will be discarded.

Reliance.—Canes small and weak; fruit small and soft; quality medium; yield 5½ quarts; ripe July 8th.

Smith's Giant.—Plants very vigorous; canes strong, moderately hardy and productive. fruit borne in clusters of the largest size; black; quality good; yield 9¼ quarts; ripe July 17th

Shaffers Colossal.—A strong, vigorous grower, rather tender for this district; fruit large; quality good, a little tart; color, purple; yield 5 quarts; ripe July 16th.

Souhegan.—Plants moderately vigorous, rather tender; fruit black; quality medium; berry medium to large; yield 2¼ quarts; ripe July 16th.

Turner.—Piants hardy, healthy, moderately vigorous; fruit red, rather small; quality good; yield 8 quarts; ripe July 8th; one of the best early varieties.

Thompson.—An early red variety, hardy, healthy and fairly vigorous; fruit a little soft, fair size, quality very good; yeild, 3¾ quarts; ripe July 8th.

Taylor.—Plant a rather weak grower, half hardy; fruit black, small and soft, quality medium: yield 2¾ quarts; ripe July 16th.

Varieties that have failed. Brinckle's orange, Hansell, Loudon, Rancocas, White Champlain, Superlative, Gregg, Gault, Kansas, Lovett, Lottie, Mammoth Cluster, Pioneer.

STRAWBERRIES.

NOTES BY E. B. STEVENSON.

(*Strawberry Sub-station.*)

The season that has just passed was on the whole a favorable one. The spring was somewhat late and shortly after spring opened up dry weather set in and May and June were dry. Thus, though the vines came through the winter in good shape, there was a lack of the necessary moisture for the plants to do their best and yield as large a crop as they were capable of doing under more favorable circumstances, so that the picking season was considerably shortened on

this account. But, on the other hand, the prices were good throughout the whole picking season. Thus, though the crop was not as large as some seasons, the prices were considerably above the average, the growers making as much, if not more, out of their crop. There was very little rust on any of the kinds.

Several new varieties have been offered to the public and very great claims made for them. Among the early ones it is claimed that Johnson's Early and August will take the place of Michel's Early and Beder Wood and those of the Crescent family. I have both this kinds in my trial plot and will be able to report on them next season, both have made a good growth ; also among the late varieties we have the Klondike that will come in competitien with the Woolverton, Brandywine and Gandy, but it will be a difficult matter to displace these fine late sorts from their position as the best of the late kinds. Among the other new ones that are very highly spoken of are the Miller, Salem, Senator, Dunlop, Gibson, Pennell and others, I will be able to report on these after the next fruiting season. The old standards did well viz : Bubach, Haverland, Clyde, Warfield, Williams, Saunders, Van Deman. The Bubach plant is weakening, not as vigorous as it was a few years age.

Annie Lawrie —(Perfect). Very best quality ; fine bright large berry ; not prodnctive enough to grow for market.

Bubach No. 5.—So well known that it needs no description, save to say that it did well, held its place as one of the largest berries.

Benoy (Perfect).—This is a seedling of Mr. Benoy of Indiana, from Bubach & Jessie. Plant strong, good grower, healthy, no rust ; the berry is large, good quality ; it did well the past season.

Bismarck (Perfect).—Plant resembles the Bubach, its parent, very much ; a good grower, healthy ; berry very large, roundish, and beautiful looking ; a good variety, well worth growing.

Bird (Imperfect).—A seedling of Manchester and Mt. Vernon, grown by W. F. Bird, of Ann Arbor, Mich. A very strong, healthy grower ; runs well ; the berry is good size, roundly conical ; productive ; good quality.

Boynton (Imperfect).—This is no doubt a seedling of the Crescent, which it very much resembles both in plant and berry and style of growing and season of ripening almost identical with Crescent.

Brandywine (Perfect).—A very vigorous, strong grower, making wide row ; healthy plant ; fruit large, firm and best quality, with some people not as productive as it is on other soils, but a satisfactory variety on the whole.

Bubach No. 3298.—A seedling of Bubach, from the Missouri Experimental Station ; the plant resembles its parent very much, healthy, good grower, plant vigorous ; fruit large ; not as productive as Bubach.

Clyde (Perfect).—The most favorable reports from all quarters come speaking very highly of the Clyde ; I have now fruited the Clyde for seven or eight years and I still consider it the best of all for the market grower. I find in some sections it is not very well known, but where well known it is being grown altogether. The plant is the strongest and healthiest, good grower, makes lots of plants, very productive and the berry is the largest, good quality and firm enough to ship ; as firm as the old Crescent. I consider this the most profitable variety for the market grower ; it is early, ready to pick two or three days after the Michell.

Clyde No. 800 (Perfect).—A seedling of the Clyde, grown by E. B. Stevenson of Ontario. The plant is strong, vigorous and healthy resembling its parent ; productive ; would like to give another year's trial before reporting on it.

Carlie (Imperfect).—This variety is of the Haverland type ; both plant and berry resembles the Haverland ; it bore a very good crop of large long berries a little firmer than Haverland.

Crescent No. 1801 (Imperfect).—This is a seedling of the Crescent, grown by Horticulturist at Experimental Station of Missouri and sent to me for trial. The plant is very much like the Crescent. The berry is somewhat firmer and later ; it did well the past season.

Cobden Queen (Perfect).—Seedling of Wilson, by John McCaffrey of Illinois ; a good, healthy grower ; making plenty of plants ; fairly productive the past year.

Downy's Bride (Imperfect).—The plant is a strong grower and healthy and quite productive ; the berry is large, regular in shape, conical, bright red and good quality ; well worth a trial by growers.

Eleanor (Perfect).—Very early ; productive ; dark in color ; a very good early sort.

Earliest (Perfect).—This very much resembles the Michell's Early in every respect ; in fact it would be hard to point out any difference between them. It no doubt is a seedling of Michell's Early.

Excelsior.—This variety was greatly praised on its introduction as a very early berry ; it is early, but it is very poor in quality ; the plant is small, making many plants ; the fruit is medium to small in size ; fairly firm, round in shape, medium in productiveness ; no good reason that I can see why it was put on the market ; many others much better.

Emperor (Perfect).—This is a seedling grown by the late John Little of Granton, Ont., and introduced by M Crawford of Ohio ; a strong, healthy grower ; plant shows no rust ; the berry is large, bright somewhat irregular ; at least the first berries are medium in productiveness ; mild, pleasant flavor ; will be grown by those desiring large, fine looking fruit.

Empress (Perfect).—This is also a seedling of the late John Little's, also introduced by Mr. Crawford; it is very similar to the Emperor in most respects; same in shape, a little darker in color, and perhaps better flavor; well worth a trial.

Geisler (Perfect).—This variety again has done well; it is one of the first in bloom; the flowers are very rich in pollen; plant is strong, vigorous and healthy; the berry is large, long and blunt at the end, resembling the old Mary; a good one for fertilizing early blooming pistillates.

Glen Mary (Perfect).—This has done well again this year; plant healthy, strong grower and vigorous; bore a large crop of immense sized berries; sometimes the end of the berry is hard and green and seedy, which is against its appearance, not first-class in quality, but is one of the largest berries now grown.

Greenville (Imperfect)—This variety has done well, producing a good crop of fine-looking berries; it has succeeded well wherever tried; no mistake can be made in planting the Greenville.

Gladstone.—A good grower; plant healthy; berry large, and good flavor; desirable.

Haverland (Imperfect)—An old stand-by; has done well this year; does not seem to lose any of its vigor: bore a large crop of finest berries; it is so well known that it needs no description from me.

Hall's Favorite (Perfect).—A good grower and healthy plant; berry is of the Splendid type; quite productive; it is not as good a variety as the Splendid.

Hunn (Imperfect).—A seedling sent out by the New York Experiment Station; the plant is a strong one and good grower; its greatest and perhaps only fault is that sometimes it rusts quite badly, though in some places report says it does not rust at all. It is a very late variety; good bearer; the berries are dark red in color, roundish in shape, quite firm and fair quality.

Jersey Queen (Imperfect).—Plant strong and healthy; no rust ever on it; the plant bears a good crop when properly fertilized; it is very late in ripening; the berry is large roundish in shape; bright color with golden seeds; one of the most desirable late sorts; the quality is good; well worth growing for market.

Jerry Rush (Perfect).—A seedling of Bubach and Jessie; grown by Mr. Benoy of Indiana; plant a strong healthy grower; makes plants freely; the berry is large, roundly conical; good bright crimson in color, good flavor and fairly productive; it is very highly spoken of by some growers.

Klondike (Perfect)—The plant is a good grower and bore a large crop; it belongs to the late ones; it is fairly productive for a late one and will be useful as a fertilizer for late varieties as Gandy, Jersey Queen and Hunn. The berries are not as handsome in appearance as Gaudy and Jersey Queen, but it will prove a useful variety for those who wish to grow late sorts.

Lovett (Perfect).—A strong grower, generally healthy, had some rust the past season; quite productive; berry conical, firm and good color, fair quality: there are others I consider better than this one, it does very well on some soils.

Leo.—This variety did not do well this year. I will give it a further trial and report.

Lord Sheffield (Perfect).—This is an English variety; it is an extra early and a very good one. The plant sometimes rusts, but makes a good growth of plant; the berry is roundly conical, large, bright red; quite productive; a fine early variety, larger and more productive than Michel and quite as early.

Margaret (Perfect).—One of the best crops of strawberries I ever saw was on the Margaret. The plant is strong, healthy and vigorous, it did very well this year again; does its best in very rich soil and well repays any extra work you may give it; finest berries, bringing highest price; I would like to make its excellencies known more widely than they seem to be.

Marshall (Perfect).—The Marshall does not make many plants; perhaps enough for fruiting: the berries are fine and very large, ripening quite early, the earliest very large variety; this is a good variety for amateurs to grow, who can give an extra amount of petting to it; not profitable for market growers

Michell's Early (Perfect).—This variety is being discarded by most growers, still it bears paying crops on some soils, growers saying they can make as much out of the Michell as any other, on account of its earliness and because it ships well Sometimes late frosts catch the blossoms and thus ruins the crop. The Michell is being replaced in many places by the Clyde.

Maximus—I would like to give this another trial before reporting on it. I do not believe it did its best the past year; it has good points about it; I will try it another year.

Mastodon (Imperfect).—This variety did well, bearing a good crop of the largest and finest berries; plant strong, healthy, berry very large, bright scarlet in color; medium in firmness; good quality; a very desirable sort.

Morgan's Favorite.—Plant is large and healthy, does not make many plants, is quite productive; the berry is conical in shape and bright red in color and fine flavor; worth a trial.

McKinley (Perfect).—This new variety did very well the past season. The plant is strong and vigorous as well as healthy and quite productive: the berry is good size, of conical shape, good color, firm and fine; it is worth giving a trial; I believe it will prove desirable.

Nick Ohmer (Perfect).—This is a good one ; the plant is healthy, strong and quite vigorous, making plants freely that take root without any difficulty ; it is an ideal plant maker. The fruit is large in size, conical in shape, firm and very good quality ; the plant is quite productive. It wants good soil and good cultivation and will repay such favors ; would advise growers to try the Nick Ohmer.

Noble (Perfect).—The plant is healthy and fairly vigorous ; does not produce enough to make it profitable ; the fruit is very large, roundish, bright red in color, firm and very good quality. It is an English variety, grown by Mr. Saxton, of England.

Pride of Cumberland.—A desirable variety, judging from once fruiting. The berry is large; good color ; firm. The plant is productive ; I believe it is a good one ; will give further trial.

Ruby (Perfect).—This one has done well with me ; it has had a large crop of very fine berries ; the plant has some rust ; the berry is conical, large, firm and good quality ; it is a mid-season variety.

Ridgeway (Perfect).—This has not done at well with me as in some other places ; it has not been productive enough ; some growers speak very highly of it ; it has failed with me ; will give a further trial.

Smith's (Perfect).—This is of the Michell type ; plant healthy, good grower, making plants freely ; very early, as early as the Michell ; only medium in size, but fairly productive for so early a variety ; I like it better than the Michell for an extra early.

Saunders (Perfect).—This one has done well again this year as indeed it has always done since I first tried it some five or six years ago. It is not so well known as the Williams, but it is a better sort than the Williams in several respects. It has a stronger plant. The berry ripens all over better than the Williams ; it is of the same season, ripening at same time ; would advise those who like the Williams to try the Saunders ; it is a seedling grown by the late John Little, of Ontario.

Seaford (Perfect)—The good things I said of the Seaford I repeat and add to—it is a variety that has taken first rank wherever it has been grown ; the plant is a strong and healthy grower ; quite vigorous ; the berry is large, good color, quite firm and very good quality ; the plant is very productive ; it is one of the best.

Sharpless (Perfect).—Did fairly well, as well as it ever does ; it is too shy a bearer ; the fruit is large and of best quality.

Star (Perfect).—Plant healthy ; good grower ; it is very like the Sharpless ; I do not think it is any improvement on the old Sharpless.

Sunrise (Perfect).—This failed again to do even fairly well ; will drop it for the future.

Splendid (Perfect).—Did very well ; it is early and large ; the plant is good runner, strong and healthy ; the berry is roundish, large, bright color, firm ; the plant is quite productive ; this is a profitable variety to grow ; a good shipper ; would advise a trial.

Staples (Perfect).—This is a good early kind ; will fertilize the Warfield and is a good one to grow with that variety, as the berry is very similar both in shape, size and color.

Stahalne (Imperfect).—Plant very free grower, making many plants and healthy ; fruit is roundly conical, medium to large in size ; good quality ; fairly productive.

Sample (Imperfect).—Plant is healthy, makes a good row of plants ; the fruit is large and fine in appearance, though not of best quality and on the soft side. It bore a good crop and will do well for near market. I am on the whole pleased with this variety ; it does not come up to what was claimed for it ; it was said to be the most wonderful berry of the 19th century , it is not that, but it is a good one.

Tennessee Prolific (Perfect).—This variety has done well again this year ; plant is healthy, good grower, making wide row, very productive ; berry, medium to large bright red, firm and carries well ; a first-class market sort ; has done very well wherever grown.

Vera (Imperfect).—Strong grower, vigorous and healthy ; no rust ever seen on it ; quite productive ; berry good size, conical in shape, looks well in the box and ships well ; bright glossy, firm and good quality ; not very extensively grown.

Van Deman (Perfect).—This is an early variety ; plant sometimes has some rust ; the season of the Van Deman is long, it is among the first to ripen and you can pick it with the latest ; the berry is conical in shape, firm, the very first quality ; a good early.

Warfield (Imperfect).—Plant good grower, but small, healthy and very productive ; berry medium in size, conical, dark color, firm and good quality where it has enough moisture ; one of the most profitable kinds.

Wm. Belt. (Perfect)—This is a good one. Plant good grower but rusts somewhat, is quite productive, berry is large, conical, fine-looking, firm and good quality. It does not do equally well in all places : with me it has done very well and is well worth growing ; berries bring highest price.

Williams. (Perfect)—Widely grown in Canada ; a good one but not as good as Saunders ; plant good runner and lies close to the ground ; plants are produced close together ; quite productive ; berry roundly conical, does not ripen at tip ; sometimes green and seedy ; is firm and ships well ; fair quality.

Woolverton. (Perfect)—A good one for fancy berries ; a good strong plant ; healthy ; blooms among the first ; rich in pollen ; berry is very large, conical in shape, mild and good quality ; medium to late in season ; I like the Woolverton.

New Varieties.

I have secured some new varieties, some of which are very highly spoken of. They will fruit with me the coming season, when I will report on how they do here. Among them are the following :—August Luther (P.), claimed to be the earliest; Bennett (Imp.); Gibson (P.), Howell No. 2 ; Johnson's Early (P.); Mrs. McDowell ; Miller (P.); New York (P.); Parsons' Beauty (P.); Pennell (P.) ; Rough Rider (P.) ; Sunshine ; Salem (P.) ; Senator Dunlop (P.); W. J. Bryan (P.).

Early and Extra Early Varieties.

As the result of this season's fruiting the first to ripen were Van Deman, Mitchell's Early, Smith's, Excelsior, Clyde, Staples, Lord Sheffield, Warfield, Marshall.

Medium early to mid-season :—Bismarck, Bubach, Haverland, Seaford, Tennessee Prolific, Splendid, Ruby, Mastodon, Nick Ohmer, Wm. Belt, Glen Mary.

Later Kinds.

The best are Margaret, Brandywine, Gandy, Hunn, Saunders, Williams', Woolverton, Aroma, Klondike.

Growers cannot go astray in choosing from the above list. The above are among the best and most profitable that have been offered to the public. The past two or three years strawberry growing has paid well, crops have been good and prices have kept up, so that more money has been made out of strawberries than any other small fruit.

CATALOGUE OF FRUITS AND FRUIT TREES FOR THE USE OF PLANTERS.

Showing their adaptability to the various parts of the Province, designed to aid planters in selecting suitable varieties.

APPLES.

Key to Quality:
1 Very Poor.
2–3 Poor.
4—5 Fair
6–7 Good.
8—9 Very Good.
10— First Class.

Key to Market Value.
1— 3 4th Rate.
4 6 3rd Rate.
7— 8 2nd Rate.
9—10 1st Rate.

Key to Adaptation:
*—Desirable.
**—Especially Desirable.
+—Promising.
0—Undesirable.
00—Not Hardy.

Key to Stations:
1. Southwestern.
3. Wentworth.
4. Burlington.
5. Lake Huron.
6. Georgian Bay.
7. Simcoe.
8. East Central.
9. Bay of Quinte.
10. St. Lawrence.
13. The Secretary's Fruit Farm.
14. Algoma.

Varieties tested at Bay of Quinte Station. W. H. Dempsey, Trenton.	Season in use.	Tree.				Fruit.					Adaptation.										
											Southern Stations.				Middle Stations.				Northern Stations.		
		Vigor, scale 1-10.	Hardiness, scale 1-10.	Productiveness, scale 1-10.	Total value of tree.	Quality, scale 1-10. Dessert.	Quality, scale 1-10. Cooking.	Value, scale 1-10. Home market.	Value, scale 1-10. Foreign market.	Total value of fruit	No. 1.	No. 13.	No. 3.	No. 4	No. 5.	No. 6.	No. 8.	No. 9.	No. 7.	No. 10.	No. 14.
APPLES.																					
Adams Pearmain	Jan.-Feb.	7	8	8	23	10	9	9	9	36	....	....	....	....	..	....	....	*	..	....	....
Albury	Aug.-Sept.	8	10	6	24	6	6	4	.....	16		....	..	*		..	..	*	0	....	....
Alexander	Aug.-Oct	10	10	8	28	4	9	9	9	31	0	*	*	*	*	*	*	*	**	*	....
American Golden Russet	Jan.-Mar.	8	10	6	24	8	8	7	9	32	*	*	*	*	*	*	**	0	*	*	...
American Pippin	Jan.-Mar.	8	9	6	23	7	8	7	8	30	....	....	....	....	....	....	*	*	..	..	..
Antonovka	Feb.-Mar.	8	8	8	24	7	7	4	4	22	....	....	....	....	....	....	....	0	....	....	....
Astracan	Aug.-Sept	9	10	8	27	8	8	7	1	24	*	**		*	*	**	*	0	0	*	....
Bailey Sweet	Nov.-Mar	6	8	8	22	4	8	4	4	20		....	....		0	*	..	0	....	....	....
Baldwin	Jan.-Mar	6	7	10	21	6	8	8	8	26	**	*	**	**	**	**	*	*	00	00	00
Beauty of Kent	Oct.-Nov	10	10	8	28	4	6	8	8	26		*	...		*		*	0	*	..	....
Ben Davis	Mar.-May	8	10	10	28	3	6	6	9	25	**	*	....	*	*	**	**	**	**	*	....
Benoni	July-Sept	8	10	8	26	10	8	4	7	29	....	....	..	....	..	*	..	0	....	....	....
Blenheim	Nov.-Mar	10	10	10	30	6	8	9	9	31	*	**	....	*	*	*	*	*	**	....	....
Blue Pearmain	Oct.-Feb.	8	10	6	24	8	7	8	9	32	.	0	....		....	....	*	....	*	*	....
Bogdanoff	Oct.-April	10	10	8	28	..	..	..	.....	....	....	....	....	....	..	....	....	....	....	..	....
Bonum	Dec.-Feb.	8	10	10	28	8	8	7	7	38	..	....	..	....	..	....	**	0	....	....	..
Boston Star	Oct.-Dec.	9	10	10	29	6	9	7	8	30	....	.	....	....	....	....	..	..	....	....	....
Bietigheimer		....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	*	0	....
Bismarck		....	....	....	....	....	....	....	....	....	....	....	....	....	*	....	....	*	....	....	....
Brockville Beauty	Aug.-Sept	7	8	10	25	9	9	7	.....	25	....	....	....	....	....	....	....	....	*	*	....
Cabashea	Oct.-Nov	10	10	5	25	2	6	6	6	20	*	0	....	*	*	*	0	0	0	....	...
Canada Reinette		....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	*	....	....

Canada Red	Dec.-Mar	8	9	10	27	7	8	8	.....	22	*	*	....	*	*	*	*	0	0	0	....
Cayuga Red Streak	Dec.-Feb	7	4	8	19	4	8	7	6	25	0	*	....	....	....	**	**	0	*	..	....
Cellini	Oct.-Nov	7	7	7	21	6	7	6	7	26	....	....	....	....	....	..	....	*	..	....	....
Chenango Strawberry	Sep.-Oct	6	7	7	20	9	7	7	.....	23	....	*	....	0	*	*	*	0	*	....	....
Colvert	Oct.-Nov	7	10	9	26	4	8	7	6	25	*	*	....	*	*	**	*	0	**	....	....
Cox's Orange Pippin	Dec.-Jan	4	7	7	18	10	9	9	9	37	..	....	....	....	....	....	....	**	.	....	....
Cranberry Pippin	Dec.-Feb	8	10	9	27	4	6	9	10	30	*	....	..	*	....	....	....	*	....	....	....
Early Harvest	July-Aug	7	8	8	23	8	7	6	.....	21	*	**	....	*	0	*	*	*	0	....	....
Early Joe	July-Aug	7	8	9	24	7	7	6	....	20	..	0	....	....	....	....	....	0	....	....	....
English Codling	Aug.-Sept	7	8	8	23	7	8	6	....	21	....	....	....	....	....	....	....	0	....	....	....
Fallawater	Jan.-Mar	10	10	5	25	5	8	8	9	31	*	....	....	0	*	*	....	0	*	....	....
Fall Jenneting	Sept.-Oct	9	9	9	27	5	6	4	4	19	*	*	....	....	....	....	....	0	..	**	....
Fall Pippin	Oct.-Dec	10	10	8	28	7	10	6	6	28	*	....	..	0	0	*	*	0	*	....	....
Fameuse	Sept.-Dec.	8	8	10	27	10	8	10	8	36	*	0	...	0	*	**	**	*	**	....	**
Gideon	Oct.-Dec	10	10	10	30	8	9	10	8	35	...	0	...	...	*	....	....	....	*	....	....
Golden Sweet	Aug.-Sept	10	10	10	30	2	4	1	.....	7	....	....	...	*	....	....	0	0	....	....	....
Golden White	Aug.-Sept	10	10	10	30	6	8	8	.....	22	....	0	....	....	....	....	...	0	....	....	....
Grand Sultan	Aug.-Sept	10	10	8	28	5	8	6	6	25	....	....	....	....	....	*	....	*	....	....	....
Gravenstein	Aug.-Sept	10	10	10	30	10	10	10	10	40	....	....	....	*	0	**	*	**	*	....	....
Green Newtown Pippin											....	**	....	....	....	....	....	00	....	....	....
Grimes Golden	Oct.-Mar	7	5	8	20	9	6	4	.. ..	....	....	....	....	0	*	*	*	0	00	....	....
Greening	Jan.-Mar	8	8	10	26	8	10	8	8	34	**	**	**	**	**	**	**	**	**	....	....
Haas	Sept.-Oct	9	9	9	27	2	6	6	4	21	....	....	....	0	0	*	**	0	*	*	....
Hare Pipka	Sept.-Oct	10	10	9	29	5	8	9	7	28	....	....	....	....	....	....	....	....	*	....	....
Hastings	Jan.-Feb	8	9	8	25	8	7	7	6	28	....	....	....	....	....	....	....	*	....	....	....
Hawthornden New	Oct.-Dec	8	8	8	24	7	7	8	8	30	...	....	....	....	....	....	....	*	....	....	....
Hawthornden Old	Sept.-Nov	7	8	8	23	5	7	5	7	24	....	....	....	0	....	0	....	*	....	....	....
Highland Beauty	Jan.-Mar	6	9	8	22	9	7	7	7	30	....	....	....	.	....	....	....	0	....	....	....
Holland Pippen	Aug.-Oct	8	8	7	23	6	7	6	5	24	....	....	....	*	....	0	*	0	....	....	....
Horn	Dec.-Mar	8	10	10	28	8	7	7	7	29	....	....	....	....	....	....	....	**	....	....	....
Hubbardston's Nonsuch	Dec.-Mar	8	10	9	27	6	7	8	8	29	....	....	....	..	....	....	0	**	....	....	....
Hurlbut	Dec.-Feb	7	9	7	23	8	8	8	8	32	.	....	....	....	....	....	....	**	**	....	....
Jonathan	Dec.-Mar	8	8	9	25	10	7	8	9	34	..	†	....	..	...	*	....	*	....	....	....
Kean's Seedling	Sept.-Nov	10	10	10	30	7	10	9	7	33	....	....	....	....	....	....	....	....	*	....	....
Kentish Fillbasket	Oct.-Jan	9	9	9	26	4	9	7	.....	20	....	....	....	0	*	*	*	0	*	....	....
King	Oct.-Feb	7	5	5	17	9	10	10	10	39	**	*	*	*	**	**	*	0	00	00	00
La Rue	Oct.-Dec	10	8	6	24	7	7	6	..	20	....	....	....	....	....	....	....	0	*	*	*
Lord Burleigh	Jan.-May	10	9	9	28	8	10	8	8	34	....	....	....	....	....	....	....	0	....	....	....
Lord Suffield	Aug.-Sept	6	8	9	23	4	7	5	3	21	....	....	....	....	....	....	....	0	....	....	....
Lowell	Sept	6	8	9	23	4	7	5	5	21	....	....	....	....	*	....	....	....	*	....	....
McIntosh Red	Nov.-Mar	9	10	10	29	10	8	8	7	32	....	†	....	..	....	*	0	*	*	....	....
Mann	Feb.-May	7	10	5	22	6	8	6	7	27	*	....	...	0	**	*	*	*	*	**	....
Maiden's Blush	Oct.-Dec	9	10	10	29	5	8	9	8	30	*	0	....	*	**	*	....	*	*	....	....
Margil	Nov.-Jan	6	7	9	22	10	8	7	7	32	....	....	....	....	....	....	....	*	....	....	....
Minkler	Jan.-April	9	10	8	27	6	7	8	8	29	...	....	....	....	....	...	**	*	....	....	....
Mother	Nov.-Jan	5	7	7	19	10	8	7	7	32	...	....	....	....	*	....	....	0	....	....	....
Mountain Beet	Sept.-Oct	8	9	8	25	6	6	5	.....	17	....	....	....	....	....	....	....	0	....	....	....
Mountain Tulip	Sept.-Oct	7	8	8	23	6	6	6	....	18	...	...	....	....	0	....	....	0	....	....	....
Munson Sweet	Oct.-Dec	10	10	10	30	1	3	2	.....	6	....	....	....	....	....	0	....	0	....	....	....
Northern Spy	Jan.-Mar	10	8	10	28	9	9	9	9	36	**	**	**	**	**	**	...	*	**	0	00
Northfield Beauty	Sept	8	9	9	26	9	8	9	.....	26	..	....	....	....	....	....	....	*	....	....	....

CATALOGUE OF FRUITS.—APPLES.—*Continued.*

Varieties tested at Bay of Quinte Station. W. H. Dempsey, Trenton.	Season in use.	Tree.				Fruit.					Adaptation.										
						Quality, scale 1-10.		Value, scale 1-10.			Southern Stations.				Middle Stations.				Northern Stations.		
		Vigor, scale 1-10.	Hardiness, scale 1-10.	Productiveness, scale, 1-10.	Total value of tree.	Dessert.	Cooking.	Home market.	Foreign market.	Total value of fruit	No. 1.	No. 13.	No. 3.	No. 4.	No. 5.	No. 6.	No. 8.	No. 9.	No. 7.	No. 10.	No. 14.
APPLES.—*Con.*																					
Oldenburg	Aug.-Sept	10	10	10	30	6	9	10	9	34	**	*	*	*	**	**	*	**	**	**	**
Ontario	Jan.-Mar	8	9	10	27	9	9	9	9	36	....	*	*	**	*	**	*	**	**	+	....
Pewaukee	Jan.-Mar	10	10	8	28	7	8	8	8	31	*	*	....	....	**	0	*	0	0	*	....
Princess Louise	Dec.-Feb	6	7	9	22	8	6	8	9	31	....	*	....	....	....	....	*	0	*	....	....
Plumb Cider	Oct.-Dec	8	9	10	27	4	4	4	.....	12	....	....	....	*	....	....	....	0	....	....	....
Rambo	Oct.-Jan	9	10	10	29	5	5	5		15	....	0	....	*	0	0	....	0	....	....	.
Rawle's Janet	Feb.-June	6	9	10	25	5	4	5	5	19	....	....	....	....	....	....	....	0	**	*	....
Ribston	Nov.-Mar	7	7	6	20	10	8	9	10	37	*	*	*	**	0	*	*	0	....	....	....
Peter																					
Roxbury	Jan.-May	7	7	8	22	6	7	8	8	29	*	*	*	**	*	*	....	*	*	....	....
Salome	Jan.-May	8	9	7	24	9	6	8	10	33	....	....	....	....	....	....	....	....	....	*	....
Sutton Beauty															*						
Stump	Sept.-Oct	8	8	8	24	6	6	6	5	23	....	....	....	....	....	....	....	0	....	....	....
Scarlet Pippin	Sept.-Dec	9	10	10	29	10	9	10		29	....	....	....	....	....	....	....	....	....	**	....
Seek No Farther	Dec.-Mar	8	8	8	24	7	7	8	8	30	....	*	....	*	0	....	0	*	*	*	....
Sops of Wine	Aug-Sept.	8	9	7	24	4	4	4	.....	12	....	....	....	....	0	0	....	0	....	....	....
Sour Bough	Aug.-Sept	10	9	8	27	2	7	8	....	17	....	....	....	....	0	....	....	....	....	....	....
St. Lawrence	Sept.-Oct	9	10	10	30	8	9	9	6	32	*	....	....	*	*	**	....	0	*	*	....
Stuarts Golden	Dec.-Mar	8	9	10	27	7	6	6	6	25	....	....	....	....	....	....	....	*	....	....	....
Stark	Feb.-May	10	10	10	30	4	7	7	8	24	*	....	....	....	....	....	....	**	**	....	....
Spitzenburg		6	8	6	20	10	9	8		....	*	0	....	*	*	*	....	0	....	....	....
Swaar	Dec.-Mar	8	8	7	23	8	7	8	9	32	0	0	....	....	....	....	*	0	....	....	....
Swazie	Nov.-Jan	7	8	9	24	9	8	5		22	*	*	....	*	*	*	*	0	*	....	....
Sweet Bough	Aug.-Sept	7	9	8	24	8	.....	5	....	13	....	*	....	*	*	....	....	....	*	....	....
Tolman Sweet	Dec.-April	10	10	9	29	6	6	4	4	20	**	*	....	*	*	*	*	*	*	*	....
Tetofsky	August	9	10	5	24	7	9	6	....	22	....	....	....	....	0	0	....	....	0	....	....
Utters Red															*			0	....	....	....
Wealthy	Sept.-Dec.	9	9	10	28	9	8	9	8	33	*	*	....	*	*	*	**	**	*	**	+
Wagener	Dec.-Feb	7	8	10	25	9	8	9	7	32	*	*	....	*	**	*	....	*	*	....	....
Winesap	Dec.-May	6	8	9	23	7	5	7	7	36	....	....	....	....	....	....	....	....	....	....	....
Wolf River																			*	*	+
Walbridge																0	0	0	0	....	....
Yellow Transparent	August	10	10	8	28	6	8	6	.....	20	*	*	....	....	*	*	*	*	*	*	**
Yellow Newton																		*	00	....	....
Yellow Bellefleur	Dec.-Mar.	6	8	5	19	9	8	7	...	24	....	0	....	*	*	0	....	0	*	*	.

CATALOGUE OF FRUITS—BLACKBERRIES—RASPBERRIES.

Tested at Burlington Station.	Season in use.	Bush.				Fruit.					Adaptation.											
						Quality, scale 1-10.		Value, scale 1-10.			Southern Stations.					Middle Stations.				Northern Stations.		
		Vigor, scale 1-10.	Hardiness, scale 1-10.	Productiveness, scale, 1-10	Total value of Tree.	Dessert.	Cooking.	Home market.	Foreign market.	Total value of fruit.	No. 1.	No. 2.	No. 3.	No. 4.	No. 13.	No. 5.	No. 6.	No. 8.	No. 9.	No. 7.	No. 10.	No. 14.
BLACKBERRIES.																						
Agawam	July 27-Aug. 10	9	10	8	27	6		6		12	*			*	*	*						
Ancient Briton	" 21- " 5	7	9	7	23									0								
Childs' Tree	" 20- " 6	7	9	7	23									0								
Dorchester	" 23- " 5	9	9	7	25	7		7		14				0								
Early Cluster	" 25- " 10	9	10	7	26	7		7		14	0			0								
Early Harvest	" 13- " 1	7	7	9	23	6		8		14	0			*	*							
Early King	" 12- " 1	7	9	8	24	8		8		16				+								
Eldorado	" 23- " 5	8	8	7	23	9		8		17	*			0								
Erie	" 23- " 5	9	10	7	26	7		8		15	0			*	*							
Gainor	" 23- " 5	9	10	9	28	10		9		19	*			+								
Kittatinny	" 23- " 15	10	9	10	29	10		10		20	**			*	*							
Lovett's Best	" 30- " 10	8	10	8	26	6		5		11				0								
Maxwell	" 20- " 1	5	7	5		5		8		13				0								
Minnewaski	" 25- " 5	8	8	6	22						*			0								
Ohmer	" 23- " 5	9	10	7	26	8		8		16				+								
Snyder	" 18- " 1	7	10	8	25	8		8		16	*			*	*							
Stone's Hardy	" 23- " 5	7	10	8	25	8		8		16	0			+	*							
Taylor	" 23- " 5	9	10	7	26	9		7		16	*			*	*							
Wachusetts	" 23- " 10	9	10	6	25	10		7		17	0			0								
Western Triumph	" 23- " 5	10	10	8	28	8		9		17	0			*								
Wilson's Early	" 20- " 5	7	9	7	23	8		9		17				0								
Wilson, Jun	" 20- " 5	10	8	6	24									0								
RASPBERRIES.																						
All Summer	July 8-Oct. 15	6	9	7	22	8		8		16				*		0						
Columbia	" 13- " 28	9	10	9	28	7		8		15				*		0						
Cuthbert	" 13- " 31	10	10	8	28	10		10		20	**			**	**	**						
Golden Queen	" 5- " 20	8	10	7	25	9		6		15	*			*	*	0						
Gregg	" 13- " 31	9	10	7	26	7		7		14	*			*	*	*						
Hilborn	" 5- " 20	8	9	7	24	6		7		13	**			*	*	**						
Japan Wine	" 25- " 31	8	6	4	18	5		5		10				00		0						
Kansas	" 5- " 20	9	10	9	28	10		8		18	**			**		*						
Kenyon	" 12- " 25	7	8	7	22																	

CATALOGUE OF FRUITS—RASPBERRIES—CHERRIES.

Tested at Burlington Station.	Season in use.	Tree or bush.				Fruit.					Adaptation.												
						Quality, scale 1-10.		Value scale 1-10.			Southern Stations.					Middle Stations.				Northern Stations.		
		Vigor, scale 1-10.	Hardiness, scale 1-10.	Productiveness, scale 1-10.	Total value of Tree.	Dessert.	Cooking.	Home market.	Foreign market.	Total value of fruit.	No. 1.	No. 2.	No. 3.	No. 4.	No. 13.	No. 5.	No. 6.	No. 8.	No. 9.	No. 7.	No. 10.	No. 14.
RASPBERRIES.—*Con.*																						
Lottie	July 10-Oct. 25	8	8	7	23	....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0	...	....	..	...	....	...
Loudon	" 13- " 31	8	10	8	26	8	.....	8	....	17	*	.....	...	*	....	*	...	....	....	...	....	....
Lovett	" 10- " 25	7	9	7	23	6	.....	8	....	14	...	....	....	0	....	0	...	....	....	...	....	....
Marlboro	" 5- " 25	7	10	10	27	2	.....	10	...	17	0	..	...	**	**	*	....		...	...	....	
Miller	" 12- " 23	6	9	7	22	....	.....	.....	.....	.....	.....	.....	.....	*	.....	*	.....	.....	.....	.....	.....	.....
Mills	" 9- " 20	8	9	7	24	....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	..	...	.....	.....	.....	.....
Ohio	" 3- " 31	9	10	8	27	9	....	8	.....	17	.....	.....	.....	*	...	*	.....	.....	.....	.....	.....	.....
Older	" 8- " 25	8	9	6	23	4	....	8	.....	12	.....	.....	.....	*	.....	*	.....	.....	.....	.....	*	.....
Palmer	" 1- " 20	8	10	8	26	9	....	8	.....	17	*	.....	.....	*	...	.....	....	....	...	....	..	....
Phœnix	" 11- " 25	5	9	7	21	..	....	....	.....	.....	*	.....	.....	.....	....	*	.....	.....	.....	.....	.....	.....
Progress	" 3- " 20	8	10	5	23	8	.....	8	.....	15	.....	.....	.....	.....	...	0	.....	.....	.....	.....	.....	.....
Redfield	" 10- " 20	8	10	7	25	0	.....	8	.....	17	.....	.....	.....	+	....	0	.....	.....	.....	.....	.....	.....
Reliance	" 3- " 31	8	10	8	26	9	.....	9	.....	18	.....	.....	.....	+	....	0	.....	.....	.....	.....	.....	.....
Royal Church	" 13- " 31	6	9	7	22	..	.....	....	.....	....	0	..	....	....	....	0	...	....	....	..	....	....
Shaffer's Colossal	" 10- " 25	9	8	7	24	5	.....	8	..	13	*	.....	...	*	*	*	.....	.....	.....	.....	.....	.....
Smith's Giant	" 13- " 31	10	8	9	27	8	....	8	.....	16	.....	.....	.....	+	+	*	.....	.....	.....	.....	.....	.....
Souhegan	" 8- " 20	7	10	7	24	7	.....	8	.....	15	.....	.....	.....	*	...	*	.....	.....	.....	.....	.....	.....
Thompson	" 8- " 31	6	10	6	22	5	.....	7	.....	12	.....	.....	.....	.....	...	.....	.....	.....	.....	.....	.....	.....
Winant	" 10- " 25	5	7	3	15	.....	.....	.....	.....	.....	.....	..	....	0	....	.....	.....	.....	.....	.....	..	....
CHERRIES. Tested at Maplehurst.																						
Choisy	June 24-July 4	6	9	4	19	10	4	5	4	23	...	..	....	...	*	....	...	....	....	...	..	....
Cleveland	" 15 to 25	9	8	8	25	10	5	9	8	32	..	....	....	....	**	....	....	....	....	....	....	..
Coe	" 25-July 6	10	8	6	24	6	5	5	2	19	*	....	....	....	0	....	....	....	....	....	....	....
Dyehouse	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	**	.....	.....
Eagle	July 1 to 10	7	8	4	29	10	4	4	8	7	...	....	....	...	0	....	....	....	....	**	....	....
Early Purple	June 15 to 25	9	9	5	23	8	2	8	8	26	...	....	....	...	*	....	..	....	....	....	....	....
Elkhorn	July 10 to 20	8	8	10	26	5	6	10	10	21	...	....	....	...	**	....	..	*	....	....	....	....
Elton	.....	7	8	8	9	9	8	8	.....	.....	*	.....	.....	.....	*	.....	.....	.....	.....	.....	.....	.....
English Morello	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	..	...	....	....	...	*	*	...	....	*	..	....
Eugenie	June 20 to	9	10	7	26	0	10	6	6	28	.....	.....	.....	.....	*	.....	.....	**	..	.....	.....	.....
Hortense	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	*	.....	.....	.....	.....	.....	.....
Kentish (late)	.....	4	10	4	18	2	7	6	6	21	**	.....	....	....	*	*	*	....	....	*	*	....
Knight	June 20 to 30	7	8	6	21	10	5	9	9	33	..	**	....	....	*	....	....	....	....	....	....	....

Kosloy Morello	July 10 to														†								
Late Duke																*							
Magnifique																							
May Duke	July 15 to 30	8	9	7	24	7	10	9	8	34	*	**			**	*	*	*					
Mazzard	July 1 to 12	10	10	4	24		2	2		4	0				6								
Mezel	July 4 to 14	10	8	10	28	8	7	10	10	35					**								
Montmorency	July 1 to 10	6	10	8	24	3	9	7	7	26	**	**	**	*	**	*	**	**		*			
M. Ordinaire																**	**						
Napoleon	July 4 to 12	9	8	10	27	5	8	9	9	31	*	*			**								
Olivet		8	10	7	25	4	10	7	7	28	*				**	*							
Orel 24																				*			
Ostheim	July 8 to 16	4	10	7	21	4	8	7	7	26					*	*				**	*	†	
Philippe		8	8	8		6	9				*												
Richmond	June 20 to 30	4	10	6	20	3	9	7	7	26	**				**	**	*			*	*	†	
Rockport															0								
Spanish	July 4 to 12	10	8	6	24	8	8	8	8	32	*	*			**	*		*					
Tartarian		8	8	7	23	10	7	10	10	37	*	**			**		*	**		0			
Vladimir												*											
Windsor		8	10	8	26	8	5	10	10	33	**				**	*				0	*		
Wood	June 20 to July 4	7	8	8	23	10	5	8	7	30	*				**		*						
Wragg															*	*							
CURRANTS. Tested at Burlington.																							
Belle de St. Giles	July 8—13	7		5	12	9		10						*									
Black Victoria	" 8—20	9		6	15			9						*									
Brayley's Seedling	" 8—13	7		8	15	6		8		14				†									
Champion	" 20—31	10		9	19			10			*			*		*							
Cherry	" 6—12	8		9	17	9		10		19	*			**	**	*							
Collin's Prolific	" 20—31	10		5	15			9						0									
Fay's Prolific	" 7—12	6		7	13	7		9		16	*			*	**	*							
Lee's Prolific	" 12—20	8		8	16			9			*			**	**	*							
Naples	" 12—20	9		9	18			9			*			**	*								
New Victoria	" 4— 8	7		6	13									0									
North Star	" 7—12	7		7	14	7		9		16				0	00								
Pomona	" 4— 8	7		5	12																		
Raby Castle	" 11—16	8		10	18	7		8		15	*			*	*						*		
Red Cross	" 7—12	7		7	14	8		6		14	*			*									
Red Dutch	" 4— 8	8		7	15	7		7		14				*									
Red Victoria	" 7—12	8		9	17	9		9		18	*			*							*		
Saunders	" 12—20	9		6	15									*	**								
Versailles	" 7—12	7		6	13	7		8		15	*			*	*								
White Grape	" 7—12	8		8	16	7		7		14	*			†	0	*							
White Imperial	" 7—12	8		7	15	10		8		18				†									
Wilder	" 7—12	8		8	16	7		10		17	*			*									

All hardy thus far.

(*a*) Those varieties left blank not as yet sufficiently tested.

CATALOGUE OF FRUITS—GRAPES.

Key to Quality:
1 Very Poor.
2—3 Poor.
4—5 Fair.
6—7 Good.
8—9 Very Good.
10 First Class.

Key to Market Value:
1— 3 4th Rate.
4— 6 3rd Rate.
7— 8 2nd Rate.
9—10 1st Rate.

Key to adaption:
*—Desirable.
**—Especially Desirable.
†—Promising.
0—Undesirable.
00—Not Hardy.

Tested at Wentworth Experimental Station by M. Pettit, Winona.	Season in use.	Tree.					Fruit.			Adaptation.											
										Southern Stations.					Middle Stations.				Northern Stations.		
		Vigor, scale 1-10.	Hardiness, scale 1-10.	Productiveness, Scale 1-10.	Freedom from disease, scale 1-10.	Total value of Vine, max. 40.	Quality, scale 1-10, Dessert.	Value, scale 1-10. Home Market.	Total value of Fruit.	No. 1.	No. 2.	No. 3.	No. 4.	No. 13.	No. 5.	No. 6.	No. 8.	No. 9.	No. 7.	No. 10.	
Adirondac	September	3	2	2	2	9	9	2	11	....	..	0	....	....	....	..	..	....	....	....	....
Agawam (Rog. 15)	Oct.-Nov	9	9	8	4	30	9	9	18	**	**	**	*	**	....	....	**	....	....	....	....
Alvey (Hagar)	October	7	8	6	8	29	2	2	4	....	....	*	....	....	....	....	....	....	....	....	....
Amber	"	6	6	3	4	19	2	2	4	....	....	0	....	....	....	....	....	....	....	....	....
Amber Queen	Oct.-Nov	7	6	5	6	24	6	5	11	....	....	0	....	....	....	....	0	....	....	....	....
Aminia	September	6	8	7	7	28	6	.....	....	....	...	*	....	....	....	....	....	....	....	....	....
America	October	8	9	6	7	30	2	.....	.....	....	....	0	....	....	....	...	*	....	....	....	....
August Giant	September	8	8	7	8	31	5	5	10	....	....	0	....	0	....	....	....	....	....	....	....
Bacchus	October	9	9	8	8	34	2	.....	.....	....	...	0	..	0	....	....	....	....	....	..	....
Barry	"	9	9	8	7	33	7	7	14	*	....	*	*	....	....	....	....	....	....	..	....
Berckman's	September	6	6	5	7	24	7	.....	.....	....	....	*	....	....	....	....	....	....	....	....	....
Black Delaware	"	4	7	4	7	22	8	.....	.....	....	....	0	....	...	....	....	....	....	....	....	....
Black Eagle	"	7	5	6	6	24	8	..	....	....	....	0	....	...	....	....	....	....	....	....	....
Black Pearl	"	9	9	9	9	36	2	2	4	....	....	0	....	....	....	....	....	....	....	....	....
Brighton	"	8	10	7	6	31	8	7	15	*	*	*	0	**	*	**	*	....	....	..	....
Brilliant	"	8	8	7	7	30	7	.....	.....	....	....	*	....	....	....	...	....	....	....	....	...
Cambridge	October	8	8	8	6	30	8	.....	.....	....	....	*	....	....	....	....	....	....	....	....	....
Catawba	Oct.-Nov	8	10	8	5	31	10	.....	.....	*	*	*	0	*	....	....	....	....	....	....	....
Colerain	September	7	7	8	8	30	8	10	20	....	....	....	....	....	....	....	....	....	....	....	....
Concord	Sept.-Oct	10	10	10	9	39	6	10	16	**	*	**	**	**	**	*	*	....	....	*	....
Cottage	September	6	8	3	8	25	4	4	8	....	..	0	...	....	....	....	....	....	....	....	....
Clinton	.....	.....	.....	.....	.....	.....	.....	.....	.....	0	*	....	0	0	**	0	*	....	....	....	..
Crevelling	September	10	10	6	6	32	6	4	10	....	..	....	....	*	....	....	....	....	....	....	....
Croton	"	6	7	6	6	25	8	... ..	....	....	....	0	....	..	....	....	....	....	....	....	....
Cynthiana	October	7	8	5	6	26	2	... ..	. .	....	....	0	....	....	....	....	....	....	....	....	....

Delaware	September	5	8	8	6	27	10	10	20	**	*	**	**	**	*	*	**			*	
Diana	October	9	9	7	6	31	6	6	12	0		*		*							
Dracut Amber	September	6	9	7	6	28	2	4	6			0									
Dr. Collier	October		8	8	7	30	4					*									
Duchess	"	6	5	6	8	25	5	6	11			0		*			0				
Early Ohio	August	7	8	8	8	31	5					*					**				
Eldorado	September	8	8	6	7	29	9	6	15			0	0								
Empire State	"	7	8	4	7	26	4	4	8	0	0	0		*			†				
Eumelan	"	6	7	6	7	26	7	5	12	0		0									
Goethe (Rog. 1)	October	9	9	8	8	34	4	7	11					0							
Herbert										*	**	*					0				
Jefferson	Oct.-Nov.	4	5	5	7	21	6	6	12			0									
Janesville												0		*			**				
Jessica												0	0	*						*	
Lady	September	2	10	2	6	20	8	8	16				*	**			0				
Lady Washington	October	9	9	7	5	30	4	4	8		0	0		0							
Lindley (Rog. 9)	September	9	10	8	8	35	9	9	18	**	**	**	*	**	*		**				
Lutie	"	7	8	9	8	32	4														
Marion	October	8	8	7	8	31	2					0									
Martha	September	4	6	4	6	20	7	4	11	0		0					0			*	
Massassit (Rog. 3)	"	10	9	6	6	31	8	7	15	*	0	*	*	*		*				*	
Mills	"	6	8	7	7	28	8					*		†							
Merrimac										*	*	*		*							
Missouri Reisling	October	7	8	7	5	29	4	3	7			0		0							
Moore's Diamond	September	6	8	6	7	27	7	7	14	**		*	*	*		**	**		*		
Moore's Early	"	5	9	4	9	27	7	8	15	**	*	*	*	**	**	*	*		*	*	
Moyer										0		*	*	0					*		
Niagara										**	**	**	*	**		**	**		*	*	
Noah	October	9	9	10	5	33	2	3	5			0		0							
Oneida	"	8	7	8	7	30	5					0									
Perkins	September	8	8	7	7	30	3	5	8					*							
Pocklington	October	5	8	6	8	27	7	6	13	0	0		*	*		*	*				
Poughkeepsie Red	"	7	6	5	6	24	8			*		*		†							
Prentiss	"	6	7	6	6	25	5	5	10			0									
Rebecca	September	3	4	3	3	13	8	5	13												
Requa (Rog. 28)	"	10	8	8	7	33	8	8	16			*									
Rockwood	October	7	8	9	6	30	8					*									
Salem	September	10	8	8	6	32	8	9	17	*	*	*	*	**		*	0			**	
Taylor	October	9	9	3	7	28	2	2	4			0									
Triumph	"	9	9	9	8	35	6					0		0							
Transparent	"	7	7	7	6	27	6							0							
Ulster Prolific	"	7	8	8	7	30	5			†				†							
Vergennes	Oct.-Nov.	7	7	6	7	27	6	8	14		**	*	*	**		*	0				
Victoria	September	7	6	6	7	26	6							*							
Wilder	"	7	9	7	7	30	7	8	15	**	*	**	*	**		*					
Woodruff Red		9	9	8	8	34	8			*		*		†							
Worden	September	7	10	7	8	32	9	8	17	**	**	**	**	**	**	*			*		
Wyoming Red	"	8	8	7	8	31	4	6	10	*	*		*	†							

CATALOGUE OF FRUITS—PEARS.

Tested by E. C. Beman, Newcastle, Ont.	Season in use.	Tree.				Fruit.				Remarks.
						Quality.				
		Vigor.	Hardiness.	Productiveness.	Total value of tree	Dessert.	Cooking.	Home market value.	Total value of fruit.	
Ananas d'Ete	Sept, Oct.	7	6	7	20	8	6	8	22	Very subject to blight.
**Bartlett	Sept.	8	8	9	25	9	10	10	29	One of the best for market.
Bergamot Gansels	Sept, Oct.	6	9	5	20	8	5	5	18	
Bergamot Gansels, late	Jan., Mar.	6	8	8	22	2	5	4	11	Not worth growing.
Belle Lucrative	Sept, Oct.	7	6	7	20	8	6	6	20	Very good, subject to blight.
Beurre Assomption	Sept.	7	5	6	18	6	7	8	21	Not sufficiently hardy.
*Beurre Bosc	Oct., Nov.	8	7	8	23	9	7	10	26	Very fine for market.
Beurre Bachelier	Oct., Nov.	7	8	8	23	5	5	6	16	Not valuable.
Beurre Baltet Pere	Nov., Dec.	6	6	8	20	5	6	6	17	
**Beurre Clairgeau	Nov., Dec.	6	5	8	19	5	6	8	19	Very showy.
Beurre d'Amanlis	Sept	8	9	9	26	5	5	4	14	
*Beurre d'Anjou	Nov., Dec.	9	10	4	23	9	6	10	25	Not productive.
Beurre d'Aremburg	Dec., Jan.	8	8	7	23	6	6	5	17	Sometimes astringent.
Beurre de Martillet	Sept.	7	6	7	20	7	5	7	19	Rots at core, handsome,
Beurre Diel	Nov., Dec.	7	8	6	21	8	7	7	22	Liable to rot.
Beurre Gris	Sept, Oct.	6	7	6	19	6	6	5	17	Very valuable, usually poor.
Beurre, Golden of Bilboa	Sept	7	5	6	18	5	6	6	17	Very showy, but poor.
Beurre Goubalt	Sept.	5	5	7	17	4	5	3	12	Not worth growing.
Beurre Hardy	Oct	8	8	6	22	7	6	7	20	
Beurre Oswego	Oct., Nov.	8	9	8	25	6	5	5	16	Spots and cracks.
Beurre Robin	Sept.	9	8	8	25	5	5	6	16	
Beurre Superfin	Oct	8	10	6	24	8	6	6	20	
Blanc Perne	Dec., Ap'l	6	7	8	21	2	6	4	12	Not worth growing.
Black Warseter	Dec., Mar.	9	8	10	27	1	4	2	7	Of no value.
Bloodgood	Aug.	5	7	7	19	9	5	5	19	Fine for home use.
Bonne d'Eyee	Sept, Oct.	5	6	6	17	8	6	5	19	Identical with Buckworth.
Bon Chretien, Summer	Sept.	7	9	7	23	5	8	5	18	Spots and cracks.
Brandywine	Sept.	8	8	5	21	7	4	5	16	Rots at core.
British Queen	Nov.	7	6	5	18	7	6	6	19	
Buffum	Sept, Oct.	8	7	8	23	6	5	5	16	
Catillac	Dec., Apr.	6	5	7	18	1	6	3	10	
Calite Mignot	Nov., Dec.	7	6	10	23	2	4	3	9	
Church	Sept, Oct.	7	8	6	21	7	5	6	18	
*Clapp's Favorite	Sept.	9	7	9	25	9	8	9	26	Subject to blight.
Comet	Aug.	8	7	8	23	2	4	5	11	Beautiful but very poor.
Dana's Hovey	Nov, Dec.	8	8	6	22	9	4	5	18	Very fine for home use.
Dearborn's Seedling	Aug.	7	8	7	22	8	6	5	19	
Dix	Oct., Nov.	8	8	6	22	7	6	6	19	Liable to spot and crack.
Doyenne Boussock	Sept, Oct.	9	8	7	24	7	6	9	22	
Doyenne d'Ete	July, Aug.	7	7	8	22	7	4	4	15	
Doyenne Gombalt	Dec., Mar.	5	5	4	14	6	5	6	17	
Doyenne Gris	Oct., Nov.	6	7	7	20	6	6	4	18	Spots and cracks.
Doyenne White	Oct.	7	8	8	23	8	6	5	19	Spots and cracks.
*Duchess d'Angouleme	Oct., Nov.	5	5	8	18	4	6	6	16	Season too short.
Duchesse de Bordeaux	Jan., Mar.	7	7	6	20	7	6	5	18	Good for home use.
Duchess Precoce	Sept.	7	8	10	25	6	10	10	26	Fine for market.
Flemish Beauty	Oct.	10	8	9	27	8	7	8	23	Spots and cracks.
Foselle	Nov., Dec.	6	5	6	17	4	4	5	13	Beautiful but poor.
Fondante de Malines	Sept, Oct.	5	6	8	19	3	6	7	21	
Garber	Nov.	10	7	10	27	4	8	7	19	
Glout Morceau	Dec.	5	4	6	15	5	6	4	15	Subject to blight.
Goodale	Oct.	8	9	9	26	7	7	8	22	
Graslin	Oct., Nov.	8	6	8	22	6	6	7	19	
Harvard	Sept.	8	9	7	24	5	5	6	16	Rots at core.
Howell	Oct.	7	7	9	23	6	7	8	21	
Idaho	Oct.	8	7	8	23	7	8	5	20	Very subject to blight.
Jaminette	Dec., Mar.	9	7	8	24	7	6	7	20	Good for long keeper.
Jargonelle, English	Aug.	7	6	7	20	6	5	3	14	Subject to blight and
Jones	Oct., Nov.	8	8	10	26	8	5	7	20	rots at core.
Josephine de Malines	Dec., Feb.	7	7	8	22	9	6	7	22	

PEARS.—*Continued.*

Tested by E. E. Beman, Newcastle, Ont.	Season in use.	Tree.				Fruit.				Remarks.
						Quality.				
		Vigor.	Hardiness.	Productiveness.	Total value of tree.	Dessert.	Cooking.	Home market value.	Total value of fruit.	
*Keiffer	Nov., Dec.	7	7	10	23	5	10	6	21	Rots at core.
Kirtland	Sept.	8	6	7	22	7	6	5	18	Unproductive.
King Sessing	Sept.	7	8	5	20	7	7	6	20	
*Lawrence	Nov., Jan.	7	7	8	22	9	7	7	23	
*Louise Bonne de Jersey	Sept., Oct.	7	7	9	23	7	9	7	23	Subject to blight.
Madeline	Aug.	7	6	7	20	6	4	5	15	
Marshall	Sept.	7	8	7	22	6	5	6	17	
Madame Eliza	Nov.	9	8	8	25	5	6	5	16	Subject to blight.
Mons. Haberlin	Sept.	7	6	5	18	7	6	6	19	
Mount Vernon	Nov., Dec.	8	8	7	23	8	6	7	21	
Nonreau Poiteau	Nov.	7	6	8	21	6	7	7	20	Sometimes astringent.
Onondaga	Oct., Nov.	8	6	7	21	6	6	7	19	
Osband's Summer	Aug.	6	7	6	19	7	5	4	16	
Ott	Aug.	7	6	8	21	9	5	5	19	Variable in flavor.
Passe Colmar	Dec., Jan.	8	6	8	22	7	6	5	18	
Paradise d' Automne	Sept., Oct.	8	7	9	24	8	6	7	21	Subject to blight.
Pitmaston	Oct., Nov.	7	6	8	21	6	8	8	22	
Pound	Dec., Mar.	7	7	6	20	1	6	4	11	
Pratt	Sept., Oct.	8	7	9	24	6	6	7	19	Very fine for home use.
Rostiezer	Aug., Sep.	8	7	6	21	9	5	6	20	
Rutter	Oct,. Nov.	7	7	8	22	6	5	7	18	Best dessert pear grown.
*Seckel	Sept., Oct.	7	9	8	24	10	6	7	23	
*Sheldon	Oct.	9	8	7	24	9	7	9	25	Subject to blight.
Souvenir du Congres	Sept.	7	6	7	20	7	8	8	23	Subject to blight.
Steven's Genessee	Sept.	7	7	8	22	6	5	6	17	
St. Germain	Nov., Dec.	6	7	7	20	6	7	5	18	
St. Ghislain	Sept., Oct.	7	7	8	22	7	5	5	17	
Triomphe de Vienne	Sept.	8	8	9	25	8	7	8	23	
Tyson	Sept.	10	9	7	26	10	5	5	20	Variable in quality.
Urbaniste	Sept., Oct.	7	7	6	20	8	7	8	26	
0Vicar of Wakefield	Nov., Feb.	8	6	8	22	2	8	6	16	
Washington	Sept.	7	7	9	23	8	5	6	19	
*Winter Nelis	Dec., Jan.	6	7	8	21	9	5	9	23	Variable in flavor, sometimes astringent.
Wilmot	Sept., Oct.	10	10	10	30	8	6	8	22	

CATALOGUE OF FRUITS.—PEARS.

Key to Quality.

1—Very Poor.
2-3—Poor.
3-4—Poor to Good.
5-6—Good to Very Good.
7-8—Very Good.
8-9—Very Good to Best.
10—Best.

Key to Adaptation.

*—Desirable.
**—Especially Desirable.
†—Promising.
0—Undesirable.
00—Not Hardy.

Varieties tested at East Central Station. R. L. Huggard, Whitby.	Season in use.	Tree.				Fruit.				Adaptation.											
						Quality, scale 1-10.				Southern Stations.					Middle Stations.				Northern Stations.		
		Vigor, scale 1-10.	Hardiness, scale 1-10.	Productiveness, scale 1-10.	Total value of tree.	Dessert.	Cooking.	Value, scale 1-10. Home market.	Total value of fruit.	No. 1.	No. 2.	No. 3.	No. 4.	No. 13.	No. 5.	No. 6.	No. 8.	No. 9.	No. 7.	No. 10.	No. 14.
Ananas d'Ete	September, October	8	6	4	48	4	4	5	13	....	....	....	....	....	**	**	**	0	....	....	....
Bartlett	September	7	7	9	23	9	5	10	24	**	**	**	**	**	**	**	**	**	†	00	00
Belle Lucrative	September, October	6	7	8	21	8	4	7	26	....	....	....	*	....	*	*	**	0	....	....	....
Beurre Antoine	October, December	7	7	7	21	8	4	6	25	....	....	....	....	....	....	....	*	....	....	....	....
Beurre Bosc	September, October	....	....	....	....	....	....	....	....	*	**	....	*	**	....	....	....	**	....	....	....
Beurre d'Anjou	October, December	8	9	6	23	7	6	8	34	*	**	**	**	**	**	....	+	*	†	....	....
Beurre Diel	September, December	9	....	....	....	8	....	....	....	....	....	....	....	*	....	....	....	....	....	....	....
Beurre Easter	....	....	....	....	....	....	....	....	....	....	....	....	....	*	....	....	*	....	....	....	....
Beurre Giffard	August	7	7	7	21	10	6	9	25	....	....	*	*	**	....	....	*	....	....	....	....
Beurre Hardy	September, October	10	10	10	30	8	8	9	25	....	....	....	*	*	....	....	*	**	....	....	....
Beurre Clairgeau	October, January	9	8	9	26	8	7	8	32	**	**	*	**	**	*	*	*	*	....	....	....
Beurre Superfine	October	7	8	8	23	8	4	6	26	....	....	....	....	....	....	....	*	....	....	....	....
Brandywine	August, September	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	....	....	....	....
Brockworth Park	December	8	8	7	23	7	6	6	19	....	....	....	....	....	....	....	*	....	....	....	....
Buffum	Last of September	9	9	6	24	7	5	7	19	....	....	....	....	*	....	....	*	0	....	....	....
Clapp's Favorite	August, September	10	7	9	26	10	7	9	26	*	*	*	**	**	**	*	**	*	*	†	....
Doyenne d'Ete	July	9	7	8	24	8	....	8	....	....	....	....	....	*	....	....	*	....	....	....	....
Dempsey	October, November	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	**	....	....	....
Doyenne Boussock	September, October	10	10	10	30	8	9	9	26	....	....	**	**	**	....	....	*	**	....	....	....
Duchess	October	8	8	7	23	8	8	8	24	*	*	....	**	*	*	*	**	*	**	....	....
Duchess de Bordeaux	December, February	....	....	....	....	....	....	....	....	....	*	....	....	....	....	....	*	0	....	....	....
Duchess Precoce	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	**	+	....	....	....
Dorset	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	†	....	....	....

D'Jules Guyot																			†		†	
Eastern Belle																						
*Flemish Beauty	September	9	9	8	26	8	9	7	24	*	0		0	0	*	**	*	0	*	*		
Goodale	October	8	8	7	23	8	7	8	23				*	*	*	*	0	*				
Glout Morceau	December	8	8	6	22	6	6	8	20								*	0				
Graslin	December	8	7	8	23	8	7	7	22								*					
Grey Doyenne	July	7	6	6	19	8	2	8	18				*				0					
Howell	October, November	8	6	7	21	9		8				*	*	**		*	**	*				
Idaho	October, November	8	9	7	24	7	8	8	23					*			*	0				
Josephine de Malines	December, January	7	7	8	22	8		7						*	*		*	*	†			
**Kieffer	November	10	10	10	30	4	9	7	24	**	*	*	*	*	*	*	**	0	*	†	†	
Lawrence	December	6	8	5	19	8		8		*	*	*		*	*		*	*				
Louise Bonne	September, October	7	8	9	24	10	7	8	25	*	*	**	*	*		*	**	0				
Lawson										0							*		†			
Le conte	October													0			0					
Manning's Elizabeth																	0	0				
Mount Vernon	November, December	9	7	8	24	8	6	7	21					*			*	0				
Margaret														*								
Osband's Summer	August													*			0					
P. Barry	December													†								
Petite Marguerite	August													*								
President Druard	December, January	7	9	7	23	6	8	5	19								*					
Ritson	October, November	9	10	8	27	8		6		0							*			†		
Rostiezer	August, September	10	8	8	26	10								*			**	*				
Sheldon	October	9	7	7	23	10	7	8	25	*	*		*	*	*		**	0	†			
Souvenir du Congres	August, Septembor	8	7	8	23	7	8	9	24		0		*				*	0				
Tyson	August, September	7	10	8	25	9	8	8	25		*			*		*	*	0				
Seckel	August, October									*	*		*	*		*	*	0	*			
Vicar of Wakefield	November, January									0			*	0		*	*	0				
*White Doyenne	September													0			0	*				
Winter Seckel	January, March	6	7	6	19	7		7														
Winter Nelis	December, January	8	10	9	27	8		7		*				*			**		†			

* Scabs badly at Southern Stations.

CATALOGUE OF FRUITS FOR THE USE OF PLANTERS.

PLUMS.

Key to Quality:
1 Very Poor.
2—3 Poor.
4—5 Fair.
6—7 Good.
9—9 Very Good.
10— First Class.

Key to Market Value:
1—3 4th Rate.
4—6 3rd Rate.
7—8 2nd Rate.
9—10 1st Rate.

Key to Adaptation:
*—Desirable.
**—Especially Desirable.
†—Promising.
0—Undesirable.
00—Not Hardy.

Varieties tested at Georgian Bay Station. — J. G. Mitchell, Clarksburg.	Season in use.	Tree.				Fruit.					Adaptation,												
						Quality, scale 1-10.		Value, scale 1-10.			Southern Stations.					Middle Stations.				Northern Stations.		
		Vigor, scale 1.10.	Hardiness, scale 1-10.	Productiveness, scale 1-10.	Total value of tree.	Dessert.	Cooking.	Home Market.	Foreign Market.	Total value of fruit	No. 1.	No. 2.	No. 3.	No. 4.	No. 13.	No. 5.	No. 6.	No. 8.	No. 9.	No. 7.	No. 10.	No. —.
Abundance		10	10	10	....	5	7	6	6	.....	*	**	**	*	*	†	*	**	....	†	†	†
Arch Duke	Last of Sep	8	10	. .	.....	6	8	....	....	...	...	**	*	..	..	..	**	....	....	†	....	....
Bradshaw	Aug	9	8	8	25	8	9	10	10	27	**	**	**	**	**	*	**	*	....	†	....	†
Burbank	Sept	10	10	10	.....	5	8	.....	.....	.....	....	....	**	**	**	†	*	....	....	**	....	....
Bleeker's Gage	.....	...	.....	...	.....	.....	....	.....	.....	.....	....	....	....	....	....	..	*	....	....	....	....	....
Bingham	.....	.....	.....	...	.....	.....	.....	.....	... ..	.....	....	...	....	....	....	....	...	....	....	....	..	....
Chabot	.....	.....	.....	...	.....	.....	.....	.....	.....	..	....	...	....	†	....	....	...	....	....	....	....	....
Coe's Golden Drop	Sept.-Oct	4	8	8	20	7	10	10	... ..	24	*	**	**	*	*	*	**	*	..	†	....	....
Columbia	Sept.	10	8	10	28	8	9	10	.....	27	....	*	*	....	**	....	*	....	....	....	....	....
Damson	August	9	10	10	29	....	7	4	.... .	11	....	**	....	*	....	*	*	....	....	....	....	....
Duane's Purple	August	9	8	8	22	7	8	8	8	21	*	*	*	*	*	....	*	....	....	....	....	....
De Soto	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	....	..	....	*	...	....	..	....	....	†	*	....
Fellemberg	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	....	*	....	..	....	....	*	*	....	....	....	....
General Hand	Sept.	10	9	6	25	7	8	10	.. ..	25	*	0	*	0	*	*	0	*	....	*	....	....
Glass	Sept.	10	10	9	29	4	8	7	.....	19	....	*	*	**	....	....	**	*	....	*	†	..
Goliath	Aug	8	7	8	23	6	7	7	.....	20	....	*	....	....	....	....	..	....	....	..	....	....
German Prune	Sept.-Oct	7	7	7	20	.. .	9	8	.....	17	....	**	....	*	....	*	**	**	....	†	....	....
Grand Duke	.....	.....	.....	.....	.....	.....	.....	.....	...	.....	..	†	*	*	....	†	**	..	..	....	....	....
Gueii	Aug	10	10	8	28	5	7	7	.....	19	*	*	....	*	....	....	*	*	....	*	†	....
Howard's Favorite	Sept.-Oct	8	10	8	26	6	9	6	.....	24	....	..	....	..	....	....	*	..	....	..	....	....
Huling's Superb	.....	.....	.....	.....	.....	.....	...	.....	.....	.....	....	**	....	....	....	....	*	**	....	....	....	....
Imperial Gage	Aug	10	8	9	27	10	10	10	.....	30	**	**	*	**	**	**	*	**	....	*	....	....
Jeffers n	Early Sept	7	6	6	19	10	10	10	.....	30	....	*	....	*	*	....	*	....	....	....	....	....

Lawrence's Favorite	Aug	10	8	8	26	10	10	7		27												
Lincoln																						
Lombard	Sept.	10	10	10	30	8	9	8	8	25	**	*	*	**	*	**	*	**		**	*	
McLaughlin	Aug	8	7	6	21	10	10	9		29		*			*		*	**				
Moore's Arctic	Early Aug.	7	10	10	27	2	5	7		14		*			0	**	*	*				**
New Goderich	Sept.	9	9	10	28	5	8	8		21							*					
Niagara		9	9	8		8	9	10	10		*	*	**	**								
Ouillin's Golden Gage												**										
Orange	Aug	9	8	8	25	4	6	8		18		*										
Prince of Wales	Sept.	6	7	6	19	8	9	10		27		**	*	*	*		*	*		†		
Peach	Aug	7	6	4	17	8	8	8		24							*					
Pond Seedling	Last of Sept.	10	10	8	28	4	7	10		21			*	0	*	*	*	**		*	†	
Peter's Yellow Gage																	*	*		†		
Prince's Yellow Gage	Early Aug.	9	10	8	27	6	6	7		19		**		*			*			**		
Purple Egg												**	*	**								
Quackenbos	Sept.	10	10	9	29	4	8	7		19		*		**	*		**	*		*		
Reine Claude	Sept.-Oct.	10	10	8	28	10	10	10		30	**	**	**	**	*		**	*				
Reine Claude Violette																						
Red Magnum Bonum												*	*					*				
Saunders		7	10	9		6	8	7	8		*	*		*								
Smith's Orleans	Aug.-Sept.	10	10	9	29	6	9	9		24		*		*		**	*	*				
Spaulding																		0				
St. Catharine	Sept.	8	8	8	24	10	10	9		29		*				**						
Victoria												*					*	*				
Washington	Aug.-Sept.	9	7	8	24	10	10	10		30	*	**	*	*	*	*	**	**		0		
Willard		10	10	10		1					*											
Wild Goose																						
Wickson		10	10								*			*	†	†				†		
Yellow Egg	Sept.	8	8	6	22		8	10		18	*	*	**	*	*	*	**	**		*	*	
Yellow Gage	Aug	6	7	8	21	7	10	7		24				**		*	0					

CATALOGUE OF FRUITS FOR THE USE OF PLANTERS.—RASPBERRIES.

Varieties tested at Lake Huron Station. B. A. E. Sherrington.	Season in use.	Tree.				Fruit.			Adaptation.												Remarks.
									Southern Stations.					Middle Stations.				Northern Stations.			
		Vigor.	Hardiness.	Productiveness.	Total value of Tree.	Quality, Dessert.	Value, Home market.	Total value of fruit.	No. 1.	No. 2.	No. 3.	No. 4.	No. 13.	No. 5.	No. 6.	No. 8.	No. 9.	No. 7.	No. 10.	No. 14.	
All Summer		4	10	...	14	...	...	0	...	...	...	...	...	0	...	...	...	...	...	...	
Brandywine	July 5-July 28	8	10	10	28	9	8	17	*	...	..	...	..	*	...	...	...	...	...	...	
Brinckle's Orange	" 11-Aug. 4	7	10	5	22	7	4	11	..	..	...	...	...	*	...	...	...	...	...	...	
Cuthbert	" 11- " 6	10	9	10	29	10	10	20	**	..	...	...	...	*	...	...	..	...	...	..	
Caroline	" 11- " 8	10	10	10	30	4	4	8	0	..	...	...	...	*	...	...	...	...	...	...	
Conrath	" 13-July 28	10	10	10	30	9	10	19	...	...	..	...	...	†	...	...	...	...	...	...	
Columbian	" 22-Aug. 8	8	5	4	17	8	8	16	...	...	...	...	...	...	..	..	...	...	...	...	Badly winter killed.
Golden Queen	" 11- " 4	7	10	9	26	8	8	16	*	...	...	...	...	*	..	...	...	...	...	...	Best yellow berry.
Gregg	" 16- " 4	9	7	5	21	10	10	20	**	...	...	...	..	†	...	...	...	...	...	...	
Gault	" 22- " 8	7	8	6	21	7	8	15		...	...	...	...	†	..	...	...	...	...	...	
Hilborn	" 13-July 28	4	10	3	17	5	5	10	**	...	...	...	...	†	...	...	...	...	...	...	Don't think this is the true Hilborn.
Hansell	" 2- " 28	8	10	9	27	7	7	14	0	..	...	...	...	*	...	...	..	...	...	...	
Johnson's Sweet	" 16-Aug. 1	5	4	3	12	1	4	5	*	..	...	...	...	0	...	...	...	...	...	..	
Kansas	" 13- " 1	9	10	10	29	10	10	20	*	...	...	...	...	**	...	...	...	...	...	...	
Lovett's	" 16- " 4	8	7	8	23	7	7	14	...	...	...	...	...	*	...	...	...	...	...	...	
Lottie	" 16- " 1	8	10	5	23	9	6	15	...	...	...	...	...	*	..	..	...	...	...	...	
Loudon	" 9- " 1	7	10	4	21	9	9	18	*	...	...	...	...	†	...	...	...	..	...	...	
Marlboro	" 8- " 4	8	10	8	26	7	9	16	0	...	...	...	...	**	...	...	...	...	...	...	
Miller	" 11- " 4	9	10	7	26	7	9	16	...	...	...	...	...	*	...	..	...	...	...	...	
Mammoth Cluster	" 13-July 28	4	10	4	18	4	5	9	*	...	..	...	...	0	...	...	...	...	..	...	
Ohio	" 16-Aug. 8	9	8	8	25	6	8	14	...	..	...	...	...	*	...	...	...	...	...	...	
Pioneer	" 13- " 4	7	10	9	26	7	8	15	...	..	...	...	...	*	...	...	...	...	...	...	
Phœnix	" 11-Aug. 6	8	10	5	23	9	9	18	...	...	...	...	...	†	...	...	...	...	...	...	
Reliance	" 8-July 25	8	10	7	25	7	7	14	...	...	...	...	...	*	..	...	...	...	...	...	
Rancocas	" 2- " 25	8	10	6	26	7	6	13	..	...	..	...	...	*	...	...	...	...	...	...	
Redfield	" 20-Aug. 4	9	10	7	26	2	2	4	...	...	...	...	...	0	...	...	...	...	...	...	
Shaffer	" 16- " 6	10	4	5	19	6	7	13	*		..	...	...	†	...	...	...	...	...	...	Badly winter killed.
Smith's Giant	" 18- " 1	9	8	7	24	10	10	20		...	...	..	..	†	...	...	...	...	...	...	" "
Superlative	" 13- " 4	5	5	4	14	9	9	18	0	..	..	...	...	†	...	...	...	...	...	...	" "
Strawberry Raspberry	" 28- " 8	5	10	6	21	0	0	0	...	...	...	...	...	0	...	...	...	...	...	...	
Turner	" 2-July 25	8	10	5	23	9	9	18	*	...	...	...	...	*	...	...	...	...	...		
Taylor	" 9- " 25	8	10	8	26	6	6	12	..	.	..	...	...	*	...	...	...	...	...	...	
Thompson	" 2- " 25	7	10	8	25	6	7	13	..	...	...	...	...	*	...	...	...	...	...	...	
White Champlain	" 9- " 2	6	9	4	19	7	5	12	..	...	...	...	...	*	...	...	...	...	...	...	Row not full.
Zettler	" 11-Aug. 4	9	10	9	28	7	9	16	...	...	...	...	...	**	...	...	...	...	...	...	A local berry.

CATALOGUE OF FRUITS FOR THE USE OF PLANTERS.—GOOSEBERRIES.

Key to Quality: 1—Very Poor. 2-3—Poor. 3-4—Poor to Good. 5-6—Good to very Good. 7-8—Very Good. 8-9—Very Good to Best. 10—Best.
Key to Adaptation:: *—Successful. **—Especially Desirable. †—Promising. 0—Undesirable.

Varieties tested at Simcoe Station. By Stanley Spillett Nautyn.	Season in use.	Tree.				Fruit.					Adaptation.												
						Quality, scale 1-10		Value, scale 1-10			Southern stations.					Middle stations.				Northern stations.			
		Vigor, scale 1-10.	Hardiness, scale 1-10.	Productiveness, scale 1-10.	Total value of tree.	Dessert.	Cooking.	Home market.	Foreign market.	Total value of fruit.	No. 1.	No. 2.	No. 3.	No. 4.	No. 13.	No. 5.	No. 6.	No. 8.	No. 9.	No. 7.	No. 10.		
Autocrat	July 10 to 25	8	10	8	27	10	10	8	....	28	....	....	....	....	....	....	....	....	....	*	....	....	
Champion	June 20 to 30	10	9	10	28	3	8	8	....	19	....	....	....	....	....	....	....	....	....	*	....	....	Used while green.
Chatauqua	July 5 to 20	7	7	7	21	9	10	10	....	29	....	....	....	....	....	....	....	....	....	†	....	....	
Carnie's Golden	" 5 to 20	5	7	5	17	10	10	10	....	30	....	....	....	....	....	....	....	....	....	0	....	....	
Crosby's Seedling	" 10 to 25	8	9	8	25	10	10	10	....	30	....	....	....	....	....	....	....	....	....	†	....	....	
Crown Bob	" 10 to 25	7	9	6	24	10	10	10	....	30	....	....	....	....	....	....	....	....	....	†	....	....	
Columbus	" 5 to 20	8	9	8	26	10	10	10	....	....	....	....	....	....	....	....	....	....	....	**	....	....	
Cook's Eagle	" 10 to 25	5	5	5	15	10	10	10	....	....	....	....	....	....	....	....	....	....	....	0	....	....	
Downing	" 20 to Aug. 5	8	10	9	28	8	8	8	....	24	....	....	....	....	....	....	....	....	....	*	....	....	
Dominion	" 10 to 25	8	8	6	24	10	10	10	....	30	....	....	....	....	....	....	....	....	....	†	....	....	
Golden Prolific	" 10 to 25	5	7	5	20	10	10	10	....	30	....	....	....	....	....	....	....	....	....	0	....	....	
Green Chisel	" 20 to 30	5	7	5	20	8	8	8	....	24	....	....	....	....	....	....	....	....	....	†	....	....	
Ingram's Ocean	" 20 to 30	7	7	5	20	10	10	10	....	30	....	....	....	....	....	....	....	....	....	0	....	....	
Keepsake		....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	No fruit and the only variety that missed.
Lancashire Ladd	July 5 to 20	5	7	5	21	10	10	10	....	30	....	....	....	....	....	....	....	....	....	0	....	....	
Large Golden Prolific	" 10 to 20	8	8	8	24	10	10	10	....	30	....	....	....	....	....	....	....	....	....	†	....	....	
London	" 10 to 15	5	5	5	15	10	10	10	....	30	....	....	....	....	....	....	....	....	....	0	....	....	
Lanceolot	" 10 to 15	5	5	5	15	8	8	8	....	24	....	....	....	....	....	....	....	....	....	0	....	....	
Mrs. Whittaker	" 15 to 20	7	7	7	21	10	10	10	...	30	....	....	....	....	....	....	....	....	....	†	....	....	
Oregon Jumbo	" 20 to 30	10	10	9	29	9	9	9	....	27	....	....	....	....	....	....	....	....	....	*	....	....	
Ontario	" 20 to 25	8	8	8	24	10	10	10	....	30	....	....	....	....	....	....	....	....	....	**	....	....	
Pearl	July 20 to Aug. 5	9	10	10	28	9	9	8	....	26	....	....	....	....	....	....	....	....	....	*	....	....	
Phœnix	" 15 to 20	7	7	6	20	9	9	9	....	27	....	....	....	....	....	....	....	....	....	†	....	....	
Queen	" 20 to 25	7	7	7	21	10	10	10	....	30	....	....	....	....	....	....	....	....	....	0	....	....	
Red Jacket	" 20 to 30	10	10	9	29	9	9	9	....	27	....	....	....	....	....	....	....	....	....	**	....	....	
Red Champagne	" 15 to 20	5	5	5	15	9	9	9	....	27	....	....	....	....	....	....	....	....	....	0	....	....	
Success	" 20 to 30	8	10	9	28	8	8	8	....	24	....	....	....	....	....	....	....	....	....	*	....	....	
Triumph	" 15 to 20	7	7	7	21	9	9	9	...	27	....	....	....	....	....	....	....	....	....	†	....	....	
Whitesmith	" 20 to 25	8	8	8	24	10	10	10	....	30	....	....	....	....	....	....	....	....	....	**	....	....	
White Crystal	" 20 to 30	5	5	5	15	10	10	10	....	30	....	....	....	....	....	....	....	....	....	0	....	....	
Whinham's Industry	" 20 to 25	5	5	5	15	10	10	10	....	30	....	....	....	....	....	....	....	....	....	0	....	....	
Yellow Scotch	" 25 to 30	8	8	7	23	10	10	10	...	30	....	....	....	....	....	....	....	....	....	†	....	....	

REPORT

OF THE

INSPECTOR OF SAN JOSÈ SCALE

1900.

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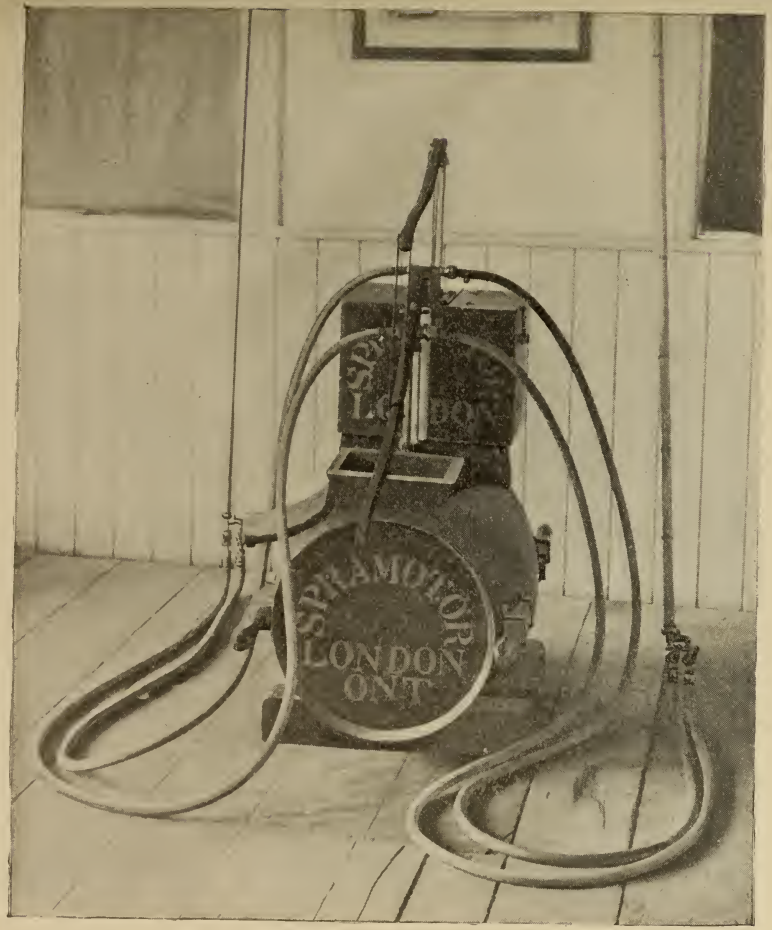
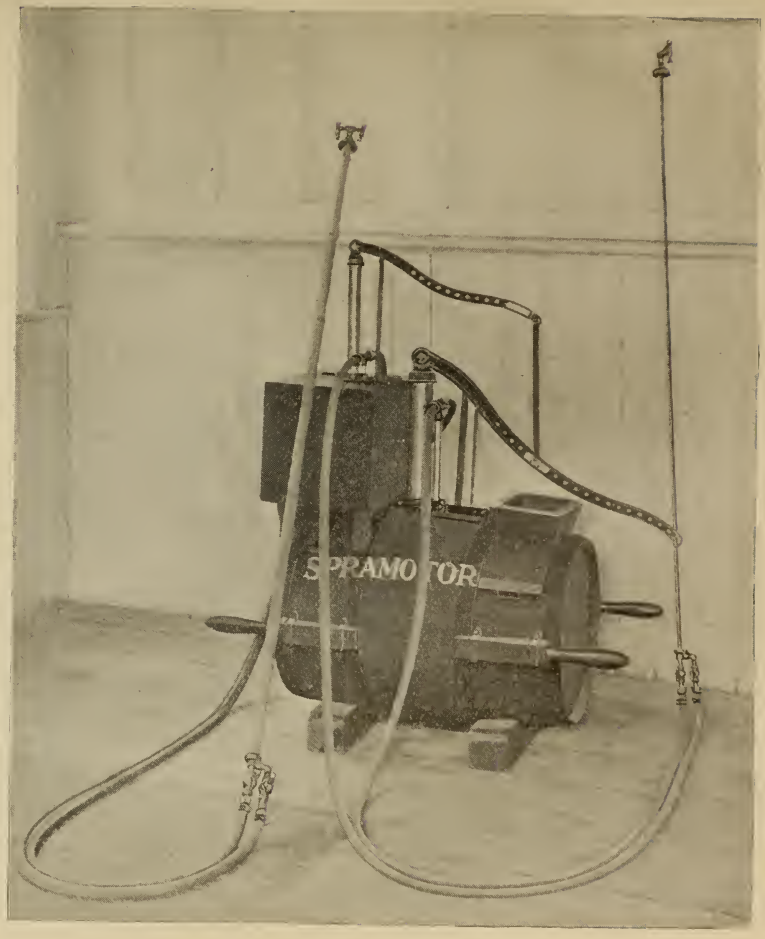
TORONTO.





End View—Spray Pump for Crude Petroleum—Side View.

REPORT

OF THE

INSPECTOR OF SAN JOSE SCALE,

1900.

To the Hon. John Dryden, Minister of Agriculture :

Dear Sir,—I have the honor to present to you my report of what has been done in the San José Scale investigation during the present year, referring to the effort made to control the pest, the increase and spread which has occurred, its destructiveness in infested sections, the information gathered from abroad, together with such conclusions as I am in a position to offer.

Owing to the great increase and spread of the Scale which took place last year, so many large and valuable orchards being involved, destruction by burning became impracticable.

In accordance with your instructions of March 23rd, I at once proceeded to secure a quantity of insecticide material for treating the affected trees. Having previously consulted soap manufacturers in Toronto, Hamilton and St. Catharines, none of whom could supply the quantity required within the time remaining before the soap would have to be applied, that is, before the buds opened, an order was placed with Mr. W. H. Owen, of Catawba Island, Ohio, for three cars of 60 barrels each of his U. S. Standard Whale Oil Soap, which had been highly commended by the San José Scale Commission, and for which several of the growers had expressed a preference. These cars came on, a car at a time, as rapidly as the soap could be manufactured, one car going to Niagara, one to St. Catharines and the third, which was intended for points outside of these, arrived in Hamilton on the evening of April 27th, and was promptly distributed from Hamilton and Winona. Soap manufactured by Toronto, Hamilton and London firms, and home-made soft soap, were also used in our experimental work. Sixteen barrels of crude petroleum were procured from Horatio Wigle, of Ruthven, wells at Dutton, and from the Dawn Producing Co., of Toronto, wells at Florence. A quantity of kerosene was also used, which was purchased from time to time, in small quantities, as required.

Through your influence, duty on the imported soap was not exacted. About 200 barrels of material was procured in all, and in compliance with your instructions, was turned over to the people at one half its cost laid down.

Mr. Robert Thompson, of St. Catharines, Mr. Joseph Healey, of Niagara, and Mr. J. Fred Smith, of Glanford, were associated with me in making the original canvass to ascertain who, among the growers, would undertake to use the remedy ; in distributing and collecting for this material ; in instructing the people in its use ; in doing a series of experimental work, and in subsequent examinations. I am greatly under obligation to these gentlemen for the part they had in bringing this huge experiment to so successful

a conclusion, which, at very moderate cost to the Government, has resulted in gaining much valuable information that will assist greatly in determing what is most likely to be the best course to pursue for the future. The remedies were distributed from one end of the Province to the other—from Windsor to Ottawa, and were placed in the hands of 125 entirely distinct growers who have all paid their proportion of the cost. The money was placed to the credit of your Department by the Provincial Treasurer, and I hold his receipt.

Many persons expressed high appreciation of the action of your Department in thus coming to their rescue, and gratitude to you personally for the interest shown in them at this time, hoping that some effective remedy would be found by which they may destroy the Scale and save their orchards.

Printed instructions specifying the manner of preparing trees, and of preparing and applying the remedies, were furnished to those who were interested, the necessity for thorough work being particularly emphasized. Many growers were visited while the spraying was in progress, and such instructions and assistance given as were possible under the circumstances. Some of the growers who used soap, fearing the consequences of the Scale and realizing the necessity for careful work, did their spraying thoroughly and well, using a full strength mixture in sufficient quantity upon the trees. Others were less careful as to the strength of the material used, and thoroughness in applying it. This was easily determined from the quantity of soap purchased, and the extent of orchard treated, and from visiting treated orchards in July, when the soap was still in evidence on the trees and the Scale breeding freely on untreated portions. Anticipating these conditions we took the precaution to do some work ourselves and operated on an orchard at Niagara, belonging to Messrs Simpson Bros.; at St. Catharines on an orchard belonging to Mr. Archibald Buchanan, and at other points. In this experimental work the different soaps were used in various percentages of strength, and thoroughly applied on whole blocks in which were both slightly and heavily infested trees. These orchards were examined several times during the summer and the results, as they appeared from time to time, carefully noted, as were also the results of the spraying done by the growers.

Effect of Soap on the Trees.

The general effect of a full strength mixture of soap applied to fruit trees in the spring of the year is to clean up and greatly invigorate them by destroying insects and fungi; moss and rough bark scales off, and the living bark is loosened, which promotes circulation and stimulates growth. Trees thoroughly sprayed with soap have foliage larger and darker in color than that on similar trees untreated, while the bodies being smooth and bright are easily distinguished. This condition was particularly noticeable in the apple orchards of Mr. W. H. Bunting, of St. Catharines, and Mr. Joseph F. Greene, of Niagara, where the trees were carefully prepared and a thorough application made, and also in the peach orchards of Major James Hiscott, of Niagara, and Mr. Thos. Archibald, of St. Catharines, who used the soap very largely for the suppression of leaf curl and mildew, for which it is a specific. Many orchards were visited to determine this matter, parts of blocks usually affected were under treatment, practically exempt, while other sections of the same orchard, not so liable to be attacked, and which had not been treated, showed considerable leaf curl. We had some good examples in our own work. At Mr. Buchanan's, four rows at the north end had been left unsprayed as a check. These four rows developed leaf curl badly, some varieties more than others, but as the spraying was done across the rows, all varieties were treated alike, and at first lost much of their foliage and later most of their fruit, while adjoining rows, which had been treated, not only retained their foliage, but matured their crop.

At Mr. Robert Thompson's, St. Catharines, trees sprayed May 9th with Ohio whale oil soap, one pound to the gallon, and other trees sprayed with home-made soft soap, one pound to the gallon, were free from leaf curl, while check trees in the same row were badly affected. This shows that one pound of soap to the gallon is effective in destroying leaf curl. In the same orchard two rows across a block of two year old peach trees were sprayed on the above date with common lye as it came from the leach, with the result that the trees so treated retained their foliage, while the balance of the block became almost denuded, showing it is the potash in the soap which destroys fungus.

Leaf curl has in some cases developed later in the season, especially on the Elberta peach, which is peculiarly susceptible, and was destroyed by Mr. David Clark, of Sandwich, and Mr. Thomas Archibald, of St. Catharines, who, as soon as it appeared, applied whale oil soap in the proportion of one half pound to the gallon of water without injury to the foliage. These gentlemen, and many others, claim that soap is a good fertilizer and that a peach orchard treated with it annually will remain vigorous and bear fruit much longer than if it had not been used. They have signified their intention of continuing the soap treatment, because of the general benefits the trees derive, and without any regard for destroying the Scale.

The Effect of Soap on the Scale.

At the beginning of this season, the true character of the Scale not being yet fully recognized, there were many instances of the soap being used in insufficient quantity, both as to the strength of the solution and the amount applied, one pound to the gallon being made to take the place of two pounds as was indicated by the printed instructions, and with this weak mixture the trees were sprayed only from one side, a very imperfect application which checked the scale but slightly. As the season advanced the folly of such work became apparent, the treated portions of the trees were soon reoccupied, and breeding went on almost as rapidly as when trees similarly affected had not been treated. One orchard of which I kept a close watch during the summer, and in which the owner had taken the precaution to remove and destroy all encrusted limbs before applying a weak solution of probably one and one-half pounds to the gallon, now has many trees encrusted, and I venture the opinion that very few in this orchard of 600 trees remain uninfested, as at my last visit I spent considerable time examining and could readily find the Scale in any part of it. There may be some disappointment, but growers should not be discouraged. The instructions stated distinctly "Thoroughness is imperative," and had this been observed the results would have been better. If there be one thing which above all others is worth doing well, it is treating trees affected with the San José Scale. A solution of soap must be of full strength, and every part of the tree must be saturated.

But where a full strength mixture of two pounds of soap to a gallon of water as recommended was used, and an honest effort made by growers to secure a perfect application, the results from soap in destroying the Scale are not as good as we had been led to expect. Careful examinations made in June of infested trees which had been so treated at the end of April always disclosed some over-wintered Scale still remaining alive, and occasionally a larva could be seen moving on the trees which fixed in convenient locations, developed, and reproduced without being noticeably retarded by the soap. Multiplication went on, and by the end of the season the scale was as plentiful on these trees and in some cases more so than when the treating was done. This condition was general, there being very few instances of the degree of infestation being materially reduced. I wish, however, to mention an advantage from the use of soap in preventing the spreading of scale in orchards which were previously but slightly infested, and in which but a small percentage of the trees had been blazed in 1899. In comparison with orchards similarly affected which were not treated the advantage is very great indeed, especially where a full strength mixture had been carefully applied. The Scale does not spread much until it becomes plentiful, and where there is a good opportunity to settle it appears not to remain in its active condition so long as on trees which are badly infested, and is consequently not so likely to be distributed. It was so reduced by the treating that it did not again become plentiful till nearly the close of the season.

Check Work.

In the experimental work Mr. Owens' U. S. Standard Whale Oil Soap from Ohio, gave the best results, after which according to our judgment came London, Toronto, Hamilton, and home made soft soap in the order named. The London people say they used fish oil in their soap, the Toronto soap was said to have been made from linseed oil, the Hamilton soap from a vegetable oil (probably cotton seed oil) and the home made soft soap from such grease as is ordinarily used for such purposes, with lye got by leaching wood ashes.

In the Buchanan orchard of 500 trees, mostly peach, the work of applying these soaps was carefully done during the last week in April, and being convenient was frequently examined during the season, and it is to the results obtained here that my remarks refer more especially rather than to those observed elsewhere.

The first inspection was made on June 20th about the time breeding began, badly infested specimens were cut and carefully examined with the aid of a microscope to determine whether certain individuals were really living or dead, and the results agreed upon are as follows :

On trees treated with Ohio soap about 5 per cent. of the scale remained alive, with London soap about 10 per cent., Toronto soap about 15 per cent., Hamilton soap about 25 per cent., home made soft soap left nearly all alive, and the Toronto soap used one pound to the gallon at the request of manufacturers—who claimed that one pound of it would do as good work as two pounds of any other—was but little more effective than home made soap.

Early in August the increase on treated trees was easily noticeable, the soap having no apparent effect in resisting reinfestation, while at that date the scale on untreated trees was multiplying very rapidly. In September and from that on the increase was so great that by the end of the season the original condition of infestation or treated trees was fully restored, even on those trees where only 5 per cent. remained alive. During this period many of the untreated trees had become encrusted, and it is enough to say of the final results from the use of Toronto soap, one pound to the gallon, and home made soft soap, that trees on which they were used were yellow with creeping larva. One badly infested pear tree standing in a separate lot was sprayed with Ohio soap two pounds to the gallon, and the infestation so reduced that in the early examination very little Scale was found which enabled the tree to make from one to two feet of fresh wood during the season of growth; but before the summer was over the small percentage of Scale left alive had so increased that now the infestation is as dense as when the tree was treated.

Just a word about soap. Any remedy to be most effective in destroying the Scale must remain fresh upon the tree a very long time to enable it to penetrate the layers of dead Scale as is the case in encrustation, and reach the living Scale in the wood beneath all this protection, to find the limits of the cracks, distribute itself up well under overhanging bark, and follow the scale to its securest hiding places. Soda makes soap hard, and not at all suitable for this work. Potash varies in quality just as much as wood, and fish oil ranges from a light limpid oil to a heavy thick residue. I cannot understand that whale oil soap could ever have secured the reputation it has as an insecticide, from such results as were obtained this year. I have noticed that the soaps we used, some much more than others, soon become fixed on the trees, and would neither penetrate nor distribute sufficiently. Soap made from a good grade of limpid oil, in as large percentage as possible, and having a little more first sorts potash than is necessary to make the softest of soft soap will in my opinion be effective in reducing the Scale to a very narrow margin. I like soap because of the general benefits the trees derive, and never having seen a tree injured by it, I consider it safe to recommend for general use late in the spring. But the soap we used this year left too many Scale alive, and I beg to suggest that such steps be taken as will place at the disposal of the people a sufficient quantity of the best possible make on such terms as in your judgment seem best. When less than two pounds of soap to the gallon was applied little permanent good was done. The increase was checked more or less according to the quantity used, but in all such cases any advantage gained was soon recovered by the Scale, and the present condition of these trees is much worse than when treated.

Other uses for Whale Oil Soap.

Besides the Scale many other injurious insects are controlled by soap treatment, but in my opinion it cannot be relied upon to destroy the vitality of eggs. The tent caterpillar and forest caterpillar, which winter in the form of larva, but still within their cells, did not materialize in treated trees. Pear Psylla, if treated before eggs are laid will be destroyed. Mr. W. A. Emory, of Aldershot, has a cherry orchard which was very badly affected with aphis in 1899, and which he sprayed this year with whale oil soap

full strength when the blossoms were opening. The aphis, being by this time hatched, were almost annihilated.

Mr. Joseph Tweddle, of Fruitland, reports using soap one-quarter pound to the gallon on grape vine thrips with good result. He also treated apple trees affected with canker worm with the same strength of mixture. All worms hit were dead in half an hour and not many escaped. In using soap in this way I would add Paris green or arsenic, and would expect the soap to fix the poison to the foliage. The injury sustained by potatoes from fungous diseases is not well understood. One-quarter pound of soap to the gallon, added to the water used for distributing poison, has a very beneficial effect. Gardeners about St. Catharines, on Burlington Plains, and near Sandwich, report great difficulty in combatting insects attacking their squash, melon and cucumber plants till they tried soap one-quarter pound to the gallon, which acted like magic. These gentlemen did not explain whether the offenders were killed or promptly decamped, but are delighted at having such a convenient, cheap, and effective remedy.

Kerosene.

Kerosene was used in nine places before the buds opened, on peach, plum, pear and apple trees, most of which either died or were seriously injured. As a winter treatment I regard kerosene as being more liable to injure trees than any other remedy with which we have acquaintance. It is not so fatal to fruit buds as soap applied in early winter, but so far as has been observed the effect on trees was almost invariably disastrous. It was used in a mechanical emulsion in the proportion of 20 per cent. with water, which was not effective as an insecticide, and cannot be said to do even satisfactory work in killing the scale. In a few instances parts of trees which showed weakness early in the season recovered, but generally those which were injured gradually succumbed. All trees upon which kerosene was used started late, and the pale green foliage, dead twigs, and tender growth told plainly of the trial through which the trees had come.

Kerosene is said to have been used successfully for a summer spray as a mechanical emulsion in the proportion of 10 per cent. with water for destroying the young Scales during the breeding season, which in Ontario extends from the middle of June to the end of November. To be effective, it should be applied every ten days in bright, airy weather, which promotes rapid evaporation. The danger from kerosene consists in its remaining long on the trees. It will kill the moving larva and those newly fixed, but will not penetrate the cover scale beyond the white stage.

Crude Petroleum.

Most of our growers fearing the ultimate effect of crude petroleum on their trees did not use it, but enough was tried to furnish some good examples of its effectiveness as an insecticide. It will certainly destroy insect life better than any other remedy with which we have experience: Not only the San José scale but other scales that winter alive; also Tent Caterpillar, Pear Psylla, Bud Moth, Case Bearer, etc., and if applied late will catch the larva from many eggs. No one questions this, and it is unnecessary to offer examples. It has the quality of remaining fresh for weeks, even months, in fact some of the trees treated last January have soft oil on them still. It will spread and soak, penetrating the layers of Scale on encrusted trees, and so distributes that it reaches every part, destroying the pest in its hiding places, and where it was carefully applied very few individuals escaped. The oil affords a perfect covering which shields the tree from re-attack, for no young Scale can fix on oil-treated bark, and the larva from the few remaining must either be content with such accommodation as they find in crevices which escape treatment or make their way to the young growth.

At Niagara crude oil was used on Mr. Nelson Bissell's apple trees with very gratifying results. It was applied about the middle of January very freely without injury to the tree, and reduced the Scale so that little remains.

We had the pleasure of a visit from several of the leading fruit growers of New York State, to this orchard, who remarked that they had previously remarked among themselves: "If the Scale becomes established in our apple orchards the difficulties would

be such that it would not be practicable to control it, but having seen the results from this work we have changed our mind."

A result of oil treatment is to greatly retard growth in the spring. Oil treated trees start from one to two weeks later than those untreated, and one is likely to think the trees have been killed, but this idea is dispelled when the luxuriant dark green foliage appears.

I might give one example of the effectiveness of crude oil in destroying insects. A large apple tree standing at Lakeview slightly affected with San José Scale, and very badly with case bearer, was sprayed with crude oil early in March. When examined in July the case bearer was in the same position in which it had spent the winter, held fast by the oil which killed it, and the remarkable growth of foliage remained without blemish.

In Mr. James Titterington's orchard of Japan plums in St. Catharines a good example of the effectiveness of crude oil as an insecticide may be found, where in comparison with winter treatment with soap the results are very striking, the Scale being conspicuously present in soap-treated trees, and almost entirely absent in the other. The trees were all marked during the inspection of 1899 with three spots indicating heavy infestation, and were fairly distributed among the remedies. In December I visited this orchard in company with Mr. Koltmeier, of St. Catharines, who, in his recent letter to the Toronto press, expressed the opinion that Scale could not be controlled by remedies. To his astonishment he failed to find live Scale on some of these oil-treated trees, and was highly gratified with the work. Several other gentlemen from outside points visited these trees, and we invite the inspection of those who desire information of this matter.

The oil was applied in the proportion of 25 per cent., 33 per cent., and 40 per cent., with water, and while those supposed to have been treated with 25 per cent. and 40 per cent. not only lived but made a splendid growth, two of the trees supposed to have been treated with 33 per cent. died outright, and the third was so seriously injured that it seemed beyond hope, but the oil being carefully scraped from the trunk and large limbs, it has recovered. This treating was done with an ordinary emulsion pump which was not reliable, and the trees which were marked for 33 per cent., and which died, appeared to have twice as much oil on them as those marked 40 per cent. Most of the loss and consequent dissappointment which has come from the use of mineral oils has been occasioned by irregular applications through using unreliable apparatus.

The people of Ontario must be congratulated in having in the London Spramotor combination pump the best machine which has so far been produced for applying a mechanical mixture of oil and water. There are two pumps, one for oil and one for water, which are so arranged that any percentage may be got by changing the relative length of stroke. The action throughout is positive, the oil and water being forced through separate channels to the nozzle, which is absolutely necessary because of the great difference in their specific gravity.

Some experiments were made to ascertain which remedy would best destroy the New York Plum Scale. In an orchard belonging to Mr. W. F. W. Fisher, of Burlington, in competition with kerorene 20 per cent. and four soaps, crude oil was much the most useful. About 75 four year old plum and apple trees were treated with each. No tree was permanently injured, even those treated with kerosene which started late with pale green leaves soon recovered and became of natural color. An examination made early in June showed a considerable percentage of lecanium remaining alive on the soap and kerosene treated trees, which had fixed, and eggs were being laid, but in the row treated with crude oil not a single living one could be found. Mr. Fisher subsequently wrote me that he might be induced to experiment further with soap, but he would depend upon crude oil to clean up his orchard. Similar results were obtained in an orchard near Hamilton belonging to Mr. Thos. Macklem. In this case several trees died, most of which had been treated with soap, and I take it the injury came from some other cause. Whale oil soap was also used during the last week in April on a block of 1,000 plum trees near Homer belonging to Mr. F. Geo. Stewart, part of which was done with a full strength mixture without materially checking the multiplication of the Scale. Had this work been done early in April, before the scale became fixed the result would probably have been better.

So far as the destruction of scale insects is concerned crude petroleum may with all propriety be termed an almost perfect remedy, but unfortunately it has in some instances also proved injurious to the trees. Having observed these trees very closely I am forced to the conclusion that every case of injury was occasioned by an overdose.

Whale oil soap to be effective must be applied liberally; on the contrary crude oil is strong medicine and must be used sparingly, very little will kill the scale but every part of the tree must be reached. The parts most likely to be missed are the upper or inner side of the branches and the twigs which can be best treated from the opposite side of the tree, and together with the deep cracks in the rough bark of the trunk should have special attention In the work done in January and February we used crude oil in the proportion of 25 per cent., 33 per cent. and 40 per cent. with water, but I am satisfied that much more depends on the proper manipulation of the nozzle than upon the percentage of oil used. It has already been explained that every part of a tree must be treated. I say here and wish to emphasize that in using crude oil no part of a tree must be treated a second time; that is, the nozzle must be so controlled that no part of a tree shall be covered more than once, and a light even application made throughout. If in using a 33 per cent. mixture the spray covers the tree or part of it three times as much oil will have been applied as if it had been used undiluted, for the water is soon gone and the oil remains, and probably more would be used, for one is not likely to be as careful in using oil diluted as undiluted. It really does not signify whether oil be used diluted or undiluted so long as not too great a quantity be applied, the only advantage of using water with the oil is that it assists in distributing a light application. The very finest Vermorel nozzle is required, and especial pains must be taken to use the least possible quantity that will reach every part of the tree. The cost of oil treatment being about one-fifth the cost of soap is an important consideration, for in dealing with large orchards expense is always a prominent factor.

Whale Oil Soap and Crude Petroleum.

In my own orchards at Burlington during the first week in June last the trunks and large limbs of 1,600 full grown apple, pear, plum and peach trees were treated for the destruction of the Oyster Shell and Scurfy Bark Lice which are newly hatched at that time, Putnam scale and the multitude of injurious insects that find shelter under the rough bark of fruit trees. The results are so entirely satisfactory that I urge those having orchards to use some such remedy at this time and in this way. The trees had been well prepared by scraping off all lichen and loose bark, it being very important in such work to remove obstructions that would interfere the remedies reaching the bodies of the trees. Four soaps were used, two pounds to the gallon, crude petroleum undiluted and diluted to 30 per cent. with water, and whale oil soap and crude petroleum combined. The soaps were applied to all kinds of trees, and apparently destroyed the insects, except the Putnam scale, of which many escaped. Crude oil in both forms was applied to large apple trees only, and destroyed the insects without doing the trees any injury, but it is to the combination of whale oil soap and crude petroleum I wish particularly to refer, the behavior of which is worthy of special mention. Thirty gallons of water and 30 pounds of soap were used making 33 or 34 gallons of mixture, which was put in the barrel of a London Spramotor Combination pump, and six gallons of crude petroleum put in the tank. The pump was set to empty both barrel and tank at the same time, which gave practically one pound of soap to the gallon of mixture and 18 per cent. of crude oil. This was evenly applied to the trunks and large limbs of 40 large apple trees, and apparently the insects were all destroyed. It went on beautifully, but unlike the blackened bark of trees treated with oil in either form the bark of the trees treated with the mixture was at no time darker in color than a good deep amber, and the subsequent covering of oil was thinner than on trees treated with oil alone, and could not injure even peach. Some who have used oil and soap complain that it is not so effective an insecticide as oil alone. By varying the proportions the mixture may be brought to any condition of strength required. The soap is added to destroy fungus and to make less oil necessary for satisfactory work, thereby lessening the severity of oil treatment and making it applicable to tender trees. I have not had sufficient experience to justify saying more, but have no hesitation in recommending this treatment for further trial.

Increase and Spread.

The multiplication and distribution of the Scale during the season just closing has been very much greater than that of any previous year of its history in Ontario, and evidence of its destructiveness so promptly destroyed at the beginning of our work is again rapidly accumulating. It is impossible fully to account for the wonderful increase in some cases, and comparatively trifling in others. Infested trees exposed to the full sweep of the wind do not become encrusted as quickly as those in sheltered places. Whole orchards and those adjoining so exposed become generally infested almost immediately. There are instances of the Scale being carried by horses and implements, also by baskets that had been used in infested orchards; but there are many conditions for which I can offer no explanation.

Many growers failed to locate the Scale before it became plentiful in their orchards, not even suspecting its presence until when harvesting their fruit they found it much disfigured, and some of the limbs encrusted and dead.

One gentleman, because of the Scale attack alone, discarded as unmerchantable 60 barrels of Greenings, all of which had become badly marked, and some were decaying when the Scale had fixed.

Canners complain of the great waste there was this year in handling infested apples, and state that they will not again purchase fruit from certain orchards, and there are cases where it was not even gathered from affected trees.

Early ripening fruits—the larvae not being so plentiful at this time—are not so likely to be attacked as those maturing later, but that harvested in September and through the balance of the season is exposed to the marvellous increase which occurs during this period. The fuzzy covering of the peach protects it slightly from infestation, but the smooth skins of the apple, pear and plum are more congenial, and in bad cases become encrusted. It has been intimated that the destructiveness of the Scale is greatly overestimated; but from what I have observed of their behavior it would seem that the half has not been told. The rapid increase, quiet distribution, together with their habit of getting beyond the reach of remedies, make them exceedingly difficult to combat. Reproduction is their trade. They are a creation of one idea; their sole concern is to multiply and fill the earth. If they would hang out a flag like the tent caterpillars, or sound an alarm as some insects do, detection would be compatively easy; but no, they silently reach out into new territory, become established and extend to fresh areas beyond.

Orchards in which five to seven per cent. of the trees were marked during the inspection of 1899 are now generally infested, and some trees but slightly affected then are now encrusted. In August of 1899, Scale was first found on the small limb of a peach tree standing in an orchard which had been examined in 1898. The insect soon became distributed over this and adjoining trees, and in the spring of 1900 it blossomed freely and set a full crop. Before the fruit was half grown the leaves on some of the limbs withered and fell, and shortly afterwards the balance, the shrunken peaches still clinging to the denuded limbs. When last seen in November this part of the orchard had been reduced to cordwood, and the owner declared he had not a tree left which was free from Scale. Another gentleman, having a very valuable peach orchard, immediately destroyed trees which became badly infested, thereby considerably reducing the spread of the Scale, a practice which is commendable, but one which would be promptly condemned if being enforced.

Good evidence of the rapidity of the increase in September, the height of the breeding season, was obtained by cleaning a portion of the bark of a badly infested limb say one by two inches, which would be entirely re-occupied by newly set Scale in two days; late in October about twice this time was required. There are instances of whole trees, and parts of trees having died from the effects of the Scale, but this condition will be more in evidence another year.

I am much impressed with the advantage of maintaining vigor in infested trees. This is good orchard practice in any case, but doubly so in case of Scale, and is so far as I know the only means of fortifying an orchard against such an attack. Weakened trees do not successfully resist either frost or treatment and the margin between what peaches and Japan plums will withstand, and what is necessary to destroy the Scale is much narrower than that in pears and apples, consequently especial pains must be exercised in stimulating these varieties.

The ability of the Scale to help itself has been greatly under-estimated. It remains active much longer than was at first supposed, and can make its way from the trunk of a large apple tree to any part of it. It is capable of advancing more than an inch in a minute on the bark, which would mean that such a trip need occupy but a single afternoon. On the ground I have watched them move an inch in a quarter of an hour, and by the height of the breeding season the surface of an orchard which had been cultivated to the 1st August, will have become smooth in many places, and if when carried by the force of the wind it be deposited not too far from a tree it may reach the trunk and establish a colony, for there is abundant proof that the Scale is capable of reproduction without copulation in every case. To what extent it can go with this I am not prepared to say, but when I last visited the Geneva, N. Y., Experiment Station, Prof. Lowe was making a series of observations to determine its limit.

In infested sections all orchards are now involved, and it is extremely depressing to notice the apathy and apparent indifference of many whose interests are large. There are also those who are alive to the situation, and their example and the results of their work will, I trust, encourage the others and hasten a general fight, the difficulties of which will be greatly increased by delay.

Conditions in infested sections are now such that I cannot refrain from referring to our earlier work. In the summer of 1898 the Scale being found on newly planted trees, which were traced to the nurseries, and a list of the previous season's sales procured, this stock was followed to the limits of the Province and examined where it stood, the Scale being located and destroyed in 100 places.

Then came the inspection of the nurseries, in which I have every confidence. In these nurseries widely distributed over the Province four millions of trees were examined tree by tree, which resulted in locating the pest in eight of them and in the destruction of many thousands of nursery trees. Of these, comparatively few were known to be infested, but sufficient, had they gone out, to have deluged the Province with Scale. The importance of this early work is now demonstrated, for this is evidently a case where an ounce of preventive is better than tons of cure. In fact when once established there seems to be no perfect cure, and our only hope of saving fresh localities from infestation is in preventing the distribution of infested stock. Nurseries should be regularly inspected, and to facilitate this, all nurserymen should be required to register forthwith, and in the case of beginners when their first plantations are made, that their location will be known.

American Orchards Inspected.

The deep interest you have taken in the San José Scale matter as shown in various ways is generally appreciated and many kind words are spoken even by pronounced political opponents. Your kindness in permitting me to make several trips to infected sections in the United States, has resulted in getting valuable information promptly, which is so desirable in this work and at less cost than it could have been gained by experience. This will enable us with greater confidence to determine upon a course which is likely to prove satisfactory. Having already given you particulars of previous visits, I will now refer only to that of November last.

At Catawba Island I spent some time in the section where Scale was first introduced, inspecting mostly peach orchards and talking with the people. Whale-oil soap had been used extensively for three years and by some four years. Several gentlemen who had used it continuously during this time assured me that their orchards are far worse affected now than when they began with the soap. They admitted, however, they had not always used the soap at full strength, and possibly had not been sufficiently careful to make a perfect application. In these orchards many trees are weakening under the attack of Scale and some badly encrusted limbs have died. There are those also who think that soap, if used at sufficient strength and thoroughly applied, will keep the Scale in check, but I found it still very plentiful on their trees. They all complain of the quality of the soap used lately, especially last year, and of its great expense as compared with crude oil.

Mr. N. A. Haden, having an orchard of 9,000 trees, mostly peach, procured a kero-water pump and nine barrels of crude petroleum which was used. Being a business

man and occupied in his office he employed men to put it on who were inexperienced, and applied the oil altogether too liberally. While the work was being done the owner superintended the spraying of a row and insisted on light treatment, but when he had gone the men disregarded his instructions and again used the oil in excess, with the result that the one row was injured very little and the balance of the block all killed. Many trees in other parts of the orchard were killed, but in every such case the wood indicated heavy treatment, varieties of the Crawford type being apparently most susceptible to injury. This work was done late in March and early in April, and the balance of the orchard sprayed with different soaps at the end of April. In the spring of 1897, 3,000 trees were killed with kerosene, and since that time Mr. Haden has used tons of different kinds of soap with indifferent results, and notwithstanding the loss of trees he has sustained this year from crude oil, will continue its use, having confidence that with proper care in applying it the bad results may be avoided.

Mr. Henry Rofkar, an adjoining neighbor, used crude oil injuring his trees but slightly, a few badly weakened by Scale were killed, and a few from excessive oil, but upon the whole very little harm was done. One peach tree badly infested and standing in 18 inches of snow was treated with 25 per cent. crude oil to the snow line, and in the spring the balance of the trunk was treated with soap, $2\frac{1}{4}$ pounds to the gallon. Now the soap treated portion is encrusted with live Scale, and that which was oil treated has very little. This tree in common with others oil treated had a good crop. Had this tree been treated with soap at this time, the fruit buds would have been killed. Soap applied early is much more destructive to fruit buds than either crude petroleum or kerosene.

Much the same conditions prevailed at Lakeside. Mr. J. K. Southard had used soap faithfully for two years and concluded it would not serve the purpose, as the Scale continually increased on trees thoroughly treated with fully two lbs. to the gallon. This year, in April, Mr. Southard used crude petroleum on about 800 trees of all varieties. One block of about 165 plum trees had become so badly infested that encrustation was general. This block was treated with crude oil without any apparent injury to the trees, and now has little live Scale and that on the young growth.

In a large block of mostly Elberta peaches, all badly infested trees were sprayed with crude petroleum, 25 per cent. with water, then those having only a little Scale with whale oil soap, 2 lbs. to the gallon. Now the condition is reversed, the oil treated trees having little Scale except on the new wood, and those soap treated have become badly infested. Occasional limbs in this lot were killed, but the killing was evidently due to the Scale.

In all of this work a heavy crude oil of $35\frac{1}{2}$ degrees specific gravity was used, but Mr. Southard held the nozzle himself, and a light and very perfect application was made.

He who by crude oil would thrive
Himself must either hold or drive.

In using crude petroleum it is imperative that the owner should personally supervise the work, or have it done by competent and really reliable help. In Ohio the State will take no responsibility when crude petroleum is used, and in orchard work they do themselves will use soap, and will recommend it, at the same time conducting elaborate experiments with crude oil.

The growers I consulted say that if not interfered with in the use of oil, they are quite willing to take the responsibility themselves for the consequences of the oil treatment.

On leaving Wooster, Prof. Webster kindly gave me a letter to Dr. Howard, Chief Entomologist of the United States at Washington, D.C. Dr. Howard spent more time with me than I expected, and in the course of his remarks said, "So far as I know neither in California nor east of California is there a locality where the Scale was ever known to exist that it does not exist to-day, all persons who have ever taken strong ground in regard to the San José Scale have been obliged to step down from their high position, for it has surprised and disappointed them all. To say that the people of California are no longer afraid of the Scale is not correct. They are just as much afraid as ever they were but have a remedy in salt, sulphur and lime which has proved useful in their dry climate,

and in which they rely to control the pest. There is less San José Scale in Southern California now than formerly, but this is largely due to replacing deciduous with citrous trees on which this Scale does not feed."

Mr. W. S. Hall, who made the preliminary inspection in the Township of Trafalgar, Halton Co., had previously lived in California, and returned to Redlands two years ago, writes, "That much of the decrease of the Scale in Southern California is owing to the change made by so many in recent years in replacing apricots, peaches and prunes with oranges and lemons."

During the past summer I have noticed with much concern the alarming increase of Scale from the middle of August to the end of the season, when the drain upon the badly infested trees is simply terrible. Some claim that the Scale feeds all winter but this is not likely, though it undoubtedly does until well into winter, and badly affected trees look more emaciated in the spring than they do in the fall, which is probably the effect of frost. The spread is very rapid from encrusted trees, and badly affected peach trees do not withstand treatment the following spring. For these reasons it is important not to allow the Scale to become plentiful late in summer especially on peach trees, and I had associated fumigation with controlling it at that season. In Maryland I found Prof. Johnson working along these very lines, having fumigated large blocks without injury to peach trees and with such excellent results that while it is probable some Scale remains alive he says none can be found. One block of 2,000 four-year-old peach trees was treated with hydrocyanic acid gas at a cost of 6 cents per tree for material and labor. Considering the quality of the work done this does not seem high, as it is the last Scale we are after—the one that remains to re-infest the tree. Mr. Pease, the veteran Scale Inspector of Southern California, says that when trees are properly fumigated, unless re-infested from outside, the operation need not be repeated for three or four years. In Illinois fumigation on a large scale is pronounced impracticable, but I think differently, and certainly Prof. Johnson is well pleased with the results from his very extensive experiments. Because of its constancy Prof. Johnson uses kerosene extensively; but if he could have crude petroleum always from the same well would prefer it to kerosene.

Bulletin 122, California Experiment Station reads as follows:—"The cost of fumigation, and therefore the profits in its use, depends in a great measure in the arrangement of details especially in the economical use of time. This is more important than in the case of most methods for killing insects because of the time (40 minutes) required for the operation of the gas. Fumigation may be economically done in one of two ways with a small outfit arranged to fit in with other work, or with a large number of tents, sufficient to keep all hands busy. Work with a small outfit can be arranged so as to waste but little time. Fortunately the tents may even be left on all night without danger, if desired; so that a strict record of the time is not necessary only that it be not too short. A good arrangement is as follows:—The tents are placed in position at the close of the day's work, they are changed after supper, and again just before bed time, leaving them on till morning, care being taken to pull them off before the sun gets at them. This will give three fumigations each night." This authority concludes with the following statement:—"The uniform testimony of those who have used fumigation extensively is, that by no other means, at any cost, can as effective work be done as by proper fumigation. It is also true in no place where fumigation has been followed for years is it believed that the method is eradicative. Some indeed think that it would be if universally used, but those longest acquainted with the process do not claim that for it. When it is well done the insects that escape are far below 1 per cent.

The question between fumigation and spraying will usually resolve itself into this. If the interests of the tree or crop demands a degree of freedom from scale insects that cannot be ensured by one or two sprayings, fumigation will be resorted to. The cost of cyanide has been reduced about one-half since fumigation was begun, and if it should be reduced to about one-half what it is now fumigation would probably entirely take the place of spraying for scale insects on all trees, as it has now done to such an extent in the case of citrous trees which are so difficult to spray.

Howard G. Taylor, of Riverton, New Jersey, has a Keiffer pear orchard 8 years old containing 600 trees, which at planting, or soon after, became infested with the San José Scale. It was treated with kerosene and whale oil soap for four years previous to last spring, during which time the Scale materially increased. Notwithstanding the treatment

encrustation occurred. In February of 1900 these trees were treated with undiluted crude petroleum from one side, and again in March with crude petroleum diluted to 50% with water from the other side. The result of the oil treatment being that the Scale was greatly reduced and the fruit less marked than on previous years. Mr. Taylor will use crude petroleum again next spring. There are many instances of Keiffer pears standing among infested trees of other varieties and remaining free from Scale, which plainly indicates its ability to make choice of its host plant, when a suitable host is near, but in the above orchard it was "Keiffer or nothing," and it not only lived on the Keiffer but multiplied greatly in spite of the effort made to destroy it. I am much indebted to Mr. Taylor for the success of my visits to this point, he having on two occasions driven me about, and by his directions assisted me elsewhere.

The question is frequently asked, how will trees sprayed with crude petroleum year after year withstand the treatment? In the orchards of Mr. J. L. Lippincott the question is answered so far as pears, plums and apples are concerned. These orchards were badly affected, and after three years' treatment the Scale is much reduced, the trees having recovered their former vigor are bearing freely. Bartlett pears, which were previously badly infested, this year bore a good crop of clean fruit. Duchess pears treated with oil for three years bore heavily, and are now in a healthy condition. Mr. Lippincott has used whale oil soap one pound, two pounds and three pounds to the gallon, resin dissolved in kerosene, and kerosene, but crude petroleum is the only thing he has any faith in, and he thinks it more economical not to dilute it. Undiluted crude oil may be used in very cold weather and parts of trees will not be wet and have the appearance of being oiled, and consequently missed, as is sometimes the case when diluted oil is used. Apple, pear and plum trees just from the nursery, washed with crude oil at time of planting last spring, show no sign of injury, and have made from two to three feet of growth. Growers in this section held the opinion that the Scale would not injure large apple trees, and felt safe about their apple orchards, but that was a mistake, as many large apple trees are dying. Large apple trees badly infested have died after oil was applied, but the Scale is held to be responsible.

Mr. Benjamin Lippincott has a block of 600 seven year old peach trees, that bore a good crop in 1899, and became badly infested that season after the crop was removed, the whole interior of the block becoming encrusted, three or four rows around the outside having very little Scale. The block was all sprayed late in February last with 25 per cent. crude oil with water, except the second row on one side which had undiluted crude oil. The tops of all badly infested trees died, and those slightly infested not only resisted the treatment but had a fine crop this year, and are now in a seemingly healthy condition. The row treated with undiluted oil has not differed from the other outside rows. A remarkable growth of from four to six feet came from the base of the tops which died, and this young wood is but slightly infested.

John Repp, of Glassboro, New Jersey, sprayed 6,000 pear trees four to seven years old, and 800 apple trees ten years old, with ten barrels of undiluted crude oil using the finest Vermorel nozzle, and thinks the Scale so reduced that his trees will not again require treating for two years, but I noticed that his fruit on Philadelphia market was considerably marked. Mr. Repp is much in favor of destroying the Scale promptly where found plentiful on a tree at any time during the summer. In doing this he used crude oil 25 per cent. with water on pear trees and says he burned the foliage severely, but did not permanently injure the trees, doing splendid work in destroying the Scale.

Horace Roberts, Moorestown, New Jersey, used crude oil last spring for the first time extensively with fairly satisfactory results. The Scale was held in check in his immense orchards comprising 200 acres better than ever before, and the fruit not nearly so badly marked as last year. Apple trees which I observed last year to be wholly encrusted made good growth and have but a fraction of the infestation which existed then. Some blocks that were treated with crude oil in 1899, and again last winter, are decidedly more vigorous than when I saw them last March, and are said to have borne heavy crops. It is difficult to understand, and we are not likely to appreciate what fighting the Scale in such extensive orchards means, much of which is large apple trees. In such cases the equipment must correspond to the work, and this reduced to a regular system. Crude oil is very effective but in his opinion not sufficiently so to dispense with summer treating. He has not made choice of a remedy for such work. One block of

Wealthy apples were killed outright, and the Williams showed some injury, but the oil was probably not a straight crude, and the treating was done at any time during winter when the weather would permit.

Mr. Roberts has a peach orchard twelve years old which last year was full of Scale and was not sprayed either last year or this ; it not being considered worth the labor and expense. It is now one of the finest old peach orchards I have ever seen, and this year had a full crop of fine fruit, which matured without being marked by the Scale. There is very little Scale on the trees, and he is of the opinion that friends are helping to control it. While interviewing Prof. Johnson he spoke at much length of a parasite which he called *Aphelinus Fascepennis*, and which he had found to be well distributed in Maryland, as likely to be very useful in controlling the San Jose Scale. When infested orchards are to be treated he recommends that the pruning should first be done, the brush removed from about the trees, and left in convenient piles in the orchard till June 1st or later, as the Scale does not breed till then. The parasites remaining on the trees would be destroyed by the treating, and being a winged insect resembling the male scale, he reasons that some of those breeding on the brush would again reach the trees. Mr. Roberts thinks some such influence as this is at work in his peach orchard.

I have already taken steps toward introducing this parasite into Ontario orchards this coming season, and think it will survive our climate in the fruit districts. In the hard freeze of February, 1899, the lowest point the mercury reached at Burlington was 16 degrees below zero, and Prof. Johnson assures me that at the same time it went to 26 degrees below at the Maryland Experimental Station near Washington, D.C., and from 22 to 24 degrees below at several points between Washington and Baltimore.

Mr. Horace Robert's father, a vigorous gentleman, little past middle life, has 200 large apple trees three miles from where he lives, and blames himself very much for allowing the Scale to become plentiful in this orchard in 1899 without knowing of its introduction. He says he is not alone in this, as it is a common experience for people there not to suspect the presence of scale till their fruit is badly marked. Ten barrels of crude oil were used this year, and the Scale so reduced that the fruit was comparatively clean.

Mr. Roberts differs from Mr. Repp in regard to the durability of the killing and says if the Scale would only stay dead when we kill it we would get on all right. It is nothing to kill the Scale, but it won't stay dead. This is singularly in keeping with our experience for trees treated last spring—on which in June it was next to impossible to find any live scale are now badly infested.

It is Mr. Robert's opinion that the Scale feeds during winter, and he attributes the exhausted appearance of the trees in the spring to the sapping which he insists continues during the winter months. They find it practicable to treat large apple trees only where a strong wind is blowing preferably directly with the rows, first one way and then the other, in which case the spray goes all through the trees and several trees along the row get the benefit.

Mr. Edmund Holmes, and others I met, had unsatisfactory results from using what is known as intermediate and other unsuitable oils. The general feeling in the parts of New Jersey I visited is that a straight crude oil of light specific gravity is safe to use, and is the only remedy they have tried that has done them any good.

In the State of New York, as far as I can learn, crude petroleum is the favorite remedy. Prof. E. P. Felt, of Albany, N. Y., says the use of undiluted crude oil cannot be recommended as safe in New York State, but he does not hesitate to recommend the trial of a mechanical dilution of oil as probably the best insecticide for the San José Scale in orchards. He reports that his experiments with crude oil undiluted show it to be a most deadly substance in this latitude, killing two out of four trees and seriously injuring the remainder. The 20% or 25% mechanical emulsion gave most satisfactory results, killing many, and on some trees practically annihilating the pest without appreciable injury to the trees. The application was made late in April, and it seems advisable not to deviate widely from this time.

Pure kerosene, or its mechanical emulsions, are not so effective in killing the San José Scale in early spring as are some other insecticides, but a 10 per cent. mechanical emulsion of kerosene is very good for killing the young scales during the breeding season.

Hydrocyanic acid gas gave the most satisfactory results, but its application is limited to trees of moderate size. At the experiment station at Geneva, N. Y., I found Prof.

Lowe preparing a large box tent having one side adjustable for use on trees of considerable size. He claims it will be more easily got into place than if it had to be lowered over the tree.

When to Spray.

A knowledge of the life, history and habits of the insect to be operated upon will greatly assist in determining its most vulnerable season. The Red Plum Scale fixes and the Pear Psylla begins to lay eggs from the middle to the end of April, according to the weather conditions which have prevailed, and should be destroyed before this takes place. The San José Scale and all other insects that winter on the trees alive are more susceptible at the end of April, or as late as possible before the blossoms open, and because of their activity the trees are correspondingly more resistive than at an earlier date. Aphis and clover mite are not destroyed till the eggs are hatched, which is about the time the buds begin to open. Soap even when recently used will not prevent the scales from fixing, and if applied early will destroy the blossom buds. Crude petroleum if used then will remain fresh to a later date than if applied in winter. Catch the larva from overwintered eggs and deter borers. Whether the treatment be with kerosene, whale oil soap, crude petroleum, or a combination of these, I would treat Psylla and Lecanium early in April, and the San José Scale and trees not infested as late as possible before the buds open. Summer treating should be done as early as it is practicable to do it.

Apples should be treated first, pears next, then the hardier varieties of plums, then the more tender varieties and lastly peach, allowing sufficient time to complete the work before the buds open.

Conclusions.

The increase and spread of the Scale and its destruction to the trees and fruit have been fully equal to the early reports of it. It is so minute, its multiplication so rapid, that growers should be continually on the alert. They should become acquainted with the general behaviour of the Scale and the remedies, which will enable them to use the most effective means at the opportune moment, and by thorough and careful work to so reduce the infestation that immediate recovery will be impossible. No opportunity should be missed, as delay greatly increases the difficulty.

Because of abundant opportunities to fix on slightly infested trees the, young Scales do not remain as long active as on those badly infested, where this privilege is limited, and many individuals in quest of it; and as the spreading occurs only in the active state, the distribution from encrusted trees is incomprehensible.

The Scale has greater power of locomotion and endurance than was at first supposed and can within itself establish a colony wherever it finds lodgment on a tree. Badly infested trees soon become weakened, and will not withstand spring treatment. Such should be treated at any time during the summer and encrustation not allowed to occur. Infested scions should be carefully avoided.

In all remedies the quality of the material is of the first importance. They should not become fixed, but remain free and in a flowing condition for a long time, that they may distribute well and penetrate the layers of Scale.

In treating for Scale the results from using less than 2 lbs. of soap to the gallon are very disappointing. Even 2 lbs. have not reduced infestation and we would now recommend $2\frac{1}{2}$ lbs. to the gallon of water as an equivalent for our imperial measure. One pound to the gallon will effectually destroy leaf curl, while $\frac{1}{2}$ lb. to the gallon should be used for killing young Scales in summer.

Every part of the tree must be saturated and the Scale reduced to the narrowest possible margin; 5 per cent remaining alive will restore the infestation in one season. The soap even where recently applied offers practically no resistance to re-infestation.

When used at full strength soap materially lessens the spreading, and destroys many insects other than the Scale, but will not destroy the vitality of eggs.

Home made soap has little effect in reducing the scale, but in common with other potash soaps is good as a fungicide. We can safely rely on soap not to injure the tender trees. Those that will not withstand soap treatment had better be destroyed. If used before frosts are over at full strength it will destroy the blossom buds more certainly than either crude petroleum or kerosene.

Kerosene as a spring or winter treatment is more trying to the trees and less destruc-

tive to the Scale than crude petroleum, and being more expensive cannot be recommended. It may be used to advantage as a summer treatment in the proportion of 10 per cent with water for the destruction of the young Scales on badly infested trees, and should be used only in bright, clear weather which secures rapid evaporation, as the danger from it consists in it remaining long on the tree.

Crude petroleum has shown itself to be by far the most destructive to insect life of the remedies we have used. In fact when a perfect application is made it is almost completely so. Very little oil is necessary to kill the Scale, and the least possible quantity that will reach every part of the tree should be used. More than this is likely to injure trees, and heavy applications have killed a great many, especially of tender varieties. Apples, pears, and the majority of plums appear to withstand the effects of oil treatment with splendid results in killing the Scale, and vigorous peaches and Japan plums where not too much oil was used. In no case would I use crude oil on peach trees which had been weakened by Scale, frost, borers, the lack of proper cultivation, or any other cause. In such cases soap should be used. It is safer to use oil diluted to 25 per cent. or 30 per cent. with water. The only advantage of the water is in securing a light application. The inside of the limbs, the twigs and crevices in the bark should have special attention, and no part of a tree should be covered by the spray more than once.

To be most effective against Lecanium and Pear Psylla it should be applied early in April, but to kill the Scale and other insects without danger to the tree as late as possible before the buds open. It will remain fresh and resist re-infestation much longer if applied late, and will also act as a deterrent against borers, etc. Crude petroleum will materially retard growth in the spring, but when it comes the foliage will be remarkable both in size and color.

It is the cheapest remedy we have at present, and should be kept in tight vessels especially if held over as the lighter oils evaporate, leaving a residue too thick and heavy to be suitable.

Crude petroleum and soap are readily combined and easily applied, and when used 1 lb of soap to the gallon and 18 per cent. of oil proved destructive to insects and left a thin covering of paraffine, which could not injure even peach trees. By changing the proportions it can be brought to any strength required. The severity of the oil treatment is lessened by the soap, which also destroys fungus. I have no hesitation in recommending this mixture for further trial.

For a spring treatment we recommend crude petroleum used sparingly for apples, pears, and the majority of plums.

For tender trees such as peaches, Japan plums, etc., whale oil soap or a combination of soap and oil. For a summer treatment, whale oil soap ½ lb to the gallon, kerosene 10 per cent. with water or fumigation.

A reliable pump is indispensable ; any old appliance will not do. It should be a pump that will draw every stroke and hold what it gets. It should be provided with a sufficiency of hose, an extension pipe, a good nozzle—a Vermorel is best, which should be either coarse or fine according to the work—and also provided with a convenient stop-cock, which will greatly assist in controlling oil. An elevated platform on the wagon used for the pump is of great advantage in spraying large trees.

Burning is the only possible way of annihilating the Scale, and should be resorted to without hesitation in cases of isolated infestation, and also in the case of infested nursery stock, the distribution of which should be guarded against in every way possible. And after carefully following this matter for the past two years, and taking all things into consideration, my conclusion is that destruction by burning, the plan first adopted, is after all the only sure and effective method of subduing this pest.

Owing to the difficulty of procuring proper material for treating infested trees, I would suggest that a sufficient supply of the best make of soap and suitable crude petroleum be procured.

Believing the foregoing to be a correct statement of the present existing San José Scale conditions in the Province of Ontario, as far as it is possible thus briefly to refer to them.

I remain, dear Sir,

Yours very respectfully,

Freeman, Dec. 31st, 1900. GEO. E. FISHER.

INSTRUCTIONS FOR SPRAYING.

1. Trees must be thoroughly pruned, and all rough bark and lichen removed.

2. Have a sufficient supply of material on hand and a proper pump for applying it.

3. Do not spray the trees when wet.

4. Thoroughness is imperative.

5. For early work soap should be used in the proportion of $2\frac{1}{2}$ lbs. to the gallon of water where the Scale exists and 1 lb. to the gallon when operating only against fungus. It should be first dissolved in a separate vessel, then strained into the barrel of the pump, and is more effective when applied hot.

6. Any good force pump, provided with an abundant supply of hose, an extension pipe, and a suitable nozzle will apply the soap.

7. Soap can be used most effectively during the time between the swelling of the buds and the opening of the blossoms, even if a few blossoms are open no harm will ensue. An early application will destroy the fruit buds of tender trees. The tree should be sprayed until every part is saturated, the inside of the limbs, the twigs and crevices should have special attention. One and a half gallons of the mixture is sufficient for a full grown peach tree.

8. If undiluted crude petroleum be used the least possible quantity of oil that will cover every part of the tree should be applied with the very finest Vermorel nozzle. It is safer to use oil diluted to 25 to 30 per cent. with water.

The Vermorel nozzle, either coarse or fine to suit the work, is best. While every part of the tree must be reached no part should be covered twice with oil. A reliable combination pump only should be used in applying mechanical mixtures.

9. Treat for Lecanium and Pear Psylla early in April. San José Scale and other purposes as late as possible before the buds open. First apple, then pear; then the hardier varieties of plums, then the tender varieties, and last peach, allowing sufficient time to complete the work.

Crude petroleum should not be used at all on the foliage.

10. For summer spraying use kerosene 10 per cent. with water on bright, airy days, which will promote evaporation, or whale oil soap $\frac{1}{2}$ lb. to the gallon of water, whenever practicable.

REPORT

OF THE

INSPECTOR OF FUMIGATION APPLIANCES

1900.

(PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE.)

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REPORT

OF THE

INSPECTOR OF FUMIGATION APPLIANCES,

1900.

To the Honorable the Minister of Agriculture for Ontario:

SIR,—I beg to submit herewith my second annual report as Inspector of Appliances for the Fumigation of Nursery Stock.

When the Fumigation Act was first put into force, in the spring of 1899, a few nurserymen were inclined to shirk their duty, not only on the ground of expense, both as to the chemicals used and the construction of the fumigation house, but also on the ground of loss of time at a season of the year when work becomes very pressing. The chief objections urged during the inspection of 1900 were loss of time, and damage to peach and other stock by the process of fumigation, but I have pleasure in reporting the general willingness of the nurserymen to conform to the provisions of the Act. It is conceded by nearly all fruit growers that the Act is a very wise measure, as they are protected against the introduction of nursery stock infested with the San Jose Scale, while the nurseryman can send out his stock with the assurance that he is not to blame if by any chance the Scale is distributed to clean orchards outside of the districts where Scale is known to exist. Moreover, it is a well known fact that at least three-fourths of the nursery stock are sent out by the nurserymen of the Niagara peninsula, the north-eastern portion of which is badly infested with the San Jose Scale.

INSPECTION.

Much attention was paid to the inspection of all fumigation houses and boxes, and as a result considerable repairing was done by the nurserymen before permission was allowed to fumigate.

Many of the houses had been built very hurriedly in the spring of 1899, and little care was taken in their construction beyond making them gas-proof for the time being. It was found, however, that the heat of the summer, and the frosts of winter had racked most of the buildings to such an extent that frequently a complete overhauling was necessary before they were again made air-tight.

The buildings were tested in nearly every case with the fumes of burning sulphur or paper. Sulphur or paper were placed in a basin on the floor of the house, and ignited. When the doors were closed, all leaks could be detected by the presence of the white smoke. Although this smoke is not so penetrating and searching as hydrocyanic acid gas, yet it was considered a good test of the condition of the building, for the owner could see for himself where the leaks were, and where overhauling was required. With hydrocyanic acid gas leaks were determined altogether by the smell, for the gas is colorless.

When sulphur or paper is ignited in a house and the doors immediately closed, the air within is heated, and an expansion occurs. Even in air-tight houses, smoke would issue from all the doors and other places for a few minutes, but as soon as the pressure was relieved, no smoke would appear. In testing a house, therefore, these facts should be borne in mind.

Mr. W. N. Hutt, B S A., acted as inspector of all the fumigation houses in the Niagara district, and did his work well I have pleasure, therefore, in placing on record my appreciation of his valuable services in this connection. Mr. G. E Fisher, of Freeman, inspected the fumigation houses in the south-western and northern portions of the peninsula of Ontario, while I found time to visit the Galt and Berlin nurseries and those east of Toronto.

Regulations and Instructions.

In February, 1900, the following circular of information and instructions was sent to every nurseryman that the fumigation appliances might be in shape for inspection before the opening of the nursery season:

Ontario Agricultural College, Guelph, Feb. 24th, 1900.

Dear Sir,—I beg to call your attention to the Regulations, and to Sections 3, 4, 5, 6, and 7, Chapter 33, 61 Victoria, as amended by Amendment Act of 1899, which refer to the Fumigation of Nursery Stock: and to remind you that the Act is still in force, and compels the fumigation of all nursery stock (except such trees, shrubs, and plants, as are hereafter mentioned) with hydrocyanic acid gas.

It is very necessary that the fumigation building be perfectly air-tight if fumigation by hydrocyanic acid gas is to be effective. I have, therefore, to ask you to put your building, or buildings, in proper condition for treating nursery stock, before March 25th. A rigid inspection of all houses will, if possible be made after that date.

The attention of nurserymen is specially directed to possible leakages about the doors, windows and floor, or at the base of the roof. It is quite probable that fumigation houses which were gas proof last spring will leak this coming spring on account of warping of the building through frost action during the winter.

Every door should not only have padding in the edge of its frame, but also have large wooden buttons attached to the outside of the frame, by means of which the door may be pressed tightly into the padding.

The Inspector will test every fumigation building during his visit, and will not allow stock to be distributed to purchasers from any house that leaks, or is not air-tight.

Those nurserymen who intend using a box for fumigation purposes are required to have it well constructed, with two thicknesses of boards—one thickness, at least tongued-and-grooved and tar paper between. The box is specially recommended to those nurserymen who send out small orders, or do only a local trade. It is easily handled and the process is very inexpensive.

The chemicals necessary for fumigation, viz., potassium cyanide and sulphuric acid. will be sent out to the nurserymen in weighed and measured quantities from the Agricultural College, Guelph, and no chemicals. other than those sent from the College, will be allowed, except by special permission of the Inspector.

The formula employed in last year's fumigation will be used again this year, viz., twenty-five twenty-eighths oz. cyanide, one and a-quarter fluid ozs of acid, and one and seven-eighths fluid ozs. of water, for every one hundred cubic feet in the building. In the case of raspberry plants, gooseberry plants, and currants, the strength of dose may be reduced to two-thirds that of ordinary. In ordering their chemicals, nurserymen should state the number of doses of each strength they will require.

It would be well for the nurserymen to send in their orders as soon as possible, so that all material may be on hand at the opening of the fumigation season, and no delays occasioned.

The following plants do not require fumigation: Evergreens, strawberry plants, bulbs, and bedding plants; but all kinds of fruit trees, all kinds of vines and shrubs (other than evergreens and strawberries) including currants, gooseberries, and raspberries, must be fumigated.

Special attention is also called to the deadly nature of the hydrocyanic acid gas which is used in fumigating the nursery stock, and every precaution should be taken to follow the instructions put on each tin sent from the College.

Yours truly,

W. Lochhead,
Inspector of Fumigation Work.

Regulations for the Fumigation of Nursery Stock.

The following regulations have been prescribed by order of the Lieutenant-Governor in Council, in accordance with the provisions of the San Jose Scale Amendment Act, passed April 1st, 1899.

1. Fumigation must be carried on in a box, room, compartment, or house, suitable for the purpose which must be air-tight and capable of rapid ventilation. The owner or proprietor must notify the Minister as soon as preparation for fumigation is complete. The Minister will thereupon order an inspection of the fumigation appliances. No fumigation under the Act is to be carried on until such inspection has been made and a satisfactory report sent to the Minister.

2. The Inspector, after examining and measuring the box or house, or other compartment in which fumigation is to be carried on, will prescribe the amounts of material to be used for every fumigation, and the instructions as to the same must be carefully followed out. The Inspector may, if thought advisable, supply the material for each fumigation in weighed packages.

3. The fumigation house (which shall include all apparatus or appliances used in the fumigation, such as generators, etc.) is to be subject to the orders of the Minister on the recommendation of the Inspector. Subject to the approval of the Inspector the fumigation house may be on other lots than those on which the nursery stock are growing.

4. The fumigation is to be by hydrocyanic acid gas produced according to the instructions of the Inspector and from such formulas at he prescribes for the purpose.

5. The fumigation is to be continued for a period of not less than forty-five minutes. After the expiration of this time or longer, and when fumigation is complete, the house is to be thoroughly ventilated for fifteen minutes at least.

6. No person is to be allowed to enter the fumigating house until after the ventilation period has expired. Entering before may prove injurious, if not fatal, as the gas is a deadly poison.

7. The fumigation of buds and scions may be done in fumigation boxes of not less than thirty cubic feet capacity, the same to be subject to inspection and approval.

8. Immediately after inspection of the fumigation house, the Inspector will report to the Minister, and the Minister or the Inspector will thereupon give permission in writing for the owner or proprietor to begin fumigation.

9. The owner or proprietor of every nursery will attach to every box and to every package of nursery stock a certificate as follows, and he will furnish every purchaser who so desires a copy of the same.

CERTIFICATE OF FUMIGATION.

This is to certify that this package of nursery stock consisting of was properly fumigated on or about the day of , 1900, in accordance with the regulations prescribed by Order of the Lieutenant-Governor-in-Council, in accordance with 62nd Victoria, Chapter 35.

The following are the sections of the San Jose Scale Act dealing with the fumigation of nursery stock, 62nd Victoria, Chapter 35 :

3. No person shall import or bring, or cause to be imported or brought into the Province of Ontario, for any purpose whatever, any plant infested with Scale.

4. No person shall keep, or have, or offer for exchange or sale any plant infested with Scale.

5. The owner or proprietor of any nursery shall not send out, or permit any plant to be removed his nursery without the same being first fumigated by hydrocyanic acid gas in accordance with regulations prescribed by order of the Lieutenant-Governor-in-Council. 62 Vic., Chap. 35.

6 No person shall sell, or dispose of, or offer for sale any plant obtained, taken, or sent out from a nursery unless the said plant has previously been fumigated in accordance with these regulations. 62 Vic., Chap. 35.

7. In case the Inspector finds Scale in any nursery and so reports to the Minister, the Minister may thereupon inform, by writing, the owner or proprietor or manager of said nursery of the existence of Scale in his nursery, and the owner or proprietor or manager of said nursery shall not thereafter permit any plant or plants to be removed from said nursery until the Inspector reports to the Minister that it is safe in the public interest to permit the said nursery stock to be removed after fumigation. 62 Vic., Chap. 35.

In September, along with the Regulations, and San Jose Scale Act, as printed in the February circular, the following memo. was sent to every nurseryman :

MEMO FOR THE GUIDANCE OF NURSERYMEN IN THE FUMIGATION OF NURSERY STOCK.

1. The fomula to be used for apple, pear, plum, cherry, quince, shrubs and vines:
   - Cyanide—twenty-five-twenty-eights of an ounce.
   - Sulphuric Acid—$1\frac{1}{4}$ fluid ounces.
   - Water—$1\frac{7}{8}$ fluid ounces, for every 100 cubic feet in house or box.

2. The formula to be used for peach, raspberry, gooseberry, currant:
   - Cyanide—$\frac{2}{3}$ ounces.
   - Sulphuric Acid—1 fluid ounce.
   - Water—$1\frac{1}{2}$ fluid ounces, for every 100 cubic feet in house or box.

3. The following plants do not require fumigation :—Evergreens, strawberry plants, bulbs and tubers, herbaceous perennials and bedding plants.

4. Damage may be done to stock (*a*) if fumigation takes place too early in the fall, before the buds are set, and the wood sufficiently dormant, and (*b*) if fumigation takes place late in spring, after the buds have begun to swell.

5. The roots of stock should be exposed for as short a time as possible, both before and after fumigation. Experience shows that much injury has resulted from such exposures.

6. No nurseryman shall use chemicals other than those sent from the Agricultural College, Guelph, except by special permission of the Inspector.

7. Nurserymen should bear in mind that a certificate of fumigation must be attached to every package of nursery stock sent from the nursery.

8. No fumigation house is to be used for fumigation purposes until sanction has been obtained from the Inspector.

W. Lochhead,
Inspector of Fumigation Appliances.

The Equipment for Fumigation.

The equipment necessary for the fumigation of nursery stock consists of :

1. *Chemicals*, including water, sulphuric acid, and potassium cyanide (98-99 per cent. pure).

2. *Generator*, or some suitable vessel, jar, or crock, in which to mix the chemicals and generate the hydrocyanic acid gas.

3. *A graduated glass beaker* for measuring out the acid and water, and

4. *Air-tight fumigation house*, or *box*, to hold the stock while fumigation by gas is taking place.

The Chemicals, with the exception of the water, are sent from the Agricultural College to the nurserymen in weighed and measured quantities, suited to the capacity of the fumigation houses or boxes. Great care should be taken with the chemicals, for the acid is deadly corrosive, and the cyanide is deadly poison. They should be kept out of the reach of children.

The Generator may be a glazed earthenware crock, or pickle jar, of 1 to 4 quarts in size, according to the capacity of the house. After a charge of gas has been liberated a bluish liquid will be left in the generator, but will crystallize out as it cools. These contents are readily soluble in water, and should be emptied as soon as possible in a manure pile, but never in an exposed place. Last spring one nurseryman to my knowledge lost two good sheep by exposing the jars with the contents to these animals.

The generator should never be made of tin or iron ; always use glass or earthenware.

The Fumigation.—As soon as the trees are dug and tied in bunches they are piled loosely on the floor of the house or box, with roots towards walls, and tops overlapping. When everything is ready, the water is measured out into the generator, then the acid is slowly poured into the water and kept stirred with a stick ; finally the cyanide is dropped into the liquid from the tin or paper (as the directions state). The door, or lid, is immediately closed, and the room made perfectly air-tight The doors are thrown open again in 45 minutes, and the buildings thoroughly ventilated for about 10 minutes.

It is very important that the roots of the trees be exposed for as short a time as possible, both before and after the fumigation process, for it is essential that they should remain moist The roots, however, should not be puddled before fumigation.

Trees, especially peach, should never be fumigated a second time, nor should they be fumigated when they are drenching wet. Damp or moist trees, however, are not injured by the treatment.

Formulæ Used Elsewhere in Fumigation.

The stronger formula used in Ontario for fumigating nursery stock, viz , cyanide, twenty-five-twenty-eights of an ounce ; sulphuric acid, $1\frac{1}{4}$ fluid ounces; water, $1\frac{7}{8}$ fluid ounces, for every 100 cubic feet in house or box, is the same as the Maryland formula adopted by Prof. W. G. Johnson, who very kindly gave us great assistance in the inauguration of the Fumigation Process in 1899, and who has perhaps done more experimental fumigation work than any other person in the United States or Canada. Although this Maryland formula is apparently far from simple, yet when it is applied practically there is very little trouble with it. The dose for each box and house is computed but once, and that is the end of the apparently complex formula.

Dr. Fletcher uses the simpler formula : 1 oz cyanide, 1 fl. oz. sulph. acid, and 3 fl. oz. water for every 100 cubic feet of space, which is a slightly stronger dose than the one used in Ontario nurseries.

The New York formula recommended by the Geneva authorities is : $1\frac{1}{8}$ oz. cyanide, $1\frac{1}{2}$ fl. oz. sulph. acid, $4\frac{1}{2}$ fl. oz. water.

The Ohio formula recommended by Prof. Webster is : $\frac{4}{5}$ oz. cyanide, $\frac{4}{5}$ fl. oz. sulph. acid, $1\frac{3}{5}$ fl. oz. water.

The Connecticut formula is the same as that of Ontario and Maryland, while the Washington and New Jersey formulæ are the same as Dr. Fletcher's.

These formulæ, apparently at variance, are after all very similar. The amount of gas generated depends on the amount of cyanide used, provided there are sufficient water and acid to make the chemical action complete. The use of the water is to keep in solution the potassium sulphate, which is formed by the action of the acid on the potassium cyanide; otherwise, the action of the acid would soon cease on account of the coating about the cyanide. In some reactions, where there is not an excess of water, acid potassium sulphate is formed. This will naturally require a different proportion of acid and cyanide. The Ontario formula is supposed to be the safest, and most economical under the conditions which obtain in our nurseries.

Nurserymen everywhere agree that the best known way of killing San Jose scale on dormant nursery stock is by fumigation with hydrocyanic acid gas. The process is thorough and inexpensive. The treatment is valuable against other insects, which do not winter in the egg. Until some other better method is devised, it would be unwise to discard this method for any other which does not give promise of immediate relief.

Effect of the Gas Treatment on the Nursery Stock.

My last annual report dealt with this subject at some length. The conclusions then stated were that the injuries were due to one or more of the following causes:—1, the very severe *winter-freezing* of 1898-9, which destroyed very many young trees in all sections of the country; 2, the *prolonged drouth*, which was preceded by a long spell of wet weather; and 3, the *advanced conditions of the buds* at the time of fumigation. To these I would add a fourth, *the exposure of the roots too long, both before and after fumigation.*

Reports of supposed injurious effects of fumigation were received from three or four nurserymen, but when the cases were looked into carefully there was no doubt but that the chief cause of the injury was the damaged condition of the roots produced by the severe winter of 1898–9. It is a fact well known to all nurserymen and fruit-growers that young trees may have their root-systems badly injured and yet show very few effects for some time so long as they are allowed to remain in the nursery row, but so soon as they are removed they die almost immediately. Now, the peach nursery stock sent out last spring (1900) passed through the severe winter, and it is but fair to assume that it too must have suffered to some extent.

When I received notice last June of the supposed damage to nursery stock, peach in particular, by fumigation, I wrote immediately to Professors Johnson, of Maryland; Forbes, of Illinois; Smith, of New Jersey; Webster, of Ohio; Slingerland, of New York, and Pettit, of Michigan. Professor Smith was absent in Europe, from whom no reply was received, Professors Slingerland and Pettit had no experience with nursery fumigation, hence were not prepared to give information. I stated in my letter to each of these gentlemen the facts of the case as were related to me. Few of the buds had developed, but some adventitious buds were showing themselves. There had, of course, been no growth, but it is probable that they will all come through, with the loss of a season's growth, however. "Can you suggest a cause for the injury? Is the dose too strong? Can it be possible that your peach is more *resistive* than ours? I shall be glad to get full information on this matter."

The following letters were received, from which it will be observed that little credit is given to injury by fumigation such as is done in Ontario:

Urbana, Ill., July 6th, 1900.

Dear Sir.—I have your enquiry of June 29th, and I regret to say that I have no definite information bearing upon the point you mention. Vague statements have sometimes been made to me by nurserymen to the same general effect as that in your letter, and I undertook this spring to determine by experiment the truth of such suppositions. I underestimated, however, the variability of trees in starting in the spring and consequently did not make my experimental lots large enough to bring out any difference which might have appeared between fumigated trees and the check lot. I had fifty of each variety in each lot, and with that number could detect no difference attributable to the fumigation.

Unfortunately my peach stock was all practically dead, so few of the trees started in the spring in either the check or the experimental lots that I could not observe any difference.

Very truly yours,

S. A. Forbes.

Ohio Agricultural Experiment Station, Wooster, Ohio, July 2nd, 1900.

Dear Professor,—I think we have only once had any complaint of injury to peach trees by fumigation. We note, however, that fumigation is likely to injure fresh growth That is to say, that, if trees are taken after they have begun to put out their foliage in spring, and fumigated, they will be injured. I should imagine that peach trees removed early in the fall and fumigated, might perhaps be slightly injured, but in only one instance have we had any reports of injury and that was where the stock was fumigated very late in the spring. I should hardly suppose that our trees would be less resistive than yours, but have no definite information on that point, I would hardly know how to avoid this trouble, if we should come in contact with it, unless, possibly, it would be to postpone fumigation until a somewhat late day in the fall. It occurs to me that early in the autumn the peach buds may not be as mature as a little later. In other words, after they first put out they harden a little in preparation for winter. If this is the case, then it would naturally follow that there would be less injury after the hardening than before. This is not very definite, but it really is the best that I can do for you as I have not been confronted with the problem myself.

Yours truly,

F. M. Webster

College Park, Md., July 3, 1900.

Dear Prof. Lochhead,—I am in receipt of your letter of June 29th, and note what you state regarding fumigation of young peach trees. In reply would say that we have had no difficulty along this line this season, and I can not, under the circumstances, offer any suggestions as to the solution of the problem in your section. You may, however, recall the fact that I have repeatedly cautioned the nurserymen about fumigating very small nursery stock, especially peach, with the normal dose, twenty-five hundredths (.25) gramme per cubic foot. Peach, especially small grade stock, like whips and June buds, can not be fumigated with a strength stronger than sixteen or eighteen hundredths (.16 or .18) gramme per cubic foot and this method we have been following in this State, which I have repeated in my publications, copies of which no doubt you have. Did you receive a copy of my last Bulletin published by the Pa. State Agricultural Department on Nursery Fumigation, etc.? I do not believe there is anything in the resisting properties of peach in this section more than that found in your section. If anything, I would expect that yours would be more resisting than those from the South, in as much as your season is shorter, and therefore the growing period is not as great as it is here. The wood, therefore, in your section I would judge would be more mature, and perhaps better able to withstand the gas. There might also be a possibility that the reverse would be true, and that the longer growing season here would make a stronger and more resistant wood. This, however, I can hardly believe; but it may prove to be fact, when comparisons are made. I know of no experiment that can be made along this line at the present; but growers must be cautious about re-fumigation of peach and the exposure of the roots for any great length of time. I should like to hear from you about this matter later if you have any new developments.

Very truly yours,

W. G. Johnson.

With regard to the effect of hydrocyanic acid gas on the various kinds of nursery stock, the following very careful results were secured, and confirmed by many subsequent experiments by Prof. Johnson, of Maryland:

1. The tender terminals of first-class peach stock *were not affected in the least* until $1\frac{2}{3}$ *ounces Cyanide*, nearly double the normal dose, was used and exposed *for one hour.*

2 *Apple* was not affected, even when six times the normal dose was used.

3. *Plum* required nearly three times the normal dose to produce injury to the terminals.

4. *Pear* stood from three to four times the normal.

5. *June Buds and Low Grade Peach* will not stand a dose higher than two-thirds normal. The wood in these is not well matured.

6. *Buds, Grafts* and *Scions* should be treated to a two-thirds normal dose.

Suggestions re the Construction of Permanent Fumigation Houses.

It is evident that the San Jose Scale is to remain permanently with us in Ontario, for there is no thoroughly effective means of exterminating it. Future treatment will be along the line of control rather than extermination. The pest is confined at present chiefly to the Niagara peninsula, Burlington, Guilds (in Kent), and Kingsville; and it is the duty of the authorities to prevent its spread to the other fruit producing districts of

the Province. Believing that the most important agency of spread is infested nursery stock, the Government very wisely demands the fumigation of all nursery stock with hydrocyanic acid before it leaves the nursery. The fulfilment of this Fumigation Act necessitates the erection of suitable fumigation houses or boxes. At the outset many nurserymen constructed temporary buildings, under the impression that the danger of infestation from nursery stock would soon pass away ; but, as I have already stated, the San Jose Scale is here to stay, and permanent, well-constructed fumigation houses must be built.

The greatest difficulties found in maintaining fumigation houses in efficient condition from year to year are the cracking of the paper through expansion and contraction of the materials by heat and cold, and the warping and loosening of the boards by the sun and rain. Mr. W. N. Hutt tells me that although all houses in the Niagara district were put in the best of condition for spring fumigation, there was not a single one but needed repairing in the fall, and some houses had to be almost reconstructed. The majority of the houses which have been built at all carefully and with permanency in view (see Report 1899, p. 5) have a framework of 2x4 studding. On the outside of the studs is nailed carefully a covering of tongue-and-grooved sheeting, followed by a course of building paper lapped one half, then with upright matched boards battened with four inch strips.

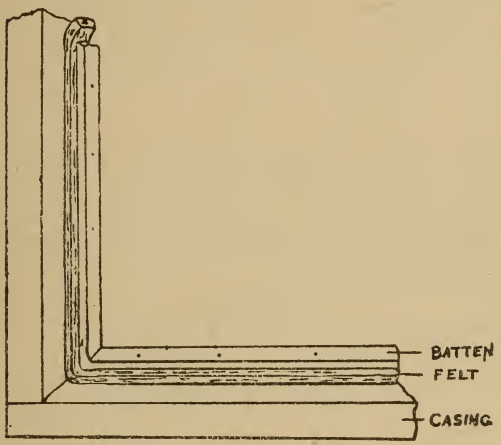

Fig. 1.

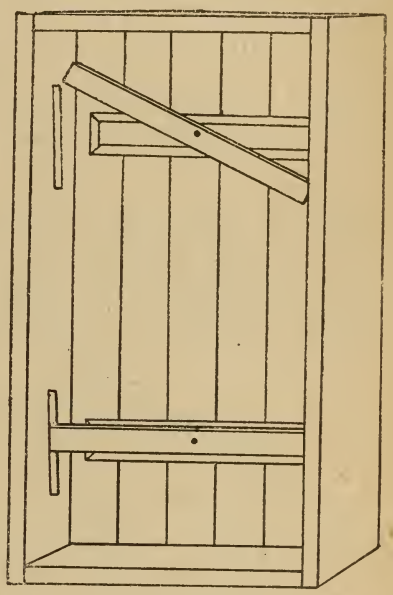

Fig. 2.

When there is an additional covering of tongue-and-grooved sheeting nailed on the inside of the studs the building is rendered more solid and at the same time air-tight. The ceiling must be carefully made, and the building paper should run continuously without a break over the roof down the sides. A floor composed of same material as ceiling or walls would add to the stability, and prevent warping to some extent.

In the course of our inspection we met with houses which were lath-and-plastered within, and had outside sheeting. Such houses, in nearly every case passed the smoke test very satisfactorily, and appeared to me ideal permanent constructions. A carefully made lath-and-plaster house having a slated rack protecting the plaster with a dead air-space between the plaster and outside wall of tongue-and-grooved sheeting, and fitted with proper doors and ventilators, would remain in a gas-tight condition in spite of wind and weather.

Another difficulty which often confronts the nurseryman in the construction of a gas-proof building is the making the doors tight. Some valuable hints on this matter have been received from the nurserymen themselves. At my request, Mr. Hutt prepared the following notes from observations he made while inspecting the fumigation houses of the Niagara district :

Fig. 1 shows a good method of padding doors and ventilators. Felt used by harness makers and known as heavy collar felt is cut into strips about 3 in. wide, and laid into the casings so that it forms the jamb, and the door crowds it evenly all around. A batten leaving about $\frac{1}{4}$ in. of the edge of the felt exposed is nailed on top of it to hold it firmly

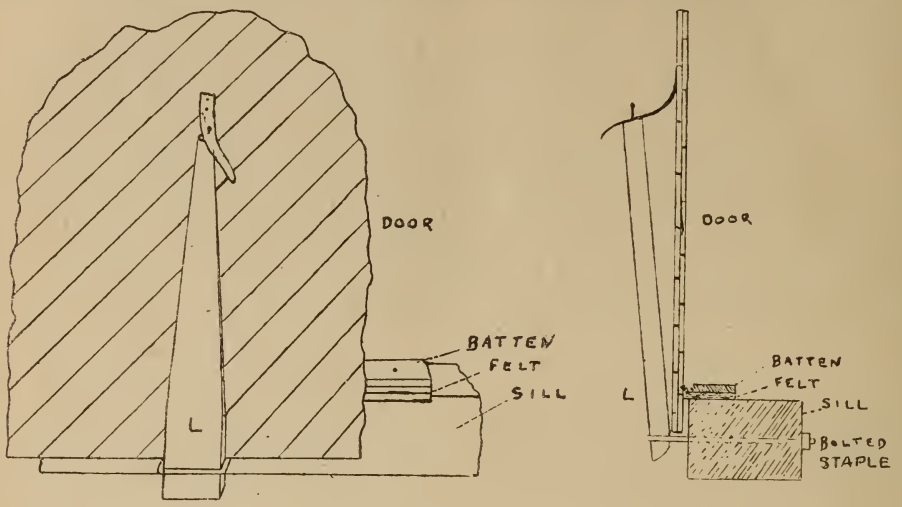

Fig. 3.

in position. Collar comes in rolls of 54 in. width and costs about $2.25 per yard. A $\frac{1}{4}$–$\frac{1}{2}$ yd. would be sufficient for an ordinary sized fumigation house. This variety of felt splits readily, and can be used to even up warped door and ventilator casings. This method of padding is used in the large fumigation house of Morris, Stone & Wellington, at Fonthill, and has been found to give the best of satisfaction.

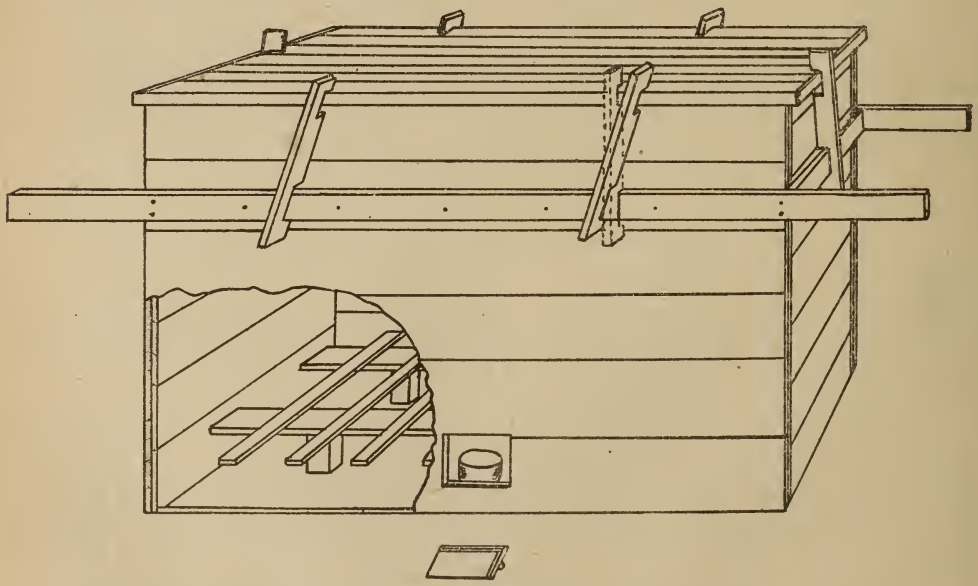

Fig. 4.

Fig. 2 represents a very close fitting door used by Mr. A. G. Hull of St. Catharines. The door, which is made of matched unbeaded lumber, fits the casing closely, and is forced into position against the padding by the movable cross-pieces fitting into the grooves in the casing. The grooves are cut slightly off the perpendicular so that the farther

the cross-pieces are pulled into them the tighter the door is wedged against the felt. A second door is hinged on the outside of the casing, and when closed makes an air-space between the two doors.

Fig. 3 illustrates a very ingenious device employed by Mr. C P. Carpenter, of Winona, for wedging doors. The lever L cut out of a 2x4 scantling is fitted at the lower end into a staple bolted through the sill. The lever forces the door against the felt, and is held in position by a strap at the top. This has proved to be a very handy and effective method of wedging a door.

Fig. 4 shows a handy box for fumigating small lots, devised by Mr. J. W. Harper, foreman of the Helderleigh Nurseries, Winona. It is made of double matched sheeting with tar-paper between. The top is held tightly against the felt padding by knocking the wooden hooks from an upright into a slanting position. The hooks are made of hardwood pieces 1 x 3 in., cut so as to hook over the edge of the lid and under the long side-strip. The rack in the bottom of the box keeps the stock away from the chemicals and insures a thorough penetration by the gas.

Fig. 5 is a diagram of a close-fitting and easily-worked ventilator used in the fumigation house of Brown Bros.' Nurseries. Before the chemicals are put in the

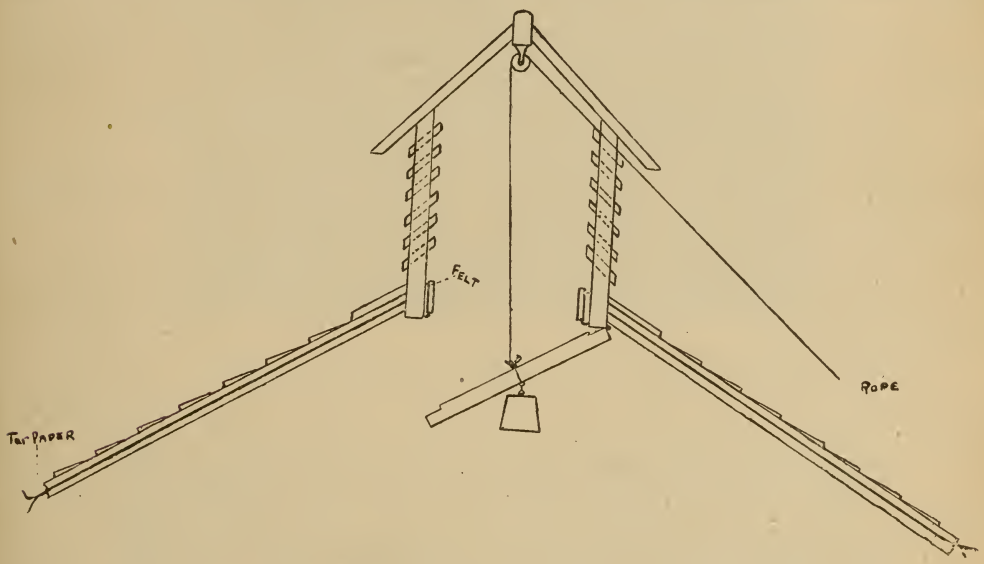

Fig. 5.

house the hinged trap is pulled up tightly against the felt, and the rope fastened to a cleat on the side of the house. Before the house is opened the rope is loosened, and the weight brings down the trap and allows the gas to escape. A ventilator of this kind having the trap opening into the inside is protected from the weather, and is not subject to the troublesome warping of exposed cap ventilators.

Fumigation Houses.

I have again taken the liberty of inserting views of two well-constructed fumigation houses. Fig. 6 shows clearly the house used by Mr. J. H. Wismer, of the Port Elgin Nursery. It is perhaps the most air-tight fumigation house in the Province. Its capacity is 904 cubic feet, and is built of three courses of siding and two courses of building paper. The doors are also built according to the latest instructions. The building on the left is the fumigation house; the centre building of the photo is a 40x60 packing shed.

Fig. 7 is the fumigation house of Mr. Wallace Woodrow, of Picton. The house is built of brick with stone foundation and plastered inside on the walls. The ceiling is lined with tarred paper covered with boards. There are two doors, the inner one of wooden frame covered with well oiled cotton. The back ventilator opening is padded on the edges.

General Recommendations.

In view of the fact that the San Jose scale is still with us and threatens to spread in spite of treatment with whale-oil soap and crude petroleum, I would recommend that—

I. Official fumigators be appointed to superintend the fumigation at every nursery. The regulations could be carried out in every respect, and the Government could then provide the certificates of fumigation. The Ohio law requires that certificates of fumigation be signed by either a State or Government officer, and does not recognise the nurseryman's own certificate. In one or two instances one of our nurserymen was put to some considerable inconvenience and expense through not being able to furnish a Government certificate to the Ohio officials.

II. All nurserymen be compelled to register with the Department of Agriculture every year, stating the nature of the stock which they are offering for sale. It is quite probable that nurserymen are doing business without the knowledge of the Department.

Some points that should be remembered by Nurserymen.

1. Never allow a tree grown by you to get out of your nursery before it is fumigated.

2. Do not fumigate trees until the wood is well-matured and the buds thoroughly dormant.

3. Never fumigate trees after the buds have begun to open in the spring

4. Never expose the roots of trees longer than is absolutely necessary.

5. Send in your orders for chemicals early, and state clearly the number of doses of each formula required.

6. Never fumigate apples, pears, plums, quinces, etc., according to second formula.

7. Repair your fumigation house early before the Inspector calls.

8. The Inspector will probably begin work about March 15th, and Sept. 15th in the Niagara region.

9. Never leave the Cyanide or the acid where children can reach it.

10. Never allow the residue after fumigation to remain long in the crock or generator.

11. Never put a new charge in a generator containing the old residue.

12. Never use tin or iron vessels as generators, they will be rendered useless in a few minutes.

13. Never allow any one to enter a fumigation house under ten or fifteen minutes after the doors and ventilators are open.

14. Never omit to attach the certificate of fumigation to every parcel of stock shipped.

W. Lochhead,
Inspector of Fumigation.

Fig. 6. Fumigation House of Mr. J. H. Wismer, Port Elgin.

Fig. 7. Fumigation House of Mr. Wallace Woodrow, Picton.

A LIST OF THE NURSERIES OF ONTARIO, 1900

Morris, Stone & Wellington, Fonthill	Fumigation houses, 2,800 cub. feet.
Stone & Wellington, Toronto	do at M. S. & W.
Pelham Nursery Co., Fonthill	do
A. L. Root, Fonthill	do
B. W. Secord. do	do house.
J. E. Crow, Ridgeville	do house, 560 cubic feet.
J. W. Page, do	
H. A. McCoomb, Ridgeville	Fumigation at M. S. & W.
C. Campbell, Queenston	
F. Walker, Virgil	Fumigation house, 866 cubic feet.
G. B. Wilson, Virgil	
W. Lee & Son, Virgil	
Angus Shaw, Virgil	
Esau Hube, St. Davids	
E. Morden, Niagara Falls South	Fumigation box, 120 cubic feet.
A. M. Smith, St. Catharines	
Smith & Reed, do	Fumigation house, 1,550 cubic feet.
A. G. Hull & Son, do	do 960 do
Alex. Glass, do	do 240 do
R. Buchanan, do	
J. J. Collins do	Fumigation house, 460 cubic feet.
Brown Bros. Co., Brown's Nurseries	do 2,816 do
Chase Bros. Co., Colborne	Fumigation by Brown Bros. Co
F. W. Bowman & Son Co., Toronto	do do
E. D. Smith, Winona	Fumigation house, 2,300 cubic feet.
E. M. Smith, do	
R. R. Smith, do	Using E D. Smith's.
Geo. Chambers do	Fumigation house, 1,056 cubic feet.
C. P. Carpenter & Son, Winona	do 1,318 do
J. J. Dean, Winona	Fumigation by Fruitland Nursery Co.
W. F. Geddes, Winona	Fumigation by C. P. Carpenter & Son.
T. B. Henry, do	do by E. D. Smith.
I. E. Henry, do	do by E. D. S. and C. P. C. & Son.
Ira Irving, do	
Keep Bros, do	
J. S. Cockburn, do	
I. E. Vanduzer, do	
Winona Nursery Co., Winona	Fumigation in E. D. Smith's.
Brown Bros., do	do do
Jonathan King, do	
Thos. Rolph, do	
A. B. Foran, do	
B. Muir, do	
J. Milburn, do	
C. J. Carpenter, do	
Grimsby Nursery Co., Grimsby	Fumigation by C. P. Carpenter and Son.
Norman Nelles, do	
Geo. Smith, do	
Boyes Nelles, Grimsby	Fumigation by E. D. Smith.
Jonathan Book, do	
W. A. Holton, Hamilton	Fumigation house, 640 cubic feet.
Webster Bros., do	do 240 do
Haskins Wine Co., do	do 642 do
Ward Bros., Bartonville	Fumigation by Haskins Wine Co.
J. W. Burns, Stoney Creek	
Brock Galbraith, do	Fumigation house, 320 cubic feet.
Fruitland Nursery Co., Fruitland	do and box, 1,620 and 70 cubic feet.
Wm. Ellis, St. Davids	
H. H. Hurd, Hamilton	Fumigation house, 1,700 cubic feet.
C. H. Davidson, Burlington	do by Hurd and Haskins.
S. T. Anderson, Waterdown	do by Hurd.
Cavers Co., Galt	do by Caldwell & Co.
Caldwell & Co., Galt	do house, 1,300 cubic feet.
H. L. Janzen, Berlin	do box, 90 cubic feet.

M. Milgau, Bright	Fumigation house,	1,377	cubic feet.
E. Hersee, Woodstock	do	630	do
A. M. Graham, St. Thomas	do	62	do
H. L. McConnell, Grovesend	do	160	do
C A. Baker, London	do	510	do
J. Gammage & Sons, London			
D. Dempsey, Stratford	Fumigation house,	100	do
J. McAinsh, Wellburn	do	145	do
Strathroy Nursery Co., Strathroy	do	1,075	do
Estate of J. Stewart, Goderich	do	300	do
J. W. Skinner, Mitchell			
A. H. Jacobs, Blyth			
B. Gott, Arkona	do	140	do
Chas. Ellis, Meaford	do	475	do
J. H. Wismer, Port Elgin	do	900	do
W. Fleming, Owen Sound	do	500	do
S. H. Newman, do	do	250	do
H. Pike, do			
M. W. Robinson, Kettleby	Fumigation house,	300	cubic feet.
Leslie Nurseries, Toronto	do	1,760	do
Steele, Briggs, Seed Co., Toronto	do	75	do
W. Rennie & Sons, do			
J. A. Simmers, do			
A. Gilchrist, Toronto Junction			
Manton Bros., Eglinton			
Stanley Spillett, Nantyr			
R. Breckon, Toronto			
Colin McDonald, Toronto			
W. L. Clarke, Leamington			
Thos. Rowley, do	Fumigation box, 36 cubic feet.		
Geo. D. Ellis, do			
Dennis Smith, do			
E. E. Adams, do			
A. Fox & Son, do			
J. Mitchell, do			
J. M. Fields, do	Fumigation box, 123 cubic feet.		
C. B. Palmer, Kingsville			
Geo. E Jones, do			
B. Jasperson, do	Fumigation box, 480 cubic feet.		
Geo. Cady, Ruthven	Fumigation house.		
McKenzie Ross & Sons Chatham	do	75	cubic feet.
F. W. Wilson, Chatham	do	1,325	do
N. T. Selby, Newcastle	do	560	do
R. J. Mackie, Oshawa	do	385	do
L. K. Shourds, Wellington	do	1,000	do
Wallace Woodrow, Picton	do	500	do
W. C. Reid, Belleville	do	190	do
J. W. Johnston, Campbellford	do		
H. A. McIntosh, Dundela	do	190	do
Thos. Dangerfield, Kemptville	do	640	do
John Conn, do	do	640	do
W. J. Kerr, Renfrew	do	36	do
David Tait, Iron Bridge, Algoma	do		

THIRTY-FIRST ANNUAL REPORT

OF THE

ENTOMOLOGICAL SOCIETY

OF

ONTARIO

1900.

(PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE.)

PRINTED BY ORDER OF

THE LEGISLATIVE ASSEMBLY OF ONTARIO.

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1901.

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TORONTO.

THIRTY-FIRST ANNUAL REPORT

OF THE

ENTOMOLOGICAL SOCIETY OF ONTARIO

1900.

To the Honorable John Dryden, Minister of Agriculture :

SIR,—I have the honor to present herewith the thirty-first annual report of the Entomological Society of Ontario.

The thirty-seventh annual meeting of the Society was held in the City of London on the 13th and two following days of November, 1900, when the officers for the ensuing year were elected and the necessary business of the Society was transacted. The report of the proceedings includes the audited financial statement of the Treasurer and reports of the various branches, sections and officers of the Society; also the papers and addresses on various Entomological topics presented during the meetings.

The *Canadian Entomologist*, the Society's monthly magazine, has been regularly issued and is now completing its thirty-second volume. Its circulation in all parts of the world, and its value as a scientific publication have been well maintained.

I have the honor to be, Sir,

Your obedient servant,

CHARLES J. S. BETHUNE,

Editor.

LONDON, ONTARIO.

ENTOMOLOGICAL SOCIETY OF ONTARIO.

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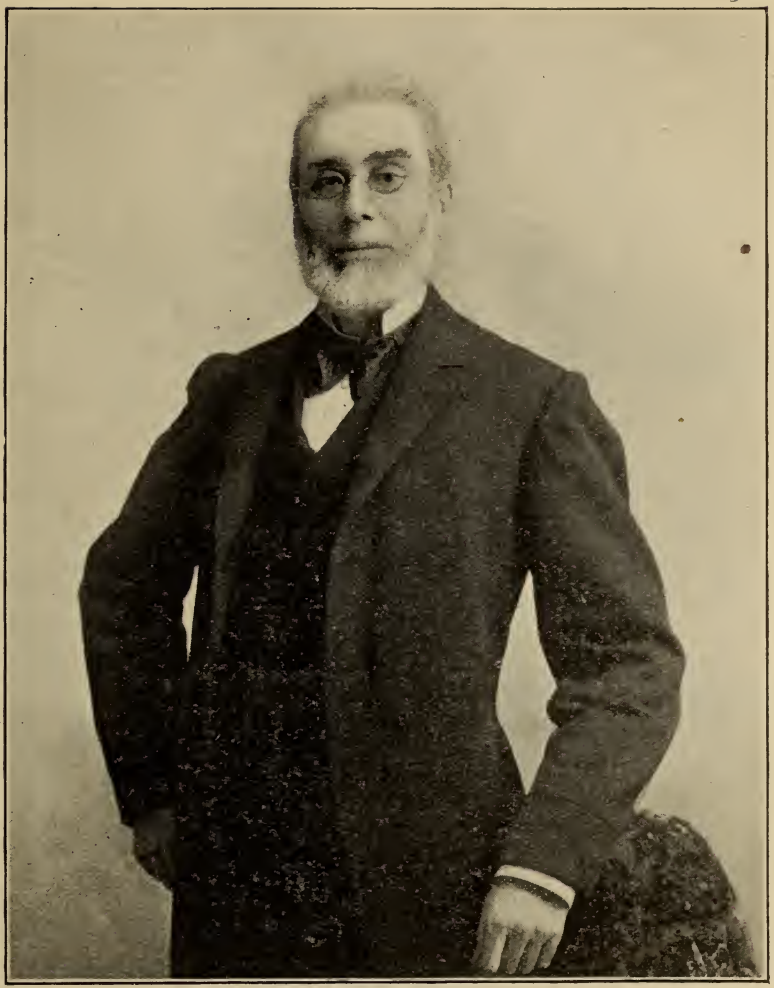

J. ALSTON MOFFAT, ESQ., LONDON, ONT.
Librarian and Curator of the Entomological Society since 1890.

CONTENTS.

THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

ANNUAL MEETING.

The thirty-seventh annual meeting of the Entomological Society of Ontario was held in London, the headquarters of the Society, on the 13th, 14th and 15th of November, 1900.

On Tuesday evening, the 13th, a joint meeting was held with the London Horticultural Society in a lecture room at the Normal School. Notwithstanding the inclemency of the weather, a snowstorm prevailing at the time, the hall was completely filled by a very appreciative audience, representing both Societies and the general public as well. The proceedings were much enlivened by instrumental and vocal musical selections kindly furnished by Miss Morphy and Mrs. Edna S. Robb, who was accompanied by Mr. J. W. Fetherston. The Horticultural Society is a new organization which has not yet completed its first year of existence, but has shewn itself to be full of energy and enterprise. Two very successful flower shows were held during the summer and several public meetings at which addresses were given on horticultural and kindred topics. The directors and officers are all members of the Entomological Society and so intimate are the relations between the two that the younger organization may be regarded as a section of the older and larger institution.

The chair was taken by Mr. C. C. James, Deputy Minister of Agriculture for Ontario, who delivered the opening address. He began by explaining the intimate relation that exists between horticulture and entomology, showing that we could have few fruits or flowers if there were no insects, and that there could be no insects if there were no vegetation. While many insects are most beneficial to fruits and flowers, other kinds are most destructive. As noxious or beneficial, the insect world has the closest possible connection with the vegetable kingdom. He then spoke of the various aspects of horticulture and referred, in the first place, to the *labor* side. In the sweat of the brow must the soil be cultivated ; no good results can be obtained without hard work, but the earth responds most bountifully when well directed labour is bestowed upon it.

The next aspect is the *financial.* Horticulture must be profitable from a pecuniary point of view, otherwise there would not be so many professionally engaged in it. Their evident success and the expensive character of their equipment shows that they are providing for a real want of the community. All over the country there are extensive conservatories for the production of flowers, and here and there large nursery gardens for the supply of fruit trees and ornamental shrubs and plants.

But is there anything *intellectual* in horticulture ? In the early days of this country the pioneer farmers devoted themselves exclusively to the raising of grain, and they began in the same way in Manitoba. All that they produced in excess of their own requirements was bartered for the necessary supplies of their families. After a time the care of cattle and pigs was added to the work of the farm and by degrees, after the lapse of many years, this department grew into the great live stock industry that we find to be so prosperous and so important to-day. The next development was the planting out of a few acres of apple trees and the addition in this way of an orchard to nearly every farm. The benefits derived from this improvement, both in the supply of a most wholesome and agreeable variety for the domestic table and the production of a lucrative crop, were soon realized ; more and more land was given up to fruit culture, a higher taste was developed, a more lofty plane of life was reached. The monotonous routine of the early farmer's life was changed to one filled with variety as the seasons came and went, and men found that reading and knowledge were required for the successful prosecution of their varied pursuits. A further mark of progress was the adornment of the homestead with flowers and shrubs. The ornamentation of the home with these objects of natural beauty and the elevation of taste engendered by them indicated the highest stage of country life. The combination of all these things that have been referred to provides a

mode of life that cannot be dull and that requires a high degree of intelligence and ability for its successful prosecution.

Intellectual people, the speaker continued, are much inclined towards horticulture. When such retire with a competence from the business of life they usually find some place on the outskirts of a city or town where there is room for a garden, and there they enjoy their leisure in the cultivation of fruits and flowers. In proof of this devotion to gardening on the part of men who possessed the highest intellectual gifts, the speaker referred to several well-known authors. Blackmore, whose novels hold a place in the first rank, thought more of his fruits and flowers than he did of his books. Rider Haggard not long ago retired to an estate in England, and now he prefers to be spoken of as a farmer or gardener rather than as a writer of fiction. John Burroughs, the charming American writer, shows in his works his devotion to birds and flowers. Charles Dudley Warner lived for ten years in Hartford before he became popular, and then it was due to his papers as an amateur gardener published in the Hartford *Courier*. These attracted much attention and were published in book-form, with an introduction by Henry Ward Beecher, under the now well-known title "My Summer in a Garden."

The greatest Canadian historian is undoubtedly Francis Parkman. Though not a dweller in our country, he devoted himself to the study of its early annals and produced a series of works that cannot be too highly praised for the beauty of their style and the intense interest of their contents. His recently published biography deserves to be widely read; it shows that the great moral of his life was the surmounting of difficulties. Almost blind, crippled with rheumatism, prostrated with nervousness, without a really well day for twenty-five years, he yet managed to accomplish a vast amount of admirable literary work. At the early age of twenty-six he made an expedition along the famous "Oregon Trail" in the search for materials for a contemplated book. The hardships he then endured undermined his health and he was compelled to lay aside his literary work for a time. Horticulture became his exclusive pursuit for several years and by its aid he gradually regained his former health and vigour. He made the growing of roses and lilies his specialty, and at one time possessed a thousand varieties of roses and a great number of hybrids that he had obtained from lilies and other flowers. The meritorious character of his work was attested by his winning no less than 326 awards at the flower shows of the Massachusetts Horticultural Society. In 1871 he was actually appointed Professor of Horticulture by Harvard University and he held the position for a year. After that he returned to his literary pursuits and gained a reputation second to none as a painstaking, accurate historian of the romantic period of the early French regime in Canada.

Horticulture when broadly pursued is an education in itself; it requires undoubted powers of observation and induction, and as it demands intelligence, men of intelligence take a delight in it. It has also a *moral* aspect. Take the case of a boy—if he has a fondness for flowers and fruits, insects and birds, he cannot be an immoral person. His tastes are too high for that; his love for the beautiful things in nature raises him to a higher level and exalts his aspirations far above the sordid things of earth. Believing this to be the result, we can realize how important it is that space should be given in our School system for "Nature Study." It instinctively appeals to the hearts of all children, and by its cultivation leads them on to higher things and makes them better fitted to take their place with their fellows in later life—to do their duty more intelligently, more uprightly, towards their country, their neighbours, and at their own fireside.

THE PLANTING, CARE AND PRUNING OF THE TREES IN THE PARKS AND STREETS OF THE CITY.

By Mr. W. E. Saunders, of London.

The subject upon which I have to speak to you to-night is of great importance from every point of view, and while I only intend to touch upon certain phases, I feel sure the interest you have in the matter will lead you to follow it out in other lines also.

In nature, trees grow in one of two ways—either in a crowded forest, or in places more or less open, where they get plenty of light. Although light is free to all, yet

among the trees it is the only necessary for which they enter a great competitive struggle, upon which their very lives depend. When once started a tree cannot help getting a certain quantity of food and moisture, but unless it receives light also, it dies.

In the forest, trees grow as closely together as they can live, and there is a constant struggle to reach the top; those that succeed in doing so will spread out, and by shading the lower ones, kill them just as surely as though one cut them off with an axe. This method of growth shades the ground closely, keeping it damp and cool, and each year's crop of leaves buries beneath it as it falls the dead limbs and bark chips which fell during the summer and preceding winter, and these, kept always damp by this mulch of leaves, soon decay, and with the leaves themselves form what we know as leaf-mould, the whole process being nature's method of making fertile soil. This is the normal forest condition, and the product of its development is timber, straight-grained, strong and nearly knot-free wood, the joy of the carpenter's heart and one of the best gifts of the Creator to man.

But once in a while, in natural conditions, and more often when the agency of man is involved, a tree gets a chance to grow in a place where there is an abundance of light on all sides, and what result do we find? This tree, instead of growing tall as rapidly as possible, for fear that some competitor will cut off its supply of light, grows broad nearly as fast as it grows tall, and sometimes faster; all sides are covered with leaves, and all the branches beneath are draped with leaves in nature's own unequaled manner. Between these two styles of trees there is little resemblance; the shape is different, the leaves are all over, instead of merely at the top, while the wood, though equally good for burning, is so full of knots from the well developed limbs that it is nearly useless for lumber, but for beauty there is no comparison. The one shows nature in a creative mood making soil and timber for the use of generations yet unborn; and the other shows her in an artistic mood, and the product is something whose beauty is rarely, if ever, equaled by the artifice of man.

Scarcely can the dullest-minded person pass a beautiful tree without rendering his meed of admiration, and many of these growths are of such surpassing beauty that one is tempted to wonder if the Creator could possibly make anything finer, and yet so inscrutable are the ways of some men that they cut, maul, disfigure and distort these gifts of God, and they appear to think that He does not know how a tree should grow and that it is their duty to teach Him.

In our parks and city streets trees are grown mainly for purposes of shade and beauty, and as the coolest and most dense shade is given by the most beautiful trees, namely, those that are covered with leaves above, below and on all sides, it naturally follows that our city trees should be grown in this form. And there is but one way to grow them after this manner, and that is by giving them plenty of light, and keeping the trimming fiend at a distance.

In Victoria Park, young as it is, many trees are at this moment ugly and deformed by a want of observance of these conditions, light and trimming, and, in fact, one can see there some of the most striking examples of how not to grow a tree that can be found in a long journey. But it seems invidious to single out Victoria Park, when one can see in any part of the city glaring examples of distrust in the Creator's good taste and ability to grow a tree properly.

To many people who do their own pruning and do a good deal of it, the idea may not have occurred that nature really intended certain trees to grow in certain forms, and that no matter how they may be pruned, that form will always be the ultimate aim of the tree. They fail also to realize that the hand of God is omnipotent, and that their best endeavours will only mar the perfection of beauty into which a tree would come if permitted to follow its natural bent.

The love of trees is implanted deep in the nature of nearly every person. Many people do not realize this until they come into possession of a plot of ground, where a few trees are growing, when their natural affection comes quickly to the surface. But few, however, have this feeling so chastened with wisdom as to enable them to treat their trees well; nearly all want to grow two, three or even a dozen trees in the space that shodld be given to one, not realizing how much better it would be to have one fine, large, well-shaped, handsome tree, than to have half a dozen stunted, mis-shapen, lopsided ones, whose only real utility is for consumption as fuel. No better proof of this deeply im-

planted love can be offered than the fact that it is almost impossible to persuade the average man to part with a single one of his trees, even when the destruction of one means the betterment of the others.

Occasionally, however, one sees a tree, even in London, that has had unlimited chance to develop, and the owners of these grand trees declare them to be without price; but these beautiful examples are all too few. The other extreme is everywhere, and perhaps the most flagrant case in London is in front of the Collegiate Institute. There stand three or four rows of trees, not one of which is now, or has any prospect of ever being anything but an eyesore, and yet those trees are old enough and have used enough nourishment from the soil and light from above to have made trees as handsome as any in the city had they been given proper opportunity. They are now so far gone that it would be almost impossible to make a really fine tree out of a single one of them; and what has occurred here is in process of occurring all over where from two to ten trees are planted in the space which one large, well-grown tree will need in twenty-five years.

At irregular intervals a man, called by courtesy a "tree-pruner," more or less authorized by those who rule over us to butcher every inanimate object, travels through our streets and makes a bad matter still worse.

A gentleman living near my house had last summer a very handsome cut-leaved birch and a good many maples growing on his front lawn. Noticing that the birch was beginning to suffer from being overcrowded, I one day complimented him on the beauty of his tree, and suggested that it needed more room in order to retain its beauty. He replied that it was a very nice tree, but it needed pruning, and he was getting a man who understood such things to come and see to it. The beauty of this species of birch lies in the long, slender, drooping branchlets, and in the handsome pyramidal shape of the tree; but this "pruner" sawed off the trunk of this tree at about eight feet from the top, sawed one-third off the larger limbs, and left the tree shorn of all its beauty and with the work of years destroyed. All the tree needed was to receive plenty of light and to be left alone. Such examples are abundant.

I notice lately that the tree pruner is getting in his deadly work at Springbank also. Within the past year or two the birches, poplars, maples, etc, near the pump-house have had from two to five feet taken off most of their branches, and from the trunk also. The object of this treatment is undiscoverable. The spruces, too, in other parts of the grounds, are receiving similar attention, and of all trees the spruce needs pruning least, and bears it worst. A pruned spruce is no longer a spruce, but an abortion, unlike anything in nature and is fit only for the brush pile, for it will never be itself again.

When trees are too many, cut some of them down. A tree which is too large for its environment can never be made handsome by any system of pruning, and not only that, it will spoil others which might be ornamental if its space were vacant.

Now, a word as to the planting of shade trees. In London we suffer from a superfluity of silver maple (Acer dasycarpum). This is a quick growing tree of handsome form, but there are others that are as quick growing and many that, though slow growers, are more desirable and very handsome. Our streets should not all be planted with one kind of tree. Monotony should be avoided. Besides, when a blighting disease or a devastating insect, affecting possibly only one species of tree, reaches a city planted with that tree only, that place is liable to have very few good trees left. Some twenty-five years ago the streets of London had many locust trees, whose foliage and flowers are both beautiful, but the locust borer came among them and now they are gone. The maple is a grand tree, hardy and nobly beautiful, but we have many other fine trees also, and doubtless it was never intended that we should confine ourselves to the use of one species only. The birches, three or four species of beautiful trees, immortalized in poetry and characteristic of the north; the lofty elm, whose fame as a street tree in New England has spread over the entire continent; the fragrant basswood, the evergreen spruces and cedar, the hemlock, which I sometimes think is the handsomest of all our trees, and the nut trees, chestnut, butternut, walnut, beech and the hickories—all these and many more have beauties of their own, and should be largely used, particularly the nut class, which render the parks attractive to the squirrels and the birds and the children, and is it not for the children, particularly those of the poorer people, for whose use the parks should mainly exist? I have no patience with the park regulations which say to the children, "Keep off the Grass." Rather

let them say, "Boys and girls, this park is for you; don't destroy it, but enjoy it in every possible way." Some day I hope we shall see this principle recognized.

Beauty in the streets and parks is an asset, and should be well looked after, as it is perhaps the greatest attraction a city can have, next to a low tax rate; and although we have to-day many thousands of spoiled, ugly trees, fit only for the woodpile, yet there are thousands more growing up, and intelligent care can prevent most of them from following the example set by their elders.

These points upon which I have touched affect not only our own city, but almost every city and town in our country; and the need for intelligent care is urgent.

It was only a few weeks ago that an eminent horticulturist wrote in the pages of *Gardening*, a leading American magazine, of the folly of planting trees in rows along the drives in parks, a method which is the worst possible, for besides spoiling the artistic appearance of the place, it prevents the people on the drives from the realization and the enjoyment of the beauties of either the nearby or the distant view, and yet, despite of the fact that this principle is freely stated and admitted by the best authorities, it is the very method which is being adopted in our river park, now in process of formation; and not only that, but the chief part of the trees planted have been soft maples and Norway spruces, the very ones of which Londoners have already far too many. It is to be hoped that ere long different methods may prevail, and while there is yet time the best may be made of the material now planted, and that the future may be properly provided for by the planting of such trees as will lend variety and beauty to the landscape. How this is to be accomplished is not difficult to tell, for it can only be done by placing the control of such matters in the hands of men who have given thought and study to the subject. Were our own city council, for instance, to appoint for 1901 a committee consisting of a few such men, and to give them a free hand in the matter the effect on the appearance of our city parks and streets would be great and lasting.

I have not touched upon the matter of shrubs and flowering plants, but it would be easy to make a great improvement over present conditions were the plan above mentioned to come into action, and no plan would be complete that did not aim at the best results in these points, as well as others; but a shrub may be at its best in five or ten years, whereas a tree is the growth of decades, and neglect for ten years may ruin the result of twenty-five years' careful work and thought.

Dr. James Fletcher, Dominion Entomologist and Botanist, Experimental Farms, Ottawa, was the next speaker. His address was illustrated with beautiful lantern pictures, which gave great pleasure to the audience. The excellent lantern was kindly provided by Mr. Merchant, Principal of the Normal School, who was assisted in its manipulation by Mr. R. W. Rennie.

Dr. Fletcher first presented a series of pictures in illustration of the paper that had just been read by Mr. Saunders and showed how trees should be grown and treated, giving as examples specimens that were growing on the Experimental Farms at Ottawa and in the North-West. Many of these were from photographs taken on the grounds of the Experimental Farm at Ottawa, and had been specially lent for the occasion by Dr. William Saunders, the Director. Among others he exhibited the Black Walnut, Russian Poplar, Austrian Pine, Blue Spruce, Scotch Pine, Cutleafed Birch, and some very remarkable trees in the Rocky Mountains and in British Columbia; he also showed some beautiful flowering shrubs and other interesting plants, the Hydrangea paniculata grandiflora, Spiræa van Houtei, Mary Arnott Rose, Charles X Lilac, Cypripedium spectabile, etc.; the Devil's Club (a most troublesome plant to mountain climbers), Hedges on the North-West Experimental Farms, Dr. Saunders's Hybrids from Apple and Pyrus baccata; the method of spraying trees at Ottawa.

He then took up the subject of insects, showing how those that are injurious may be divided into two great classes according to the mode in which they partake of their food, namely the biting (those furnished with jaws) such as caterpillars, grubs, beetles, &c., and the sucking (those provided with a beak or sucker), such as mosquitoes, aphides, bugs, &c. The former can be destroyed by poisoning their food with such substances as Paris green, hellebore, insect-powder, &c., but the latter cannot be reached in this way, and must be subdued by substances that will smother them when applied to their bodies, viz., kerosene emulsion, whale-oil soap, &c. The many beneficial species of insects, such as lady-birds, ichneumons, carnivorous ground-beetle, which prey upon cut-worms, and

many others, ought to be familiar to all, so that they should not be wantonly trodden under foot or otherwise destroyed. Excellent figures of all those referred to were shewn upon the screen, and a large number of our most prevalent insect pests, among others, the cabbage-root maggot, the devastating and climbing cut-worms, the May beetle (white grub), pea-weevil and pea-aphis, pear psylla, eye-spotted bud-moth, canker and palmer worms, the cigar case-bearer, plum sphinx and curculio, grape-vine flea beetle, spruce gall-louse, tent caterpillars, codling moth, San José scale, and the lovely Luna moth. Each picture as it appeared was briefly described in the speaker's well-known graphic and often humorous manner, and the interest and attention of the large audience were maintained to the last.

At the close of Dr. Fletcher's address, the following resolution was proposed by Dr. Bethune, who spoke briefly in its support, and seconded by Principal Kirk; on being put to the meeting, it was unanimously adopted:

"That this meeting of the Horticultural and Entomological Societies endorses the idea that the control of the city's horticulture should be in the hands of men who have made this science a study; and that this meeting urges upon the City Council the advisability of placing in the hands of a small committee of citizens the entire control of the shade trees on the streets and in the parks of London, believing that in this way only can the best results be accomplished; and that the secretaries of the two societies are hereby instructed to send copies of this resolution to the Mayor and the City Clerk early in January, 1901, asking that it be brought before the Council at the earliest possible moment, and requesting that action be taken thereon."

At the conclusion, votes of thanks were tendered to the ladies for the musical treat that they had afforded; Professor James and the other speakers for their interesting addresses; Professor Lochhead, for the loan of a number of slides; and Principal Merchant, for the use of the Lecture room and lantern, and the kind assistance that he and Mr. Rennie had afforded.

WEDNESDAY, NOVEMBER 14TH.

The Council of the Entomological Society met at 10.30 a.m., for the transaction of business and the preparation of their report on the proceedings of the past year. The President occupied the chair, and the meeting continued in session till one o'clock.

The Society met at 2.30 p.m. Among those present were the following: Rev. Dr. Fyles, South Quebec, President; Prof. Lochhead, Ontario Agricultural College, Vice-President; Dr. James Fletcher and Mr. Arthur Gibson, Experimental Farm, Ottawa; Mr. Henry H. Lyman, Montreal; Inspector G. E. Fisher, Freeman, Ont.; Prof. F. M. Webster, Wooster, Ohio; Revs. Provost Watkins, and Dr. Bethune, London; Drs. Woolverton and Stevenson, and Messrs. J. A. Balkwill, J. H. Bowman, J. Dearness, H. Gould, B. Green, C. J. Fox, W. Gammage, W. H. Hamilton, John Law, Heard, J. A. Moffat, S. B. McCready, W. E. Saunders, R. W. Rennie, E. A. Brown, H. S. Saunders, and many other residents of London.

The President called upon the Directors and Officers of the Society, the representatives of the Branches, and the chairmen of the Sections for their respective Reports on the work of the past year. These were read and discussed, as follows:

Report of the Council.

The Council of the Entomological Society of Ontario begs to present its Annual Report for the years 1899-1900.

The thirty-sixth annual meeting was held in London in October 1899, and was well attended by members from a distance as well as by those resident in the city. An interesting and important addition to the ordinary proceedings was a conference held during the first afternoon on the San José Scale and the operations that had been carried out for its suppression in the Province of Ontario. A full report of the discussion and of the subsequent proceedings at the meeting has already been published; it is therefore unnecessary to enter into particulars.

The thirtieth Annual Report on economic and general Entomology was presented to the Minister of Agriculture for Ontario in December last and was printed and distributed in the following March. It contained 127 pages and was illustrated with sixty-six wood cuts and two plates, one a portrait of Mr. Henry H. Lyman the retiring President, the other exhibiting the structure of a butterfly's wing. Besides the account of the conference on the San José Scale and the proceedings at the Annual Meeting, it contained among many useful papers, the President's address by Mr. Lyman; "One hundred years of American Entomology" and "The home of the San José Scale" by Prof. F. M. Webster; papers by Prof. Lochhead, Mr. Arthur Gibson, Mr. J. A. Moffat, Dr. Bethune, Mr. W. N. Hutt, Dr. Fyles, and articles on the most notable and injurious insects of the year by Dr. Fletcher, Messrs. Harrington, Evans, Moffat, Gibson and Drs. Fyles and Bethune. An addition of much interest was the report of the proceedings at the first annnal meeting of the North-West (Canada) Entomological Society, held at Lacombe, Alberta, in November 1899.

The *Canadian Entomologist* has been regularly issued at the beginning of each month. The 31st volume was completed in December last; it consisted of 377 pages, illustrated with 36 wood cuts and six plates. The contributors numbered no less than sixty, and included well-known writers in England, Germany, Finland, Brazil and Japan, as well as in the United States and Canada. The thirty-second volume will be completed next month; the eleven numbers already issued contain 352 pages and many original illustrations.

An index to the thirty Annual Reports of the Society, 1870 to 1899, has been prepared by the Rev. Dr. Bethune and is now being printed under the direction of the Department of Agriculture. It is expected to be ready for distribution before the end of the year, and will, undoubtedly, be found of very great value by all who have occasion to consult these Reports.

Entomological meetings have been held regularly on Friday evenings, at first fortnightly, afterwards weekly, from October to June, and have now been resumed for the autumn and winter seasons. The study of the Lepidoptera was taken up for several months and when spring opened specimens freshly captured were brought for identification and discussion. The order Coleoptera has been adopted for study during the sessions that have now begun.

The Council is glad to be able to report that the Ornithological Section has been revived and has held regular monthly meetings for a year past; at the same time it has to express its regret that no meetings of the Botanical Section have been held this year. The Geological Section has been as active as usual, holding weekly meetings on Tuesday evenings throughout the greater part of the year, and the Microscopical Section has held interesting meetings on alternate Friday evenings during the autumn and winter months.

Many valuable and interesting additions have been made to the Library and Collections. The Council desires to bear its testimony to the great care taken by Mr. Moffat in the preservation of the Society's books and specimens, and their neat and orderly arrangement. Too much praise cannot be accorded to him for the zeal and interest that he always displays in attending to the welfare of the Society and the good order of its property.

All of which is respectfully submitted.

THOMAS. W. FYLES, President.

REPORT OF THE LIBRARIAN AND CURATOR, FOR THE YEAR ENDING 31ST OF AUGUST, 1900.

Thirty bound volumes of Government Reports, and proceedings and transactions of societies were received during the year. Among them were twelve quarto volumes of the United States Geological Survey, profusely illustrated, with a volume of maps accompanying them.

Thirty-four volumes were bound and added to the library. Among these are some volumes of the Bulletins of the Iowa University (a gift to the library by Rev. Dr. Bethune) one of which is of special interest, being explorations in the Canadian Far North in search of the Musk Ox, by Frank Russell. Also contributions from Drs. Fletcher and Bethune of volumes of the Proceedings of the American Association for the Ad.

vancement of Science, which complete the Society's set up to date, and make the number of volumes added during the year 64.

The full number now on the register is 1,691.

Number of volumes issued to local members was 45.

A few additional specimens of Manitoba Lepidoptera have been secured since the last report, which are valuable for reference and comparison.

Nothing of special interest in local captures can be reported for the past season. A few doubtful forms are awaiting determination. Mr. O. C. Poling, of Quincy, Illinois, has kindly and considerately presented to the Society, a fine pair of that rare, singular and interesting butterfly, *Neophasia Terlootii*, Behr., taken in Arizona.

Respectfully submitted.

J. Alston Moffat.

Auditors' Report.

Receipts and Expenditures of the Entomological Society of Ontario, for the year ending August 31st, 1900:

Receipts.		Expenditures.	
Balance, September 1st, 1899	$ 576.30	Cork, pins, etc	$ 45.20
Sales of Entomologist	150.69	Expense acct.,(Postage, etc.)	159.79
Sales of Cork, pins, etc	93.58	Library	35 89
Advertising	14 35	Salaries	375.00
Government Grant	1,000.00	Annual Meeting and Report	254.60
Members fees	439 86	Rent	175 00
Interest	13.16	Printing	749 75
		Balance on hand Aug. 31st, 1900,	492.71
	$2,287.94		$2,287.94

We, the Auditors of the Entomological Society of Ontario hereby certify that we have examined the books and vouchers of the Treasurer and find them correct, and that the above is a true statement of the accounts of the society.

W. H. Hamilton }
Jas. H. Bowman } Auditors.

London, Ont., Sept. 18th, 1900.

REPORT OF THE MONTREAL BRANCH.

The 224th Regular and 27th Annual Meeting of the Montreal Branch of the Entomological Society of Ontario was held at 74 McTavish street on Tuesday evening, May 8th, 1900.

The members present comprised Messrs. A. F. Winn (Pres.), Henry H. Lyman, A. E. Norris, E. T. Chambers, J. C. Williams, G. Chagnon, G. Beaulieu, M. W. Davis, C. Stevenson, G. A. Moore, C. P. Newman and L. Gibb. Visitor—Rev. E. C. Trenholme.

The chair was taken by the President and the minutes of the previous meeting, and also of the last annual meeting, were read and confirmed.

Report of the Council.

The President then submitted the following report of the Council for the past year:

In presenting their report for the past year your Council is pleased to be able to state that much good work has been done.

Eight regular monthly meetings have been held, the average attendance being ten, and six new members have been added to our roll.

We have again had a visit from each of our good friends, Dr. Fletcher and Rev. Dr. Fyles, in addition we had the pleasure of having Mr. J. G. Jack of Jamaica Plains, Mass., at one meeting and one of our new members, Mr. E. D. Wintle of Como, P.Q., has come to our meetings regularly.

Two field days were held, the first at Beloeil Mountain, St. Hilaire, on May 24, which was very successful, many valuable specimens being secured; the other at Chateau-

guay on July 1st was made a most enjoyable outing, through the kind hospitality of Mr. and Mrs. Jack and their family, but the captures were disappointing owing to the strong wind which was blowing all day. Several members also attended the Natural History Society's field day at Montford.

The following papers were read at the meetings :

Retiring Address of the President—Henry H. Lyman.
Collecting at Electric Light—A. F. Winn.
Note on Emergence of Telea polyphemus—M. W. Davis.
The Genus Hydroecia—Dwight Brainerd.
Spiders—Rev. Dr. Fyles.
A Sketch of the Order Orthoptora—E. M. Walker (of the Toronto Branch).
Tribulations of a Beginner—Dwight Brainerd.
Practical Entomology, or Bee Keeping—Gilbert Wintle.
Bees and Wasps—Dr. Jas. Fletcher.
An Entomological Muddle—Henry H. Lyman.
Chrysophanus thoe—A. F. Winn.
On the Rearing of Lepidoptera—Arthur Gibson.
Danais Archippus—A E. Norris.

This list probably shows more diversity of subjects than that of any year in the history of the Branch, and the specimens shown at the meetings have included orders that have been little studied here in the past, such as Diptera, Hymenoptera and Orthoptera.

Our collection of books has again been added to by Mr. J. G. Jack, who has presented copies of the report on the Gypsy Moth and two volumes of Memoirs of the Academy of Natural Sciences. A case has been ordered for our books aud pamphlets, and the Natural History Society have kindly consented to give us space for it in their building.

The Treasurer's statement shows the Branch to be in a good financial position.

Respectfully submitted on behalf of the Council,

ALBERT F. WINN, President.

The Treasurer then submitted his report, showing a balance on hand of $59.37.

It was moved by Mr. H. H. Lyman and seconded by Mr. C. Stevenson "That the reports of the Council and of the Treasurer be received and adopted." Carried.

The following officers were elected for the ensuing year: President, A. F. Winn; Vice-President, Dwight Brainerd; Secretary, Lachlan Gibb; Treasurer, M. Waring Davis; Librarian, A. E. Norris; Council, H. H. Lyman and G. Chagnon.

Mr. Henry H. Lyman read a paper on the Life History of Euchaetes Oregonensis, and also exhibited a pamphlet entitled Memoirs of the Chicago Entomological Society.

A letter was read from E. Brunetti, London, England, asking for exchange in Canadian Diptera, which was referred to Mr. Chagnon.

After examining a number of specimens shown by the members the meeting adjourned.

LACHLAN GIBB, Secretary.

REPORT OF THE QUEBEC BRANCH.

The annual meeting of the Quebec branch of the Entomological Society of Ontario was held on May 12th, 1900, the president, Rev. Dr. Fyles, occuping the chair.

PRESIDENT'S ADDRESS.

The Quebec branch of the Entomological Society of Ontario has entered upon the fourth year of its existence. During the past year several things have happened to occasion our members much concern.

Death has removed two from amongst us. Mrs. Treffry departed this life a few months ago ; and on April 27th, Mr. Treffry after a very brief illness was also taken

away. We shall miss the active interest he took in our affairs. His ability as a journalist and his ready pen were often exercised in the interests of the Branch and his cheerful good-nature, before sorrow overtook him, added to the interest of our meetings.

Next we have to record the closing (temporary it is to be hoped) of Morrin College. The reduction of the grant from the Suporior Education Fund, the inadequacy of the number of paying students to make up for this, and the failure of support from our decreasing English speaking population, militated seriously against its interests and made it impossible to maintain its very efficient staff of professors without trenching too far upon the capital funds of the Institution. We hope that the privilege of meeting in the College rooms will still be allowed us.

The late principal, Dr. Macrae, and Professors Clark, Gunn and MacIntyre took a kind interest in our proceedings; and in Professor Walters we have had a firm friend and valuable member. Should he be called from the city, we shall regret his departure deeply at the same time that we shall indulge the hope and heartily pray that health and prosperity may attend him and his family wherever their lot may be cast.

An untoward accident in the beginning of March interfered for two months with the regular course of the proceedings of the branch, but before that its meetings were regularly held and well attended.

Four field days were held in the course of the summer: two at the Gomin; one (by invitation) in the grounds of E. H. Wade, Esq., at New Liverpool and one at the Island of Orleans.

At the meetings in Morrin College, the following subjects were considered:—Noah's Flood and the Insect World: Ichneumon Flies; Dragon-Flies; "The Kissing Bug"; the Hemiptera; the Ceratocampidae and the Saturnians.

At one of the meetings a most interesting narrative of an entomological expedition to the country north of Brandon, Man., written by Mr. A. Hanham of Winnipeg, was read and fully appreciated. At another meeting many very beautiful southern moths presented to the president by Mr. H. H. Newcomb of Boston were exhibited and greatly admired.

Among the interesting captures of the season were: *Thyatira rectangulata*, Ottolengui, which was taken on the Island by Mrs. Turner; a fine specimen of the salmon-colored variety of *Hepialus argenteomaculatus*, Harris, taken at light at St. Paul, Quebec; *Catocala Bianca*, Hy. Edwards, also at light at Levis; and a very fresh specimen of *Ufeus Satyricus*, Grote, caught on the wing at the Chaudière, on the *20th of January* by Mr. Charles Barclay.

A new pest has made its appearance in this province viz: the American Cockroach (*Periplaneta Americana*), a specimen of which was found at St. Paul, Quebec, on the 21st of April. This makes the fourth kind of cockroach that has shown itself in Quebec Province. The other three are the German Cockroach (*Ectobia Germanica*); the Oriental (*Blatta orientalis*) and the Australian (*Periplaneta Australasia*). All these insects are troublesome and disgusting, but they are incapable of inflicting personal injury. A very effective trap for them may be purchased in the hardware stores. Rapid and constant intercourse with all parts of the continent will doubtless bring many insects within our borders.

By far the worst pest that of late years has shewn itself in Canada is the San José Scale. Up to the present time it has not been found in the Province of Quebec; but in Ontario its ravages have occasioned much dismay. Fortunately the Ontario Government are aware of its dangerous character and are taking timely and stringent measures to check its course. The report of a very interesting discussion upon this scale is printed in the Society's Annual Report which will shortly be in the hands of the members.

It is to be hoped that the coming season will be a favorable one from an entomological point of view; that no troublesome insects may increase to cause alarm and that many rare and beautiful specimens may reward the efforts of our collectors.

Report of Council.

The branch now includes 43 members: 33 adults and 10 juniors.

The Treasurer's report gives a very satisfactory showing.

Several excursions were made during the year and were very successful.

Owing to an accident to our worthy president the course of lectures had unfortunately to be interrupted to the great regret of the members.

Our thanks are due to the authorities of Morrin College for having continued to allow us to use their rooms for our meetings.

H. WALTERS, on behalf of the Council.

It was moved by Miss Hamel, seconded by Mrs. Poston, and unanimously resolved that the thanks of the meeting be tendered the council and the officers.

The following were then elected :

President, the Rev. Dr. Fyles.

Vice-President, Miss E. MacDonald.

Council, Mrs. R. Turner, Mr. James Geggie, Professor Walters, Hon. R. Turner, Miss Bickell, Miss Winfield.

Secretary-Treasurer, Lt.-Col. Crawford Lindsay.

Curator, Prof. Walters.

Since the above report was written Morrin College has been re-opened, and has a large attendance of students. The Quebec Branch of the Entomological Society of Ontario has commenced its regular work and is in a very healthy condition. At the last meeting twenty-two members were present and four new members were elected. Before the close of the season it held a happy field-day in the grounds of James Geggie, Esq., at Darnoc, Quebec.

THOMAS W. FYLES,
President of the Quebec Branch.

REPORT OF THE TORONTO BRANCH.

The fourth annual meeting of the Toronto Branch ot the Entomological Society of Ontario was held in the Education Department (Normal School), on Friday evening, the 6th April, 1900.

The following members were present : Messrs. E. M. Walker (Vice-President), G. M. Stewart (Secretary-Treasurer), H. C. Austin (Librarian), D. G. Cox, R. J. Crew, C. H. Tyers and S. R. Carter ; visitor, Mr. A. Cook.

In the absence of the President, the Vice-President took the chair.

The minutes of the previous regular meeting were read and approved.

Messrs. Geo. Smith, Geo. Rossiter, Albert Cook and W. H. Harrison were duly elected members of the Branch.

The Secretary read the following report of the Council for the year ending 31st March, 1900 :

REPORT OF COUNCIL.

The Council of the Toronto Branch of the Entomological Society of Ontario take much pleasure in presenting the Fourth Annual Report of the proceedings of the Branch for the year ending 31st March, 1900.

They are pleased to report that since the last annual meeting the membership of the Branch has been increased by the addition of one new name, viz , Mr. D. G. Cox, and as some of the meetings have been attended by visitors, no doubt others may be induced to take an interest in our work in the near future.

During the past year fifteen regular meetings have been held in the Education Department, with a fair average attendance of the members. The Council is pleased at the result of Mr. Lyman's suggestion that papers be exchanged between the Toronto and Montreal Branches, and is much indebted to the members of the latter Branch for the interesting papers so kindly contributed. As a partial return, Mr. Walker's paper, mentioned below, was forwarded to be read before the Montreal Branch.

The following is a list of the papers read before the Branch during the past year :

Annual Address of the President, Mr. R. J. Crew.

Notes on Danais Archippus, Mr. H. H. Lyman, of the Montreal Branch.

A Sketch of the Order Orthoptera, with special reference to the Ontario Forms, Mr. E. M. Walker.

Collecting at Electric Light, Mr. A. F. Winn, President of the Montreal Branch.

The Rearing of Lepidoptera, Mr. Arthur Gibson.

Notes on the Anatomy of Belostoma, Mr. G. M. Stewart.

An interesting feature of the year's work was an open meeting held on the 5th of January, at which a large audience was present, including many Normal School students. Dr. Fletcher, of Ottawa, Dominion Entomologist, gave a most interesting lecture on "Bees and Wasps." Dr. Bethune, of London, editor of the *Canadian Entomologist*, also gave an interesting address on the aims of entomology, and spoke of the work being done by the Entomological Society of Ontario and its Branches.

During the year several field days were held and many interesting captures were made.

The work of classifying the collection of insects made by the Branch for the Education Department is progressing well, and it is gratifying to know that the species already collected and donated have been transferred into the cases, in the Department. During the coming season the Council would urge the members to collect largely so that by next winter the Department may be in possession of a fairly good reference collection of the insects of Ontario.

The report of the Librarian shows that many valuable Government publications have been added to the library, also that two periodicals have been subscribed for, and several books purchased during the year.

The Treasurer's report shows a small balance carried forward on the right side.

Respectfully submitted on behalf of the Council.

ARTHUR GIBSON,
President.

The report of the Treasurer was then presented, as was also that of Mr. Austen, as Librarian, and on motion the reports of the Council, Treasurer and Librarian were duly adopted as read.

The election of officers for the ensuing year resulted as follows: President, Mr. D. G. Cox; Vice President, Mr. E. M. Walker; Secretary-Treasurer, Mr. G. M. Stewart; Librarian, Mr. H. C. Austen; Members of Council, Messrs. R. J. Crew and C. N. Tyers.

The address of the retiring President, Mr. Arthur Gibson, was read by Mr. Walker, Mr. Gibson, owing to his duties as assistant in the Division of Entomology at the Central Experimental Farm, Ottawa, being unable to be present. The work of the Branch since its inception was reviewed, particular attention being made of the year just ended. The members were urged to make extra efforts the coming summer to collect and mount specimens for the collection which the Branch is forming for the Educational Department for Ontario. The latter portion of the address took the form of a practical illustrated paper on "The Preservation of Larvæ by Inflation."

A vote of thanks to Mr. Gibson for his interesting address was carried.

The meeting then adjourned.

G. M. STEWART,
Secretary.

REPORT OF THE MICROSCOPICAL SECTION.

A meeting for the organization of the Section was held on November 4th, 1899, and the following officers were elected for the ensuing year: W. E. Saunders, Chairman; S. B. McCready, Secretary; J. A. Balkwill, J. Dearness and J. H. Bowman, Committee.

During the season eleven meetings were held, with an average attendance of seven, besides occasional visitors. At each meeting interesting subjects were discussed and the objects referred to examined under the microscope; five papers were read, viz.:

The Protoplasmic Cell—J. H. Bowman.

The Multiplication of Cells—J. Dearness.

The Protoplasmic Cell—J. Dearness.

Micrometry—J. H. Bowman.

The Natural History of Florida—W. E. Saunders.

One meeting was given over to the examination of freshly collected living organisms, two to the examination of exceedingly beautiful chemical crystals, prepared on the spot by Mr. Bowman, and one to the discussion of fermentation.

At the fourth meeting Mr. Thos. Beall, of Lindsay, brought before the members the desirability of forming a Horticultural Society in London. The project was highly approved of and energetically taken up, resulting in the formation of the very successful and enterprising London Horticultural Society.

W. E. Saunders,
Chairman.

REPORT OF THE ORNITHOLOGICAL SECTION.

The reorganization meeting of the Ornithological Section of the Entomological Society was held on January 13th, 1900. Officers were elected and an outline of plans was made for the season. Monthly meetings were adopted, omitting July and August. This programme has been strictly adhered to. Nine meetings have been held, at which the average attendance has been five, and ten papers have been read, entitled as follows :

"New Birds for Middlesex and Ontario," W. E. Saunders; enumerating six species new to Ontario and eight species new to Middlesex County, all taken since the last meeting in 1894.

"An Ornithological Incursion into Florida," W. E. Saunders.

"The Sparrows of Ontario," J. E. Keays; enumerating the generic and specific peculiarities of each species, with notes on their habits, fully illustrated by specimens.

"The Cubic Contents of the Eggs of the Common Buteos," J. E. Keays.

"The Nesting of the Sharp Shinned Hawk," H. Gould.

"The Flycatchers of Ontario," W. E. Saunders.

"The Grebes and Loons of Ontario," W. E. Saunders.

"A Trip to Point Pelee," H. Gould; illustrated by specimens.

"A New Song for a Common Bird," W. E. Saunders.

"Seasonable Changes in the Food of Sparrows," J. E. Keays.

Two of the above-named papers have been published and others will be in the near future. Besides these, short notes on interesting subjects have been presented, one recording the capture of two specimens of the Long-tailed Jaeger, at Rondeau,—the first for Ontario.

The spring arrivals have also been closely recorded, 144 species being noted by members up to May 26th. Dates of the fall migrations are also being prepared and are now about complete.

A number of fine sets of eggs have been taken by the members, the best of which were six sets of the Sharp Shinned Hawk, and five sets of the Cerulean Warbler. An account of the work done on this bird was published in *The Auk* for October.

Bird protection in London was also taken up, and notices published in the papers that wanton destroyers of our native birds in the parks would be prosecuted, which notice accomplished the cessation of some shooting which had previously been going on.

All the choice new material taken by the members has been exhibited by them at the meetings, which have been interesting and enthusiastic.

J. E. Keays,
Chairman.
W. E. Saunders,
Secretary.

REPORT OF THE GEOLOGICAL SECTION.

The Geological Section of the Entomological Society of Ontario begs leave to present its annual report as follows :

The section with Dr. Wolverton as chairman continued its meetings weekly as usual, with but a short holiday, throughout the year. The interest in Geological study

was well maintained. The Huronian rocks with many of their characteristic minerals formed the principal study, while local fossils and minerals of the Devonian period received due attention. Visits for the purpose of securing specimens were made to interesting localities in Ontario and Michigan, by members of the Section, and our table was frequently well supplied with the essentials of this department of Nature Study.

The Society mourns the loss of one of its charter members, Mr. Thos. Green, who passed away at the ripe age of eighty-seven years. His brother, who is over eighty years of age, is still a member of our Section. Until a short time before his death, Mr. Thos. Green was an energetic student of Nature, and materially added to the profit of our meetings.

The Chairman reported as follows: "I have made a special trip to Manitoulin Island and the Georgian Bay District for the purpose of obtaining characteristic fossils and minerals of these regions, as a basis for the study of the Huronian formation during the winter. I travelled in all by water 450 miles, and secured a great variety of vein matter consisting of quartz, mica, plumbago, feldspar, molybdenite, bornite and other copper ores, as well as many specimens of corals.

Manitoulin Island abounds in fossil coral, and good specimens were obtained, as you may see from the collection before you. We will make a detailed study of these during the ensuing year."

Our Chairman and Mayor Rumball of this city, also visited a farm in West Nissouri township to inspect the remains of what was one of Earth's most mighty creatures. During the Western Fair this year there were exhibited about thirty bones of gigantic size supposed to be those of a Mastodon or some closely related species of that class. Owing to the absence of teeth and most of the bones of the head, it has not been identified so far. These bones were uncovered recently by some men while excavating a drain through a peat bed, and are in a good state of preservation. The tusk measures more than nine feet in length. It is curved like a cow's horn and tapers to a point. The corrugations on the tusk where it entered the head are easily discernible. The femur is three feet in length and where it entered the socket, it is three feet in circumference. The tibia and fibula are well preserved and the foot bones are entire. Four ribs of large size are made to articulate with the vertebræ by ball and socket joints, attesting the great antiquity of the fossil.

From the position in which the bones were found, it would appear, that the giant becoming mired in the bog fell over and lodged probably against some partially submerged log and strangled. From a careful inspection of the locality where the bones were found our Chairman thinks other parts of the skeleton may yet be discovered, as no thorough search has yet been made. It is hoped by many citizens, as well as by the members of our Section, that London may be the final resting place of these interesting remains.

Efforts are now being made to establish a public museum in the city in connection with the Free Library. The question has been mooted in the press, and was thoroughly discussed at a meeting of the Library Board, and there is reason to hope that this treasure will not be allowed to leave our district.

In connection with the museum, Dr. Wolverton and other citizens have offered to loan valuable collections for a term of years and as only a small expense would have to be incurred in fitting up the rooms in the library building, there would appear no sufficient reason why we should not have this important means of education secured to us.

Our correspondent, Rev. Dr. Philp, of Petrolea, sent us two very interesting accounts of trips he made to points in Lambton County. The first was to a point near Shetland on the Sydenham about eight miles north of Bothwell, to inspect the shale beds which he found exposed there for some distance along the river bed. They belong to the Portage Chemung group. The shale is very dark, almost black, bituminous and filled with nodules of iron pyrites. These shales are beautifully stratified and "we were compelled," he says, "to think of ice sawn for storage." The shale in every respect resembled that at Kettle Point. Fragments of very large concretions (Kettles) were discovered, hemispherical in shape, the tops apparently cut off by the ice when the water was about sixteen inches higher than at present. We also found in the vicinity several kettles firmly embedded in the shale, each of them five feet in diameter.

A little further north we came upon two outcrops of limestone each about seventy feet in length; one runs parallel with the river and the other at right angles. On each side of these outcrops kettles are ranged. These vary in size and shape. They are from one-half to two-thirds of complete globes. Crevices in the limestone are filled with material of the same composition as the concretions. Though we searched diligently for impressions of calamites we did not succeed in finding any at this place.

At a place three miles up the Sydenham from Shetland the Lambton limestones are exposed. They are very fossiliferous and are crowded with Spirifera Mucronata.

The Rev. Jos. Philp also visited the Enniskillen gum beds and reported to us his findings, and sent a fine specimen of what he terms mineral Caoutchouc. It was obtained from lot 16, second con., Enniskillen, near Oil Springs.

The bed is situated on the surface, and is quite extensive, though much of it has been removed and used as fuel for steam raising. With a fan blast it burns well. In appearance it resembles tar. It is almost jet black, dense and solid, somewhat resembling asphalt. People select the cleaner parts and use it as chewing gum. They say it is better than it looks. It is probably of the same origin as the petroleum found in the same vicinity.

Mr. Philp also examined the bituminous shales of Alvinston which are exposed at that point for nearly a mile along the river. They belong to the Portage Chemung group. He found one impression of a Calamite, very distinct. The stratification and the cleavage are noteworthy and the nodules of iron pyrites are very beautiful. At this point there is no trace of a kettle. He thinks the kettles are found only in the lowest portion of this formation. At least that is the case at Shetland, where the older strata are exposed.

The Lake Superior Copper Mines.

Mr. Goodburne, who visited the Lake Superior copper mines in October, 1899, read a paper descriptive of that region, opening with a brief description of copper and its ores. The first record of the discovery of copper in the Keeweenaw Peninsula, Michigan, was in 1636, and from that date its history was traced down to the present day. Mining, however, dates only from 1831, when Dr. Douglass Houghton, while a member of the Schoolcraft expedition, first made known the great wealth of the peninsula, and in 1834, the government first opened up the country to mining. From a review of the history of early mining, Mr. Goodburne proceeded to a description of the principal mines, chief interest centering in the great Calumet and Hecla, which yields 100,000,000 pounds of refined copper annually from the conglomerate lode underlying 20 acres of surface, a product valued at $18,000,000, taken from under land, which originally cost $1.25 per acre, or $25.00 for the most valuable copper mine in the world.

The great Keeweenawan formation consists of a series of eruptive beds, alternating in the upper division with sandstone and conglomerates, the whole lying above the Huronian slates, schists and metamorphic rocks. The formation was, probably, originally horizontal at the bottom of the ancient sea. The system to the east is the Medina division of the Silurian formation, a time when great volcanic forces disturbed the earth; but it was probably the subsequent movements of the crust which tilted the beds so as to form a great trough or synclinal. The eastern edge is on the end of Keeweenaw Point, and the western across the Minnesota border. Michipicoten Island and the Nepigon district are on the reverse, or northern, fold of the synclinal, for while the Michigan edge dips toward the northwest, the northern edge dips in the opposite direction, but it is very much broken by depressions, and not so easily traced as the southern edge. The lower beds of the Keeweenawan formation consist mainly of a series of coarse crystalline gabbros, from 20 to 50 feet thick. There are 4,000 or 5,000 feet of these lava flows, after which the eruptions became somewhat different in chemical character, and more frequent, with thinner flows. These flows contain the copper. The lava is generally basic, like basalt, but acid and intermediate types are present. Among the typical kinds may be mentioned gabbro, diabase and melaphyr, including the amygdaloidal examples of the two latter, in which is the copper. Other rocks are the acid lavas, including felsites and porphyries, which have furnished much of the detritus for the sandstones and conglomerates, and these acid lavas, which do not flow as far or so freely as the basic, quite often trend across the other rocks in the form of dikes or bosses, with dome-like summits.

The copper occurs in the trap formation, which cuts the centre of the peninsula, and continues its course southward through Ontonagon county, extending westward through Wisconsin, to the western shore of Lake Superior, thence northward to Isle Royal, where it disappears on the mainland, appearing again in the Nepigon district. In all these places the geological characteristics are the same, thin sections of rock from one district being scarce distinguishable from a specimen taken from another. Eastward, the copper is found on Michipicoten Island, and the formation is traceable at Gros Cap, a few miles from Sault Ste. Marie.

The copper is not an ore, but is the virgin metal, all the paying mines being opened on lodes which carry native copper. There are a few fissure veins in Keeweenaw County (on the north of the peninsula), which carry grey sulphurets producing as high as 25 per cent. refined copper. All the mines produce considerable amounts of native silver, and the Quincy Company reduces its mineral by electrolysis in order to save the silver, which averages 38 ounces to the ton of copper.

When the lava flows rested under the ancient sea, the interstices in the frothy portion were filled with copper by electro-chemical action, forming the amygdaloidal rocks. The conglomerates are ancient sea beds, formed of boulders, sand and gravel, broken from the surrounding rocks of the ancient sea. These also had interstices, and were filled with copper in the same manner.

That the copper was carried in solution and arrested in its present position by some precipitating agent is conceded by most authorities; and that it was intimately associated with the melaphyrs that have had their ferrous iron changed into a ferric state by taking up more oxygen, has given rise to the now widely accepted theory that in the peroxydation of the ferrous iron is to be found the agent of precipitation. The origin of the copper is not so easily explained. One theory is that the copper was brought to the surface by the lava flows; another that it was deposited in a sulphuretted form, along with the detrital rocks of the period.

Mr. Goodburne illustrated his paper with diagrams of the district, showing the synclinal, and the position of the mines; and exhibited many beautiful specimens of copper and silver, from the form in which it was mined, until the copper was gathered from the great stamp mills.

We offer a suggestion to the other sections of our Entomological Society.

As it is difficult to secure members to replace those lost owing to removals, deaths and other causes, we would suggest occasional public meetings under the auspices of the parent society at which there should be a programme of addresses on subjects relating to nature study illustrated where practicable by views. These public meetings would adver tise our society and would tend to increase both the interest and profit of the meetings.

G. KIRK,
Sec. *pro tem.*

REPORT FROM THE ENTOMOLOGICAL SOCIETY OF ONTARIO TO THE ROYAL SOCIETY OF CANADA,

Through the Rev. C. J. S. Bethune, D.C.L, Delegate.

During the year that has gone by since our last report to the Royal Society, the Entomological Society of Ontario has pursued the even tenor of its way and continued its useful and scientific work. There are no striking events to record, but much has been done of permanent value and additions have been made to the general store of the knowledge of insects and their ways.

The thirty-sixth annual meeting of the Society was held in October last at its headquarters in London and was especially noteworthy for the conference that was held on the important subject of the San José scale. Those who took the principal part in it were Prof. James, Deputy Minister of Agriculture for Ontario; Dr. Fletcher, Entomologist and Botanist of the Experimental Farms of the Dominion; Mr. J. Dearness, one of the special commissioners appointed by the Ontario Government to investigate the

ravages of the scale in this Province; Mr. G. E. Fisher, Official Inspector; Professor Lochhead of the Ontario Agricultural College at Guelph, and Professor Webster of the Ohio State Agricultural Experiment Station. The proceedings at the Conference are published in full in the 30th Annual Report of the Society, which was presented to the Legislature of Ontario at the opening of its last session.

The Report also contains a number of valuable and interesting papers and is illustrated with sixty-six wood-cuts, many of them drawn specially for the purpose, a portrait of Mr. Henry H. Lyman, the retiring President, and a plate representing the structure of a butterfly's wing. Among the papers may be mentioned the following: "The President's Annual Address," by Mr. Henry H. Lyman, Montreal, in which the formation of an entomological union for the authoritative settlement of questions of nomenclature especially, was strongly advocated; an account was given of the importance of accurate descriptions of larvæ and the difficulties to be surmounted in making them; a short review was made of the principal work of the year in both economic and systematic entomology, and some account of recent publications was given. "One Hundred Years of American Entomology," "The Native Home of the San José Scale," and "Some Notes on the Larval Habits of the Gray Hair-Streak Butterfly," by Prof. F. M. Webster. "Notes on some Insects on Coniferous Shade Trees," "Injurious Insects of the Orchard, Garden and Farm in 1899," "Nature Study Lessons on the Cabbage Butterfly," by Prof. W. Lochhead, Guelph. "Spiders," by the Rev. Dr. Fyles, South Quebec. "The Wing Structure of a Butterfly," and "Remarks upon some Cuban Insects," by Mr. J. Alston Moffat, London. "Fatal Bite of an Insect," and "Some Observations of a Bumble bees' Nest," by Rev. Dr. Bethune, London. "Injurious Insects in Ontario During 1899," by Dr. Fletcher, Ottawa. "The Electric Light as an Attraction to Moths," by Mr. A. Gibson, Ottawa. "Asparagus Beetles," by Mr. W. N. Hutt, Southend.

The volume contains the reports on the work of the preceding year by the different officers of the Society, the Geological and Microscopical Sections at London, and the flourishing branches in Montreal, Quebec and Toronto. There are also valuable "Notes on the Insects of the Year," by the Directors, Messrs. Harrington, Evans and Gibson, in their respective territorial divisions, and by Messrs. Moffatt, Bethune and Fyles on the season of 1899.

The report concludes with an account of the first annual meeting held at Lacombe, Alberta, in November last, of the new and vigorous North-West (Canada) Entomological Society, which is fortunate in having Mr. Percy B. Gregson, of Waghorn, as its energetic President. The report of its council, the President's address, and papers by Dr. Bethune on "The use of Entomology;" Dr. Henry George on "The Pocket Gopher," and an address by Mr. Henry H. Lyman, are published in full.

The librarian states that the library of the Society now contains 1,627 bound volumes, besides a large number of pamphlets and periodicals. The chief additions to the cabinets of insects have come from Manitoba and Cuba.

Four distinguished entomologists were elected honorary members of the Society, viz: Dr. L. O. Howard, United States Entomologist, Washington, D. C.; Professor John B. Smith, Sc.D., Rutgers College, New Brunswick, N. J.; Professor F. M. Webster, Wooster, Ohio; and Professor H. F. Wickham, M.A., Iowa City, Iowa.

The Society has continued to publish its monthly magazine, "The Canadian Entomologist," which was begun in 1868, and of which the thirty-second volume is now being issued. The thirty-first volume was completed in December last and consisted of 380 pages illustrated with six photo-gravure plates and thirty-six wood-cuts; thirty new genera of insects are described and ninety-two new species. The contributors number sixty, of whom sixteen are residents in various parts of the Dominion, thirty-nine in the United States, and one each in England, Germany, Finland, Brazil and Japan. Among the large number of important papers may be mentioned the descriptions of Coccidæ from both North and South America by Professors Cockerell and Tinsley, and Messrs. Ehrhorn, Parrott, King, Hempel (Brazil) and Marlatt.

Papers on Classification: The Entomophilous Wasps by W. H. Ashmead; Dragon Flies by Jas. G. Needham; North American Myrmelionidæ by N. Banks; Coccidæ by Prof. T. D. A. Cockerell; Bees by Chas. Robertson; Wasps by S. N. Dunning; descriptions of new species: Lepidoptera by Prof. J. B. Smith, Dr. H. Skinner and Dr. H. G. Dyar; Orthoptera by Dr. Samuel H. Scudder and Jerome McNeill; Hymenoptera by

Carroll Fowler and W. H. Harrington; Diptera by D. W. Coquillett; Neuroptera by Rolla Currie; and Hemiptera by A. L. Quaintance and Otto Heidemann.

A list of Manitoba Moths by A. W. Hanham; the Coleoptera of Canada by H. F. Wickham; Ontario Acrididæ by E. M. Walker; Canadian Lepidoptera by J. A. Moffat, T. W. Fyles and E. F. Heath.

Papers of an Economic character by Enzio Reuter (Finland), M. Matsumura (Japan), F. M. Webster, R. H. Pettit, W. Lochhead, E. A. Carew-Gibson, and others.

From the foregoing list, which does not include short notes, book notices and other items of interest, it will be seen that the magazine covers the whole field of systematic entomology and contains articles of importance by well-known authorities on most of the orders of insects. It has become so necessary to the working Entomologist that there is a constant demand for complete sets of the volumes from the beginning and the Society has in consequence been obliged to reprint several of the earlier numbers.

SAN JOSÉ SCALE DISCUSSION.

At the request of the President, Mr. G. E. Fisher, of Freeman, Ont., the Provincial San José Scale Inspector, stated that he was present by direction of the Ontario Department of Agriculture, and was willing to give any information at his disposal with regard to the prevalence of the San José scale in the Province, and the work which had been done during the past season. He regretted to say that the state of affairs was not as favourable as he could wish, and that the scale was now known to be present in many districts where it had not been discovered last year. Many experiments had been tried by instruction of the Department to see if a practical remedy could be discovered to control the insect instead of the drastic measure of cutting down the trees. He was glad of the opportunity to let the members of the Entomological Society know what the general trend of his experiments had been. To begin with he would make the statement that the infestation of Ontario orchards by the San José scale was a far more serious matter than fruit growers of the Province yet realized.

The following is a condensed summary of Mr. Fisher's address:

A great deal was said at the last annual meeting of the Society about the value of whale-oil soap as the best remedy for the San José scale, and particular mention was made of the satisfactory condition of orchards now standing on Catawba Island, which had formerly been badly infested by the scale. I therefore took great pains during the past summer and carried out many careful experiments with this material, using the strength recommended as the best, namely, 2 lbs. of whale-oil soap to one gallon of warm water, as well as other quantities. When a tree was known to be infested it was treated thoroughly with 2 lbs. to the gallon, and all trees in the immediate neighbourhood were also sprayed with a solution of 1½ lbs. to the gallon. On other trees kerosene emulsion or crude petroleum were used, and careful notes taken of their effects upon the tree and the scale. With regard to the soap, the results were rather disappointing. In no case was the scale entirely eradicated, even when the soap was applied with the greatest care, according to the formula. Some trees where the full strength of 2 lbs. to the gallon was used are still infested, and the infestation is of about the same extent as at the beginning of the season. The scale was certainly reduced on cherry trees, and it was noticed that the soap had an excellent effect in clearing these trees of aphids. The treatment was applied just at the time the buds were bursting, when most people would think it was too late to use it without doing injury to the trees, but I found that no harm was done even when many of the blossoms were open. As a rule there is too much blossom on trees, and if some of this is destroyed it is an actual advantage, therefore this late spraying may be very beneficial. We have noticed that the young scales will move out on to a part of the tree which had been sprayed in the spring with the soap mixture, and will settle there and multiply. On the 18th August last I made an application, at Niagara, on a very badly infested tree, one, in fact, which was entirely covered by a moving mass of young crawling scale insects, walking all over the tree trying to find a place to settle. The soap was applied to the tree with a whitewash brush, with the object of finding out how reliable the soap was, and a little later a second application was made. I examined the tree again about the middle of November, and I think I had the nicest example of

the multiplication of the scale that could be found. The soap had killed the scale in the first place, of course, but the tree was just now in the same condition as when it was first applied, and the scales were multiplying on the part which had been washed with the soap. Below the untreated portion and for probably a foot and a half down over the part which was washed with soap, the larvæ were coming down in great numbers and there were actually mature females giving birth to young. This shews that washing with soap will not deter the scale insects from settling there and starting new colonies. In the middle of September I took my knife and scraped off the scales from a space one inch by two, clearing the bark entirely, and in two days this space was again entirely covered so that no bark could be seen. In the middle of October the same experiment was tried and the only difference was that it took twice as long for the space to be occupied again by the scales.

Kerosene also has been somewhat unsatisfactory. Trees have been killed and the scale does not seem to have been cleaned up. Crude petroleum has I think on the whole given the greatest satisfaction. Where it was applied on apple trees I have seen no bad results. I applied crude petroleum in one orchard to about 40 apple trees and 100 plum trees without in any way injuring a single tree. This was done about the middle of May. The trees were entirely freed from the scale and all that had been alive during the winter previous were cleared off. Case-bearers and many other insects were also destroyed. The material used was a mixture of 25 to 30 per cent crude petroleum with water, and applied as a spray. I am of the opinion that a mixture of half the quantity of soap recommended and half of crude oil in a combination pump would be preferable to either used alone. The crude petroleum will kill the scale insects but if applied in considerable quantities is apt to injure the peach and other tender trees. Great care should be exercised in applying it as advised. The soap alone is not a strong enough application, it does not kill enough of the scales. I do not think it would be safe to recommend crude petroleum for general use. People did not use whale oil soap in accordance with instructions given and the chances are they would not follow instructions when using crude oil, and thus trees would be killed. Judging from the experience of the past year I think some of the reported cases of injury by crude petroleum may be due to the way in which the substance has been applied. It must be borne in mind that no portion of the tree should be covered more than once by the spray or the oil will accumulate from each spraying until there is sufficient to injure the tree. I notice frequently when people are spraying that they begin on the trunk then spray the branches and when finishing bring the nozzle down again on to the trunk thus giving that part of the tree a double dose of the oil. This carelessness I think is the cause of much of the injury reported. The way that we spray is as follows: The pump is placed on an ordinary stone boat, one man sprays in one direction and one in another, and each tree is sprayed from four standpoints, or in other words as it is approached and as it is left behind in passing down the rows on each side of it. There is one part of the tree which is frequently overlooked when spraying, that is the upper side of the limbs on the opposite side of the tree to that which is being treated. This can only be reached by pushing the nozzle into the head of the tree and spraying over to the opposite side. (Mr. Fisher here passed around the meeting, specimens of infested wood, which had been cut from trees which had not been treated at all, and others from those treated with 2 lbs. of whale oil soap to the gallon or which had been sprayed with a 30 per cent mixture of crude petroleum. It was noticed that all these had some living scales on them.) In summing up the matter of remedial treatment I think the best results will follow if work is done in the month of April both with whale oil soap and petroleum applications. A perfect remedy should remain fresh for a long time, it must penetrate easily and must of course destroy the scales without injuring the tree. Soaps made entirely with potash are the best—soda makes a hard soap which solidifies on the trees. I have never seen an apple tree which was in any way injured with crude petroleum applied of the strength I have mentioned. The whale oil soap from Catawba Island has done the best work and it was only in the case where this Ohio soap had been used that the infestation did not increase. In the case of the other soaps tried the infestation has increased beyond what it was last spring. Many people did not know of the presence of the San José Scale in their orchards until they found it on the fruit. Almost the whole of the Niagara district is now infested with the scale and it is also very prevalent in the Guilds section where

little has been done to check it. The San Jose Scale has spread much during the past season and it is now abundant where it was hardly noticeable last year. It seems to me as if this scale question is going to develop into a great national calamity, and the time will come I fear when our grandchildren may have to tell their children of the good old times in Ontario when people used to be able to grow apples and other fruits.

With regard to the work of the scale it was formerly claimed that the fruit of the peach would not be injured on account of the fuzzy down upon its surface, but during the past summer I have seen peaches so covered with scales as to have the appearance of red apples, from the discoloration due to the injurious presence of the insect.——

Mr. Fisher here gave a review of the history of the San José Scale in Ontario and the excellent work that had been done by the Government in fighting it and protecting the fruit growers from loss. He was glad to find that public opinion was changing rapidly with regard to the work that was being done. He said "at Niagara, particularly, everybody is realizing that a very great danger threatens them and that something must be done or their interests will be destroyed. The fruit interests in Ontario are very great. One gentleman in St. Catharines sold $10,000 worth of peaches in 1899 and another at Niagara sold over $4,000 worth this year, and these peaches do not by any means represent their whole crop of fruit, as there are plums, cherries, pears, apples and small fruits beside. Some years of experience have taught us that when once we discover the San José Scale in an orchard no idea can be formed without close examination as to the extent of the infestation. In 1899 one orchard was examined carefully and 87 trees were marked—about the middle of this summer I visited this orchard and traversed it from one corner to the other, and I found the scale on every single tree I examined, and moreover on the very first twig I took hold of in every case. A good deal has been said about the rate at which scales can travel, and I am sure that this has been underrated. I have watched them a great many times and find that the young larvae can travel an inch in a quarter of an hour so that in a week they could travel half way across an orchard, and if blown to the ground I am quite sure they are capable of getting back again on to the tree. In addition to this there is no doubt they will crawl on to everything that moves and by that means will be carried in every direction. The increase of the scale is very rapid indeed towards the end of the season, especially during the month of September. Notwithstanding all that I have said, and remembering the state of affairs on Catawba Island, it would seem that if an orchard is treated conscientiously and regularly the scale will not exist in sufficient numbers to materially mar the crop of fruit. This is particularly true of the early varieties, which are practically developed before the season of the greatest increase of the scale. I may mention that during the past season I have noticed a very large number of the little black lady-bird beetles (Pentilia misella) which have done such good work in feeding on the scale.

Dr. Fletcher congratulated the Society on having Mr. Fisher present at the meeting. His excellent and careful work on the San José Scale was well known. He was somewhat disappointed at the results of Mr. Fisher's experiments with whale oil soap. This remedy was an extremely valuable one, he had used it a good deal and considered that a good caustic potash fish oil soap such as the Ohio soap made by Mr. Owen, was one of the very best remedies against plant lice and bark lice of all kinds, moreover the amount of potash 12% was sufficient to act as a decided fertilizer to the trees. Many have noticed the good effect of this soap upon trees where it had been used. It was also claimed by the manufacturers to be an excellent remedy against the Peach Leaf Curl and some other fungous diseases. He considered that the thanks of the Society were due to the Honorable Minister of Agriculture for instructing Mr. Fisher to attend the meeting and to Mr. Fisher himself for the valuable and practical address he had given. Everybody who heard Mr. Fisher knew that he himself believed every word he stated, and that every experiment he recorded had actually been carried out by himself.

Prof. Webster, of Wooster, Ohio, spoke in complimentary terms of Mr. Fisher's address and said that his information was so valuable because he told us what he had seen with his own eyes, not what he had learned from others. He himself was afraid to recommend crude petroleum for general use as he had known of several instances of injury to trees, but doubtless many successful experiments had been put on record.

A general conversation then took place on the subject of the San José Scale, and all united in the belief that the attack upon our fruit-trees is a most serious one and that

the owners of orchards in the infested districts should be warned of their danger and urged to take prompt and effective measures for the repression of the pest. A hearty vote of thanks was given to Mr. Fisher for coming to the meeting and affording so much useful information.

EVENING MEETING, WEDNESDAY, NOV. 14TH.

The meeting was called to order by the President, the Rev. Dr. Fyles, who spoke of the successful gathering the night before when we joined with the London Horticultural Society in a most popular and most interesting meeting. It was quite proper he thought that the consideration of Horticultural topics should take precedence of Entomological, for Adam tilled the garden of Eden before the animals were brought before him to be named. He then gave some amusing instances of the tremendously long names that some of Adam's entomological descendants had been inflicting upon innocent species of insects.

ANNUAL ADDRESS OF THE PRESIDENT.

By the Rev. T. W. Fyles, D. C. L., F. L. S., South Quebec.

At our annual meetings, Injurious Insects—their ravages and how to check them, have very properly received a great deal of attention. In a population such as ours, largely engaged in agricultural, horticultural and fruit-growing pursuits, such subjects are of never failing interest; and our economic entomologists when they treat of them are very sure to receive attention. To-night I venture to direct your thoughts to a different phase of insect life, and to operations that are beneficial to vegetation; and I trust that we shall spend a short time pleasantly in the consideration of our insect friends, and the offices they serve for promoting the fecundity and improvement of plants.

Dr. Gray did so much to bring the science of Botany into popularity on this continent, and in Canada our excellent public schools have so effectively taken the subject into the *curriculum* of school-work, that now, when addressing an audience upon the instrumentality of insects for the fertilization of blossoms, it is hardly necessary to dwell upon the various re-productive plant-organs. A few brief statements to put you in remembrance of these will be sufficient on this occasion.

You know then that in the blossoms of a large proportion of plants there are, in the centre of each blossom, first, at the base, the *carpels*, and upon them the *styles* surmounted by the *stigmas*—these are the female organs. Around them are, secondly, the *stamens* or male organs each consisting of a filament bearing an anther containing pollen-grains. When these grains are ripe the anther bursts, and the pollen is scattered by various agencies.

For the fertilization of the blossoms it is necessary that some of the pollen-grains should alight upon the stigmas of the female organs. So alighting they adhere, because of a glutinous exudation from the stigmas; and, in a short time, there descends from each of them a sort of radicle, or very fine tube, which works its way down the style, and through, or between, the integuments, till it enters the micropyle and mingles its juices with those of the ovule. The work of fertilization is then complete, and the ovule produces a seed, which in due time and under favourable circumstances will produce a plant like unto that from which it sprang.

The blossoms of the wild rose, the apple, and the cherry are familiar instances of these bisexual flowers.

In many other kinds of plants there are both male and female blossoms—*staminate* blossoms and *carpellate* blossoms—growing on the same plant. Call to mind a field of Indian corn (*Zea mays*), well planted, well cultivated, and in full bloom. Such a field is a sight to gladden the owner's heart, and to excite the admiration of every thoughtful beholder. The tall plants tower over head, each surmounted by the graceful panicle of male blossoms, the anthers of which dangle like bells from the sloping roof of a Chinese pagoda, and scatter the dust of pollen at every puff of air or other disturbance. Below bursting from their leafy wrappers are the stigmas of the carpellary blossoms spreadin

like tassels of pale green silk to catch the pollen that descends. No bees meddle with these anemophilous blossoms; and it will be observed that they possess none of those things which attract insects, viz, bright colours, nectar and perfume.

Usually the seeds of pumpkin (*Cucurbita pepo*) are sown here and there among the corn, and the plants from them trail far upon the ground. The flowers of the pumpkin also are of two kinds, male and female, growing upon the same plant; but it is evident from the nature and position of the plants that the wind cannot effect pollination in their case: the agency of insects is necessary; and the blossoms are large and showy, and well designed to attract the bee.

Again in numerous instances the male blossoms grow upon one plant, and the females upon another of the same kind. Every grower of hops knows that for successful cultivation he must have male plants intermingled with the female. The proportion is, if I remember rightly, one in ten, or one in twelve.

The willow and the poplar are familar examples of plants of the kind we are speaking of. Who has not rejoiced to see, in the early spring, the golden catkins of the male willows, for they are tokens that "the summer is now nigh at hand?"

The country people in the south of England call the flower-laden branches of the willow "palms," for the blossoms come about Palm Sunday; and in olden times branches laden with them were carried to the churches, to represent the palms carried before our Lord on his triumphal entry into Jerusalem. In this word *palms* so applied we have a local popular name that would puzzle any to whom the circumstances of its application were unknown. And, with reference to this, if I may digress for a moment, I wish to point out that Mrs. William Starr Dana in that bright and useful little work entitled "How to know the Wild Flowers" has made a curious mistake for want of a little old-country "folk-lore." On page 124 she takes pains to shew that the word Marigold comes from "the Anglo-Saxon *mere* a marsh" and that the whole name may signify *marsh-gold*. Which (she says) "would be an appropriate and poetic title for this shining flower of the marshes," (p. 124). But Marigold simply means Mary-gold—the flowers of *Caltha palustris* having been used by our forefathers to garnish the churches on Lady Day (March 25th), just as the Pasque Flower was used at Easter, and the Michaelmas Daisy on the Feast of St. Michael and All Angels (Sept. 29th).

> "The Michaelmas Daisie among dede weeds,
> Blooms for St. Michael's valorous deeds,
> And seems the last of flowers that stood
> Till the feste of St. Simon and St. Jude"—

says an Old English Kalendar. But to return—

The willow-blooms are pollinated by means of insects. Small bees of the genera Andrena, Osmia, etc., as well as the honey-bee, frequent them in the day time, to obtain bee-bread for their young and nectar for their own delectation; and in the dusk of the evening hibernated noctuids resort to them for refreshment.

It is a common thing for European Entomologists to spread a sheet under the willow boughs at night, and then by a sudden jar upon the limbs to bring down a shower of moths. The drowsy insects lie inert whilst the operator with the aid of a lantern selects from them such as he fancies.

All these insects fly from flower to flower and from tree to tree and convey the pollen from the male to the female blossoms.

The poplars also are of two sorts, male and female—the staminate flowers growing on one and the carpellary flowers on the other. But in this case the blossoms are of unattractive colouring. They have no nectaries; and the pollen is light and dry. The wind is the agent of pollination in this case.

We have glanced then at three kinds of blossoms:—

Perfect—in which stamens and carpels grow in the same flower.

Monœcious—distinct male and female blossoms growing on the individual plant.

Diœcious—one plant producing male blossoms only, and another only females.

We have also noticed two means of pollination—(1) the agency of insects; (2) the agency of the wind. In some kinds of bisexual blossoms self-pollination takes place, as in the Mallow; but with these we have not now to do. Our attention is to be given to the insect-pollinated flowers.

Of the importance of cross-pollination—*i. e.* of fertilization with pollen from other blooms of the same sort, we may judge from the arrangements made in nature to secure it.

(1) First we notice the wonderful abundance of the pollen—sufficient for every requirement. Take your stand by an apiary towards evening, and watch the returning bees. How laden they are with bee-bread—which is compressed pollen—and yet in the course of their operations they have been instrumental in fertilizing thousands of blossoms. Yes, the busy workers have discharged their duties, and have not been stinted in their reward.

(2) We find that the various arrangements of the floral leaves, or perianth, for the shelter and preservation of the pollen are worthy of observation. Take that common flower the Dandelion (*Taraxacum officinale*). This flower is in reality an inflorescense consisting of a hundred or more flowerets packed together. This collection of small blossoms is surrounded by a green involucre—the whole forming a capitulum which closes tight on the approach of rain.

In the Sun-flower (*Helianthus annuus*), the capitulum bends over in wet weather; and the moisture is shed from the roof-shaped receptacle and the sheltering disk flowers.

In many of the lilies, the corolla forms a bell-shaped roof under which the re-productive organs lie in safety; and in the snap-dragon and other flowers of like structure they are shut up as in a cabinet—a cabinet which the bees know how to open.

(3) We learn that the relative positions of the various organs in many instances render self-pollination impossible.

The English Primrose (*Primula vulgaris*) affords us an instance of this. The flowers of the primrose are of two kinds. In one the style rises higher than the stamens, in the other the stamens are placed above the style. In either case the stigmas are at the same height as the anthers in the other. An insect comes to a flower which has a long style; its proboscis at a certain part is charged with pollen from the elevated anthers of a blossom which it has just left. As the insect rifles the long-styled flower of its sweets this pollen is brought in contact with the stigma which is at the right height to receive it. At the same time the proboscis of the insect is acquiring a fresh supply of pollen lower down from the short anthers and this it will convey to the next short-styled primrose blossom that it visits. It is *possible* that the short-styled flower may be self-pollinated; but it is quite impossible that the long-styled flower can be so.

(4) We see that the ripening at different times of the anthers and stigmas of some kinds of blossoms insures, with the aid of insects, the cross-fertilization of blossoms.

The Monk's-hood (*Aconitum napellus*) affords us an example of this. The blue flower of the monk's-hood is really the calyx. Its uppermost sepal forms a sheltering hood in which the two posterior petals are hidden. These petals are of a remarkable shape, curved and clawed, and they secrete nectar which attracts the humble-bees. The monk's-hood is exclusively a humble-bee flower. The other petals are either wanting or are insignificant. In a newly opened monk's-hood flower the numerous stamens protrude and their anthers ripen before the stigmas. A humble-bee alights in the middle of the flower, holding on by the side sepals. In its struggles to reach the nectaries, the under part of its body is brought in contact with the anthers and becomes charged with pollen.

In the older blossoms of the monk's-hood the stamens all bend back out of the way, and the carpels are protruded. A bee alighting on such a blossom brings pollen to the stigmas now ready to receive it and the blossom is fertilized.

Another noteworthy instance of a plant which ripens its anthers and stigmas at different times is afforded by the Foxglove (*Digitalis purpurea*). The foxglove like the monk's-hood is a humble-bee flower. Indeed its form and size seem especially adapted for the reception of the humble-bee. The stamens and pistil are extended along the upper part of its inner surface. A humble-bee backing out, after sucking the nectar from the further recesses of the flower, scrapes off, by means of its bristly coat, the pollen from the anthers, and carries it on its back to other foxglove blossoms whose stigmas are ready to receive it.

The result of cross-fertilization seems to be the production of more numerous and finer seed, and eventually of stronger and more beautiful plants.

Some flowers have a wide circle of insect attendants. The Buttercup is known to be visited by more than sixty different kinds of insects (Percy Groom's *Elementary Botany*, page 121). Others are exclusive, permitting only the visits of a favoured few,

We have seen that the willow catkins are pollinated by bees and noctuids. The flowers of the Blueberry (*Vaccinium Canadense*) are fertilized by wasps which resort to them in great numbers. The round head and short lingula of the wasp fit well into the shallow saucer-like blossom.

Another plant that is visited by wasps is the Kalmia (*Kalmia angustifolia*). This also has shallow blossoms which have this peculiarity, each stamen is sunk in a groove the shoulder of which confines the anther. When an insect in search of nectar butts against the centre of the flower the stamens with their anthers are set free and start forward, scattering pollen on the front of the intruder. This pollen is carried by the insect to other blossoms of the sort and fertilizes them.

In early summer the Lilac blooms are visited by long-tongued moths, such as *Amphion nessus* Cram., *Hemaris thysbe* Fabr., etc., which fly in the daytime. In the dusk of the evening the white-blossomed perennial Phlox invites the larger hawk-moths, *Sphinx chersis* Hubn., *S. Kalmiæ* A. & S., *Deilephila chamænerii* Har., etc. The flowers of the Dogbane (*Apocynum androsæmifolium*) are favourites of moths of the genera Plusia and Thyatira.

Of the butterflies *Argynnis myrina* Cram. has a partiality for Golden Rod (*Solidago Canadensis*); *Pyrameis cardui* L. for Red Clover (*Trifolium pratense*); *Satyrus alope* Fabr. and *S. nephele* Kirby for the blossoms of *Asclepias cornuti*; *Pamphila Manitoba* Scud. for *Solidago lanceolata*, and so on.

In the Society's Annual Report for 1899 I gave the life-history of a small moth *Metzneria lappella* Zel. newly introduced from Europe. It is a burdock insect. Its larvæ feed on the seeds of the plant, and the moth itself feeds from and fertilizes the burdock flowers.

The flower-head of the Burdock (*Lappa major*) contains about forty flowers. They are compressed in a globular involucre, the imbricated scales of which are coriaceous and tipped with awl-shaped hooks. The calyx in each flower is represented by a dense circlet of delicate, white, silky and branched hairs surmounting the seed vessel. The corolla consists of a white tube half the length of the blossom, and then of a vase-shaped, purple expansion, five-cleft at the top. The brownish purple anthers are united and form a tube which produces pollen on the inner side. Through this tube when dehiscence occurs the pinkish white style forces it way, carrying with it the delicate, white, pellucid pollen-grains. The style then parts at the top into two branches which bear the stigmas on the upper surface. An insect carrying pollen-grains from other flower-heads intrudes among the flowerets and leaves pollen-grains attached to the stigmas. In its efforts to reach the nectaries of the flower it dislodges pollen from the freshly protruding styles and then bears it away to fertilize other blossoms.

The Evening Primrose (*Œnothera biennis*) is the special plant of *Alaria florida* Gn. The moth fertilizes the blossoms and is sometimes wrapped in the closing petals on the approach of day. Its larvæ feed upon the plant.

The honey-bee fertilizes the white clover and the humble-bee the red. Grant Allen in "Flash Lights of Nature" has drawn attention to the fact that as the flowerets in a head of clover are fertilized they droop over out of the way so that the bees may not be hindered in their work by vain endeavours.

Another flower that is pollinated by bees is the Nasturtium (*Tropæolum majus*). Three of its five showy petals at a certain distance within are set with a protective fringe, a veritable *chevaux-de-frize* to keep out small insects which would rob the flowers of its sweets and accomplish no good purpose. When a bee of sufficient weight enters, it bears down this fringe over the anthers, and at the same time comes in contact with the advanced style, the stigmas of which become charged with pollen which the bee has brought from other nasturtium blooms. The bee passes into the recesses of the flower, to imbibe the nectar accumulated in the spur, and as it does so the fringe and the stamens rise to their normal position. Having exhausted the supply of nectar, the bee backs and turns to make good its escape, and in its efforts to do so is covered with fresh pollen from the anthers of the flower.

The Campanula grown in our gardens (*C. medium*) has an interesting lesson for us.

The long flower-bud, yet unopened, encloses the tall pistil, along which the five filaments with their long anthers are extended. When the anthers dehisce the pollen masses adhere to the style leaving about a quarter of an inch at the top free. This projecting

part contains the five stigmas. As soon as the corolla opens the anthers shrink away from the style and shrivel up, leaving the pollen masses behind them. At the same time the five sections of the style part, and curl up ram's horn fashion.

Now comes the bee as the minister of Hymen. In this case it is *Megachile scorbicularis* Smith. The insect comes with its abdomen thickly coated on the under side with pollen from other blossoms. As it passes into the flower to get to the nectaries below some grains of the pollen with which it is already charged are scraped off by the curled stigmas and adhere to them. The bee secures a further supply of pollen; but as it passes out of the blossom the under surfaces of the parted style take nothing from its fresh burden. Successive visitors completely clear away the pollen from the pistil.

The small pale flowers in the umbels of the Wild Carrot *(Daucus carota)*, the Water Hemlock (*Cicuta maculata*), the Cow Parsnip (*Heracleum lanatum*) etc., are resorted to and fertilized by a very host of small flies and ichneumons.

The English Arum (*Arum maculatum*) also is fertilized by flies. The whole process of its pollination is described in that admirable work, Percy Groom's "Elementary Botany," published by Bell & Sons, London—a work which I can strongly recommend. The story is most interesting. The flies, covered with pollen from another arum, are drawn to the newly opened spathe by an ill odour which it gives out. They creep down the inside of the spathe through a palisade of fibres which grows from the floral axis and closes in a lower chamber—a veritable fly-trap. In this chamber around the floral axis grow, at the base, a number of sessile ovaries with sessile stigmas; above them is a zone of sessile anthers. The imprisoned flies fertilize the ovaries with the pollen they have brought in, living the while upon nectar given out by the stigmas. Then the anthers above them ripen, and they become dusted with new pollen. When this is done, the enclosing fibres wither, and the flies escape to be again attracted by unpollinated arums.

The Skunk Cabbage (*Symplocarpus fœtidus*) and the Carrion Flower (*Smilax herbacea*) are mal-odorous Canadian plants that are fertilized by the aid of flies. Thoreau compared the smell of the latter to that of "a dead rat in a wall." Happily such plants are few in number and grow in out-of-the way places, or retain their offensive odors but a short time. They should serve to make us thankful—they tell us what might have been if God had not adapted the earth so favourably to the requirements and tastes of the children of men. In His great goodness He has filled it with beautiful forms and exquisite colours and harmonious voices and rich perfumes.

Asa Gray in his excellent little school-book entitled "How Plants Grow," has given reverent expression to some great truths. On page 96 he says:—

"Such a system" (The Natural System) "is not a mere convenience for ascertaining the name of a plant, but is an illustration, as far as may be, of the *plan of the Creator* in the vegetable kingdom. And the Botanist sees as much to admire and as plain evidences of design, in the various relations of the plants to each other (i.e. in their resemblances and their differences), as he does in the adaptation of one part of a plant to another, and in the various forms under which any one organ may appear. The different kinds of plants are parts of a great whole, like the members of a body or the pieces of an harmonious but complete edifice or structure; and this whole is the *Vegetable Kingdom.*"

Yes! And when the student considers the bearing of the insect tribes upon this Kingdom, he finds yet further evidences of design, he sees yet more to admire, for he obtains a wider view of the plan of the all-wise and beneficent Being whose hand hath made all these things.

"The great Creator condescends to write
In beams of inextinguishable light
His names of wisdom, goodness, power and love,
On all that blooms below, or shines above;
To catch the wandering notice of mankind
And teach the world if not perversely blind
His gracious attributes, and prove the share
His offspring hold in His paternal care."

COWPER, "*Hope.*"

The Rev. Dr. Bethune moved a vote of thanks to the President for his valuable and interesting address which had afforded much pleasure and instruction to all present. Mr. Dearness, in seconding the motion, drew attention to the fact that the beautiful diagrams

exhibited in illustration of the address were drawn by Dr. Fyles himself, who thus shewed that he was no mean artist, as well as an eminent entomologist and botanist. He then spoke of the method of fertilization of nasturtiums, and said that he had formed a different theory from that put forth by the President, and would now look forward to further investigations of the case. Mr. Bowman heartily supported the motion, and took occasion to speak of the danger many people incurred from their ignorance of the distinctive characteristics of poisonous fungi, mentioning the case of one that he had gathered this autumn, the immature specimens of which were destitute of the disagreeable odour belonging to the plant.

A PLEA FOR THE SYSTEMATIC AND ECONOMIC STUDY OF THE FOREST INSECTS OF ONTARIO.

By Prof. W. Lochhead, Ontario Agricultural College, Guelph.

Ontario has an immense area of forest lands composed of hemlock, spruce, tamarac, balsam and pine. According to a recent report of the Forestry division of Ontario, "Of the 142 millions of acres comprising the province, about 120 millions of acres are still owned by the crown. Out of this, nearly 22,000 square miles, or 14 million acres are under license to lumbermen." The Government has very wisely done much to preserve these valuable domains from destruction by fire, by the appointment of a large number of rangers, who patrol, as it were, the forests and put out fires which may have been carelessly started by Indians, campers, or settlers.

There is, however, a danger, perhaps as serious as that of fire, against which no precaution has been taken. I refer to the danger of insect depredations.

Ontario is falling behind many of the neighboring States of the Union with respect to the great problem of the relation of insect work to our forest domains. Much work is being done by the Federal Government at Washington, and by many of the States where extensive forests exist, in determining the conditions which increase or decrease the extent of insect ravages. Already extensive experiments have been carried out, and much valuable information has been secured. The investigations have found that the amount of damage caused by insects in the large forests is enormous; and to prove that their results are worthy of consideration the very persons who are most directly interested in the preservation of the forest timber, the great lumber and timber companies, have readily come forward and assisted the investigator by affording every facility in the forest for a thorough study, and by money contributions as well.

In Europe every trained forester is well informed with regard to forest insects and knows how to combat their attacks; but in Ontario we are content to go along in our ignorance and pay no heed to insects or their ravages, probably because our forest areas are so large.

The questions will naturally be asked: "In what way can a study of forest insects help us in the preservation of our forests?" and "How can assistance be rendered in cases of serious insect ravages?"

In answer to the first question it may be said that a knowledge of the life histories of injurious forest insects is just as essential to a proper, intelligent campaign of operations as is a knowledge of life histories in our work against the foes of the orchard and garden. Systematic work must precede intelligent economic work; we must distinguish the economic forms from the beneficial or harmless species. In many cases it may be possible to utilize the beneficial forms as allies against the injurious forms, and in a well developed plan of operations the beneficial insects should be preserved from destruction.

I maintain, then, that a systematic collection of forest insects should be made so that we may become familiar with the forms; that a series of observations be made so that the life-histories of as many as possible be obtained for our guidance in combatting the injurious forms.

In answer to the second question proposed it may be said that hopeful results have been secured for American conditions of forestry which are so very different from those obtaining in Europe. In Europe the forests are carefully guarded, and a semi-military system of protection is in vogue in most of the continental countries.

In West Virginia it has been found that there is a proper time to fell trees to prevent damage by insects. Dr. Hopkins cut different kinds of trees twice a month year after year, and he got definite results for the oak and hickory for example. The timber cut in the winter months was gradually converted into a powder, while that cut during the summer remained almost intact. These results are confirmed in the practical operations in the forests, for it has been observed that certain species of trees felled in late fall, winter, or early spring suffer more damage than those felled in July and August.

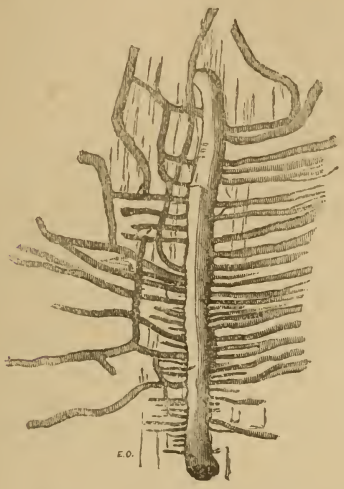

FIG. 1. Hylurgus piniperda.

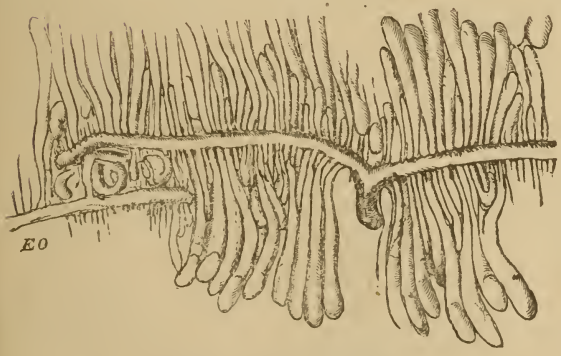

FIG. 2. Hylesinus fraxini.

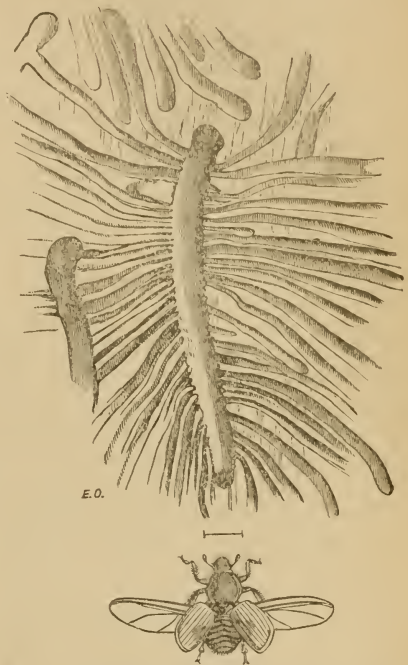

FIG. 3. Scolytus destructor. The beetle, magnified, and its burrows. (See page 72.)

Again, much has been learnt regarding the disposal of timber which has become affected, and the influence of lumbering methods and forests fires on the general problem of insect depredations. It is a matter of observation that unhealthy, weakened, dead trees are the most likely ones to suffer from insect attacks. Thus careless methods of handling timber whereby standing trees are girdled, branches broken, and otherwise dismembered and disfigured, are very fruitful sources of insect distribution to those areas. These infested areas become centres of infestation to the surrounding forest.

In Ontario where lumbering operations are carried on in many isolated limits the danger is extremely great. The trees along the margin of the felled areas are very liable to lose their vitality on account of their inability to adapt themselves to the changed conditions which have arisen. If the lumbering operations are postponed for any length of time there is a great likelihood that the insects will spread from the felled areas to the unbroken forest, but where lumbering is carried on continuously in an area the insects find sufficient new-felled timber and branches without betaking themselves to the unbroken forest.

The plan of forest-ranging for the prevention of fires is undoubtedly of tremendous value in the prevention of the spread of forest insects, but there is another work for the ranger. He could, if he knew more about insect conditions and habits, arrange for the

burning of certain felled areas at a time which would be the most favorable for the destruction of the insects which are preying upon the dead and dying trees. Such burnings, however, should be very carefully controlled so as not to injure the trees of the untouched forest, lest new feeding grounds be opened up for the insects.

Indirectly, again, the control of forest insects is of much importance. Dr. Hopkins, after a trip through the great north-west timber lands of Washington, Oregon and Idaho, states that his observations prove conclusively that forest fires originate, in very many cases, in timber areas which have been killed by insect depredators. The dead trunks and broken branches furnish suitable conditions for the rise and spread of fires.

The entrance of trunk and bark beetles into the trunk and bark of trees allows access to many timber fungi which penetrate the tissues, sap the vitality of the trees, and eventually kill them. The accompanying figures, 1, 2 and 3, illustrate the manner in which some common timber beetles burrow along the wood beneath the bark. Recent studies by European and American mycologists show very clearly how very prevalent, as well as harmful, fungous diseases are in the forests. It is quite true that insects often attack healthy trees, and fungi gain entrance to trees which have not been attacked by insects, yet the fact remains that the presence of insect pests increases very much the harmful effects of fungi.

In answer, then, to the second question asked regarding the assistance which a knowledge of insect conditions can give towards the control of forest insects, it may be said in summary that much can be done (1) by cutting and felling timber at the most advantageous season; (2) making traps for insects by girdling and felling trees to which the insects are attracted in preference to sound trees, then by careful burning of these traps; (3) preventing the cutting of timber in many parts of a limit, as these parts serve as centres of infestation; (4) preventing careless methods of handling the unfelled trees so as not to injure them and thus to expose them to insect attacks; (5) preventing fires which we know destroy many trees and render them subject to insect attacks; and (6) introducing insects which prey upon injurious forms.

We are not in a position at the present time to carry out all of these methods, for we are ignorant of the life-histories and habits of the majority of the forest insects. Accordingly, I make a plea for the better studies of insects, and such can be best accomplished by a biological survey of the great timber areas of the Province. Such a survey must naturally be undertaken by the Government, assisted, if possible, by the holders of timber limits from the Crown. It is the duty of this Society to call the attention of the Government to the necessity for such a survey.

Professor Packard states in his valuable report on the Forest Insects, published in 1890, that "the number of insects which attack the different kinds of trees in the United States is sufficiently large to excite great fears for the future prosperity of our diminished forests, unless the Government interposes, and through the proper channels fosters entomological research in this direction. Our forests, moreover, are much richer in species of trees than those of Europe. We have, without doubt, on the trees corresponding to those of Europe as many destructive species as in Europe. But we have many more shade trees and forest trees of importance in the Eastern United States alone, and when we add to these the forest trees of the western Rocky mountain plateau and of the Pacific coast, and when we look forward to the attention which must be given in the immediate future to the planting of shade and forest trees on the great plains and in California, the subject of forest entomology assumes still more importance."

According to Kaltenbach the number of injurious insects which attack the forest trees of Central Europe is as follows:

Oak	537	species
Elm	107	"
Poplars	264	"
Willows	396	"
Birches	270	"
Conifers	299	"
Beech	154	"
Alder	119	"

It is apparent that neither the officials of the Department of Crown Lands of Ontario nor the members of the Royal Commission on Forestry Protection in Ontario consider

that insects do any injury to the forests, for in the report issued a few months ago, the insect problem is not even mentioned. Such an omission must be an oversight, due, no doubt, to the fact that none of the members of the Commission are entomologists. It would, indeed, be strange if our Ontario forest domains of such great extent form an exception to the general rule, and harbor no insects.

Dr. Fyles remarked that this paper dealt with a very important subject which deserves the serious consideration of the community. He then referred to the large areas in the Province of Quebec which had formerly been covered with forests of tamarac, but now were desolated by the ravages of the Larch Saw Fly and the timber rendered worthless.

Dr. Fletcher stated that the lumbermen usually say that in the Ottawa valley alone insects cause them a loss of a million dollars annually. This amount is merely an estimate, but it serves to show that they are aware of the losses caused by insects and realize how costly their ravages are. It is found that if the logs cut in the winter are not got into water, they will surely be attacked by insects and badly injured during the summer. A plan adopted in many cases is to turn the logs over from time to time during the summer so as to change the position of the portions exposed to light and those in contact with the soil; another method is to split the bark so that the inner part dries up and prevents the insect larvæ from living in it. These operations, however, are difficult to carry out, as the lumbermen cannot stand the flies which attack them in myriads during warm weather; this cause also prevents them from cutting timber in summer, which has been proved to be a better time than winter as far as the quality of the timber itself is concerned. The attacks of insects are always made upon dead or dying trees and such may usually be found on the edges of clearings where partially injured trees have not been cut down. In 1884 there was a great forest fire in the Ottawa valley, which left an immense number of burnt trees still standing. These were immediately attacked by insects and the loss would have been complete had not the owners of the timber limits at once set to work to cut and remove as much as possible of what was left. Any tree that is scorched with fire or partially burnt is sure to be attacked by wood-borers during the following summer.

Dr. Fletcher closed his remarks by moving a vote of thanks to Prof. Lochhead for his interesting paper; this was seconded by Mr. Dearness, and carried unanimously.

RESULTS OF SOME EXPERIMENTS IN PROTECTING APPLES FROM THE ATTACKS OF THE SECOND BROOD OF CODLIN MOTH.

By F. M. Webster, Wooster, O.

In Ohio, our attempts to protect the apple crop from attack by the codlin moth have given us varying results. Some years, spraying with the arsenites like Paris green, London purple and arsenite of soda have given excellent protection, and the apples have been very free of larvæ. Other years, though the spraying has been done with equal care and in proper season, the effect has been discouraging, to say the least. The causes for these varying results are not at all clear and there are some grounds, during some years, for the question as to whether, or not, it pays the orchardist to go to the expense of two or three sprayings and get so little in return for his labor, and other necessary expenditures, which spraying necessitates. Frequently the apples will pass through the season, up to late August, without exhibiting indications of the work of the apple worm, but after that the fruit seems to be seriously attacked and much damage done. There are with us, two periods of dropping of the wormy fruit. The first in late July and the fore part of August and the second setting early in September. Orchardists have declared that they could prevent the first, very largely by spraying, but the second baffles them. I have suspected, for a long time, that this was due to the attack of the second brood, and those who succeeded in protecting their fruit early in the season were, very largely, suffering from the results of moths developing in unsprayed orchards, and migrating during August to those that had been carefully and properly sprayed, thus infesting these after it is possible to protect them by the usual measures. In order to

test the probable efficiency of spraying, during the ordinary season for doing this, an experiment was tried in the orchard of Mr. William Miller, at Gypsum, Ottawa County, along the southern shore of Lake Erie. It was obviously impossible to get two trees exactly alike, and not easy to secure two greatly alike in close proximity to each other, but we selected two well in from the outer margins, and one of these we covered with netting, such as is used for covering baskets of peaches and grapes. The trees were sprayed for the last time on June 22nd and the covering applied the next day.

All fallen apples were removed from under both trees on August 29th, while there was a cessation in dropping of infested fruit, and, as we thought, all or nearly all of the first brood were thus eliminated. On September 14th, soon after the terrible wind that swept over the lake region, the spent tropical hurricane that devastated Galveston, Texas, there were removed from under the covered tree 229 apples, 59 per cent. of these being sound, their weight being 77 pounds. Under the uncovered tree there were 1,052 apples, only 10 per cent. of which were sound, and their weight was 214 pounds.

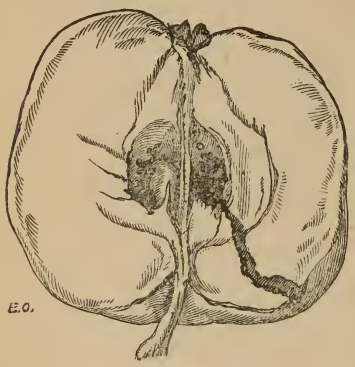

Fig. 4.

October 22nd, there were picked from the covered tree 107 pounds of fruit; 372 apples were sound and eight wormy. Windfalls, 18, all wormy. From the check tree there were picked 128 pounds of fruit, 253 apples being sound, and 41 wormy. Of the windfalls, 94 were sound and 104 wormy. (Fig. 4 illustrates the familiar appearance of a "wormy" apple.)

Recapitulating, the covered tree, after the fruit was removed from beneath on August 29th, carried 627 apples. Of these, 372 were gathered in a sound condition and 26 were wormy. The uncovered tree, after fallen fruit was removed on August 29th, carried 1,544 apples, of which 347 were sound when gathered and 145 were wormy. The summary would read thus: Covered tree, out of 627 apples, gave 466 sound and 161 wormy; the uncovered tree, out of 1,544 apples, gave 452 sound and 1,092 wormy. This, I think, shows pretty clearly what the result would be if we could manage the second brood of moths, and also who is to blame for the disastrous effects of the second in well sprayed orchards.

There are two other points worth mentioning First, where a species is double brooded, the second brood is likely to be the most migratory in habits. Second, it is the outer rows in a well sprayed apple orchard that are most affected late in the season. Taking it altogether, the trouble does not appear to be with the spraying, but with those who do not spray at all, and who furnish the migrating female codlin moths that give origin to the second generation of worms in a well sprayed orchard.

In the discussion that followed the reading of the paper, Dr. Fletcher stated that he had that day seen a young larva about a week old, which evidently belonged to a third brood. It seemed clear that the best method of counteracting this insect was to spray for the first brood and bandage the trees for the second.

Mr. Bowman asked whether a late hatching of a third brood would not be a good thing, as then they would probably all be winter killed. Prof. Webster replied in the affirmative, and said that some years ago there was a severe frost in June, which nipped the leaves of the trees. Clisiocampa caterpillars had been very abundant, but they all perished from frost or want of food, and it was years before they became numerous again.

Dr. Fletcher mentioned that he had received some cocoons of the Tussock moth from Toronto, covered with eggs. They all hatched out recently under cover, shewing how near this species is to being double-brooded.

The next paper read was by Mr. Arthur Gibson, Assistant Entomologist of the Experimental Farm at Ottawa, on the "Life-history of Arctia Phalerata," in which he described in detail all the stages in the life of this insect from the egg, through the caterpillar and pupa to the perfect insect. As it was of a highly technical character, the paper has been published in *The Canadian Entomologist.* (Vol. XXXII., p. 369.)

Dr. Fletcher, at the close, remarked that such a paper as this indicated the lines upon which the best work should be done. It had been prepared with the utmost care and minute observations had been made at every stage of the insect's life. It was very important that life histories should be worked up in this way, as the imagoes alone are not to be depended upon in the separation of species. Very little is known about some of the commonest insects, and regarding others futher details are required to fill up the blanks in our knowledge. Every Entomologist should try to rear at least one species every year, and then a very great deal would be accomplished in the course of a comparatively short time. He then spoke of the mode of describing a larva, and explained Dr. Dyar's plan of numbering the tubercles and thus simplifying very much the work of description.

NOTES ON INSECTS OF THE YEAR 1900.

Division No. 2—Bay of Quinte District.—By J. D. Evans, Trenton, Ont.

During the past season the Forest Tent Caterpillar (*Clisiocampa disstria*) has done much damage in certain districts but not to such an extent as last season.

Grasshoppers caused some destruction to grain and pasture in some localities in the northern portion of the County, but only over comparatively small areas.

The pea weevil (*Bruchus pisi*) has come to be such a pest throughout Prince Edward County, that the seedsmen are looking for other and more suitable localities, in one case having transferred their operations in part to Lindsay.

The larvæ of *Phytonomus punctatus* were observed to be quite numerous in a clover field at Lake on the Mountains, near Glenora, Prince Edward County, on the 24th of May last. In very many cases the larvæ were curled up and encircled the tip end of the blades of grass, and apparently in a dying condition from either being parasitized or from some disease. At the same time and in the same clover field a number of examples were taken of *Hylesinus trifolii*, Muell. also eleven specimens of *Phytonomus nigrirostris*, Fab.

In July last unusual visitors appeared in a pear orchard owned by Mr. W. A. Warner and situated about 2 or 3 miles to the north-west of the town of Trenton. This orchard was about one acre in extent, in the midst of an extensive apple orchard, and had a few plum trees interspersed through it. About the third week of the month all the pear trees had their lower limbs swarming with small green caterpillars, there was no web nor did they suspend themselves by a thread, but seemingly dropped to the ground when satiated or when the tree was struck, then crawled towards and up the trunks again to the higher branches. The trunks of the trees and the ground, in places, were fairly green with the crawling masses of them. The caterpillars were from $\frac{1}{2}$ to $\frac{3}{4}$ of an inch long when first noticed, of a dark green colour at one end and a lighter green at the other. The apple trees in the immediate vicinity had a few of the caterpillars but the plum trees were not visited by them. A thorough spraying destroyed them all. It was not until about two months thereafter that the writer became aware of their visit through a letter from Dr. Fletcher. The above particulars having been procured from Mr. Warner at such a long interim from their appearance, further information could not be elicited.

There has been a great scarcity of moths during the past season as compared with last, very few coming to light and they only of the commonest species.

Division No. 3.—Toronto District.—By D. G. Cox, Toronto.

Owing to other duties the writer has had very limited opportunities for observing the insect ravages of this district during the past season.

The Tussock Moth (Orgyia leucostigma) is still with us and has caused considerable damage to the foliage of the horse chestnuts in some localities. The civic authorities did considerable spraying of the foliage in the early part of the season which no doubt destroyed the young larvæ in large numbers. The pest appears to be diminishing and if they keep on fighting it, they will eventually succeed in getting it under control.

The Tent caterpillar (Clisiocampa Americana) was in considerable numbers on the wild cherry trees around the suburbs of Toronto, and many orchards were rendered unsightly by the tents. The Cabbage Butterfly (Pieris rapae) has been unusually numer-

ous this year in this locality, and the cabbage and cauliflower crop in many gardens has consequently been considerably damaged by the larvæ of this common pest. The cabbages were so badly perforated by the caterpillar as to render them unmarketable. I observed also in gardens where no cabbages were grown, that the turnips and radishes were severely attacked by this larva.

During a trip taken through Scarborough and Markham townships in the latter part of July, I visited several farms and found considerable damage had been done to the turnip crop by what appeared to be the larvæ of (Noctua C-nigrum). In some fields 40 per cent. of the crop had been cut off and the farmers were re-sowing seed in the bare places along the rows that had been destroyed. I did not know the best remedy to recommend to prevent the ravages of this cut worm, but advised them to apply to Dr. J. Fletcher, the Dominion Entomologist at Ottawa, who would give them valuable information which would be of great benefit to them in combating the ravages of the insect.

Around one of the farms I visited there were planted about two-thirds of a mile of European Mountain Ash trees (Pyrus acuparia). These trees were about fifteen years old and were so badly infested with the larvæ of the Flat-Headed Apple Tree Borer (Chrysobothris femorata) that the writer picked from the outer bark of one tree ten young larvæ about five-eighths of an inch long, several other trees were examined in the row and found to be in the same condition. Quite a number of the trees had already been killed by this pest. I advised our friend the farmer to pick out as many of the larvæ as he could during the months of July and August, after that they would have penetrated into the heart of the tree and consequently could not then be reached. I also told him to paint the trees next spring with a thick solution of soft soap and washing soda before the beetle oviposits so that the young larvæ will have difficulty in penetrating the bark. The ravages of this beetle seem to be confined more particularly to the trunk of the tree; from the ground up to the first branch. I found no evidence of larvæ above the first branch in any case.

The Spruce Gall-louse (Chermes abietis) does not appear to be so abundant in this locality as formerly.

Division No. 4.—Hamilton District—By James Johnston, Bartonville.

Want of time during the past season has prevented me from doing but very little insect collecting so that my brief report is mostly made up from my observations on the farm during my daily occupations.

During May and most of June cut worms were very troublesome, being more numerous than I have ever known them to have been. Systena blanda, Mels (the pale-stripped Flea-beetle) has been quite numerous. Eight years ago when I first noticed these little beetles, they seemed to confine themselves almost entirely to rag-weed, but each year since then they appear to be taking to other plants as food, and now they may be considered destructive to turnips, pumpkins and strawberries. Last season a few choice pumpkin seeds were planted and in the course of a short time when I went to see how they were doing I found the plants thickly covered with these beetles making them appear as if sprinkled with ashes, and, on my approaching, they all vanished, being very quick.

July 22nd, Crioceris 12 punctatus, Lin. made its first appearance in our asparagus patch when I took seven specimens. As the season advanced they increased in number so that I fear by next season it will be reckoned amongst our already too numerous garden enemies.

Aug. 17th, Colias eurytheme, Bd. In crossing the clover meadow where C. philodice was very numerous I noticed this orange-colored beauty which I secured with my sun-hat after a hard chase. It is a beautiful large specimen which is of double interest to me as it is the first of the species I have taken, and differs from those in my cabinet by having the front half of the fore wings a pale yellow.

Aug. 30th, Nonagria subflava, Gr. This is the third specimen of what is, as far as I can learn, a rare insect during my years of collecting. I took it in the house having been attracted by the light in the kitchen.

Aug. 31st, Catocala nebulosa, Guen (1 spec.) and C. Robinsonii, Gr. (2 spec.).

These two species I consider an interesting capture as both species are new to my collection and possibly to Canada as I have never heard of them as being Canadian species.

This I should say has been a year favorable for this very interesting genus as they have been unusually abundant in this locality. I missed all the early kinds as I was unable to look after them before Aug. 18th, but after that succeeded in taking seventeen species, amongst them four C. desperata, Guen., of which I never took but one, and it several years ago, and a doubtful specimen, possibly a variety of C. paleogama.

In the early part of the season I noticed that some insects were doing much damage amongst the strawberry plants by eating the heart leaves while young and tender and I was at a loss for some time to discover what they were, but finally I detected a black beetle doing the mischief, and by keeping watch I saw several doing the same thing so I have made up my mind that they are the mischief makers. They straddle the leaf and very soon destroy it as they eat quite greedily.

Division 5.—London District.—By R. W. Rennie, London.

That most exasperating of all injurious insects, at least to the average gardener, made its appearance last spring in unusually large numbers, viz., the Cut Worm, mostly the larvæ of *Hadena arctica*. There seems to be a considerable amount of uncertainty in regard to the appearance and disappearance of this insect.

In 1895 the moths were flying in immense numbers. The following spring the larvæ did great damage, but when the time arrived for the appearance of the moths, those of us who were expecting a great number, were disappointed, as very few appeared.

Again this year, the larvæ were exceedingly plentiful, but the mature insect, at the time it should have appeared, was in very small numbers. I have not seen any explanation offered for this heavy mortality amongst the pupæ. Remedies proposed:—Placing bunches of grass, clover, etc, saturated with Paris green along the rows. This is of very little use, the young larvæ are not such fools as to eat withered foliage, when they can get the fresh article right at hand. But a mixture of bran and Paris green seems to be very much to their taste, while not neglecting the plants altogether for the bran mixture, they are more inclined to try it than anything that has been proposed up to the present.

Cabbage root Maggot.—This insect has been quite destructive this year, the only remedy so far that has been beneficial has been to wrap the stems of the plants when transplanting with tar paper. In the August number of the "Canadian Horticulturist" there is a suggestion from one of the staff of the Guelph Agricultural College, namely, to try a tablespoonful of carbon bisulphide in a hole at the base of the young transplanted plant. This may prevent the mature insect from depositing her eggs on the plant, but, with carbon bisulphide at twenty cents per pound, and cabbages at twenty cents per dozen, I think that the gardener had better quit growing cabbages. The cost for carbon alone will be about ten cents per dozen plants. The recommendation of such a dangerous insect destroyer as carbon bisulphide I think should be condemned; it may answer very well for laboratory experiments, but in the hands of the general public, may be the cause of numerous accidents, which will result in all probability in a general distrust by the public of trying any new insecticide with the chemicals of which they may be unfamiliar.

Red Spiders.—This mite has been very destructive this year to growers of sweet peas. It has got to be such a pest that most lovers of this flower in this section will be forced to abandon their cultivation. Last season, although a grand season for the pea family here, was very short, ending about the middle of August, due almost entirely to the ravages of the red spider.

Cold water spraying is not sufficient to keep them under control. To apply an emulsion you will have to have a pump capable of delivering the emulsion at at least thirty-five pounds pressure.

Root Aphis.—This pest appeared in quite large numbers this year attacking sweet peas and asters. I have seen no preventative proposed. Aphides were very numerous this season. I have seen whole fields of cabbages almost entirely covered with them. Spray with kerosene emulsion, or if you have a water pressure of sixty or seventy pounds use water only.

NOTES ON THE SEASON OF 1900.

By J. Alston Moffat, London.

Ravages by cut worms were reported to me from far and near as being unusually severe. And several kinds of moths presented themselves to my notice in conspicuous profusion later on, as probably coming from such worms; such as *Agrotis C. nigrum*, *Mamestra devastatrix*, *Hadena arctica* and several others in lesser numbers, whilst toward the end of the season *Agrotis subgothica* (Fig. 5) was in great abundance.

Fig. 5.

A most unusual outbreak of *Crambus exsiccatus* made itself manifest in the early part of June, and lasted well into July. Early on Sunday morning, June 10th, I was walking down the delightfully quiet street, when my attention was attracted by the singular appearance of the pavement in front of me. I thought it was covered with peanut shells, broken up very fine, and fancied some boys had been having a feast on the previous evening, but on reaching the spot I found the strange appearance to be produced by the wings of that moth. I looked up, and there was a restaurant lamp overhead, and the light from it had dazzled the moths and brought them down, when they got trodden underfoot by the travel of the previous evening, until the stone pavement, for a space of eight feet in diameter, was literally put out of sight with their remains. How many deep I could not say. If this was but one of many such "slaughter pits," which it is reasonable to believe was the case, then how little conception one can form of the multitudes of them that were destroyed in one night; whilst it made no perceptible reduction to the numbers left in the fields or at the lights. Then to think of the injury done to crops—grasses mostly—during the feeding up of the larvæ for the production of such swarms of moths, whilst the cause of such injury would be all unseen and unsuspected by those suffering from their depredations.

The notorious "Buffalo Bug," sometimes most misleadingly called "moth," to which it has no resemblance, it being in reality a beetle, *Anthrenus scrophulariæ*, Linn. (Fig. 6 *d*), has become an established pest in London. Early in the year I took the beetle on the windows of the Y.M.C.A. building; and complaints of its depredations were heard from various parts of the city during the summer. About the first of August two larvæ were brought to me by a lady; one seemed full-fed, the other about half grown. The one pupated about the first of September, and gave forth the beetle in October, the other was still feeding at the end of the month, but died before maturing. The larval stage is the only form of its existence known to the majority of housekeepers, which is correctly represented at Fig. 6*a*, greatly enlarged, the line at the side indicating the natural size, and they would hardly believe that the beetle at *d* was the same insect, or one from which they had anything to fear. The beetles are black, ornamented with white and red, but are extremely variable; so much so that three forms have received distinguishing names. It is a European insect, but there it is spoken of as a "Flower Beetle," although known to enter houses and destroy "furs, clothes, animal collections, and even leather and dried plants." It was on this continent that it first obtained its notoriety as a carpet pest, the habit here of tacking down carpets for a year giving it a splendid opportunity to propagate undisturbed; with this, as with others of its kind, frequent

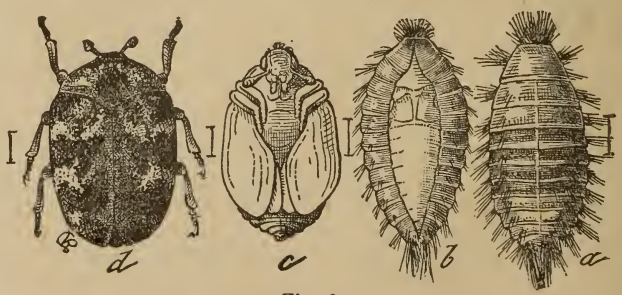

Fig. 6.

stirring up is an excellent means of deterring them from indulging their destructive propensities. And now that it is here to stay, as it is not entirely depending on indoor propagation, so cannot be exterminated except locally, there is nothing for it but to give it due attention ; and to combat it successfully, a knowledge of its nature and habits must be acquired.

Having learned to recognize the beetles, they may be seen upon the windows in early spring and destroyed before they have an opportunity to deposit their eggs, and thus prevent future trouble from them. In nature it takes a full year to complete the round of its existence, but with the artificial warmth of houses it matures in shorter time, and beetles may be found on windows before the end of winter.

When once a dwelling has become infested, not only should the carpets be thoroughly beaten, and disinfected,but narrow strips of thin muslin should be fastened over the joints of the floors with varnish before relaying, so as to prevent them secreting themselves there. A strip of tar paper laid under the outer edge of the carpet is an excellent preventative.

When they are known to be at work and it is not convenient to lift the carpet, benzine will kill any living insect that it is brought in contact with, but great care must be exercised in not allowing a light to approach it while it is evaporating, as it is very inflammable. A damp cloth and hot iron will also effectually arrest the operations of any depredators upon whom they are applied. Steam or benzine may also be used to advantage to get rid of their presence in upholstered furniture ; by such means can their operations be restrained and rendered comparatively harmless. But constant watchfulness against their presence is required, for even if a dwelling has been freed from their presence during one season, the beetles may enter at the open windows the next summer and start a colony afresh.

There is another beetle with similar habits belonging to the Dermestidæ, *Attagenus piceus*, Oliv., whose larva is about the same size and hairy character as that of *Anthrenus scrophulariæ*, which it closely resembles and might easily be mistaken for, as they are sometimes found associated ; but the beetles are quite different in appearance, *Attagenus piceus* being much longer than wide, a flatter insect and entirely black. This also will have to be guarded against, as it is just as destructive a carpet pest as the other, and in some instances becomes the most numerous of the two. For some time past it has been more troublesome in the Society's collection than *Anthrenus varius*, which is supposed to be the standard museum pest.

A friend in the country, in one of his recent letters to me, conveyed the following item of information, which may serve as a warning against the employment of cheap labour : "We got lots of help to thin our turnips this year. Some big green fellows came along who gave us their assistance and worked for their board ; but they made a bad job of it. After we had thinned some rows they would go round and thin them over again, and they left nothing whatever in some rows, but that may have been because they worked at night and did not see what they were doing."

During the remarkably fine weather we were favored with during October, winged *Aphis* were in great abundance, and made walking on the streets quite unpleasant, especially where there were shade trees. One evening when the setting sun illuminated the hazy atmosphere and the tiny wings reflected the light conspicuously and made each individual stand out distinctly, I made an effort to estimate how thick they were. By stopping at different points and watching closely, I estimated there was one to every four inches of space. Before they had all gone, those mosquito-like merry dancers (*Culiciformis*, Latreille, some of whose larvæ live in water and others feed on fungus,) made their appearance, who from some inherent perversity of their nature, congregate in living columns over the sidewalks, with their densest portion about the level of one's face, which one must either go through or turn off the walk to get round, when one would think that any other portion of the street would serve the purpose just as well. One warm summer's day, I took a seat in a pleasant shade, put my light colored straw hat on my knee, when one of these groups formed over it and commenced a jig close to my face, some of them striking it. I swept them away several times but they always returned and gathered as before. I began to suspect that the hat was the centre of attraction, so I placed it on the seat an arm's length away, when they immediately formed their dancing party over it there and kept it up until I took it to leave. So it would seem as if they iked to have some conspicuous object beneath them to keep the crowd in line.

There was sent to me by Mr. J. Tanton of this city, a most singular looking creature of the class *Myriapoda*, and shortly after another was brought by Mr. C. E. Abbott, both of them supposed to have come in packing, and had attracted their attention as something quite unusual. From information received by me at our annual meeting, it proved to be *Cermatia forceps*, Rafinesque, of the family Scutigera, and the first reported appearance of it in Canada. There is an excellent figure of it in the fourth report of the N. Y. State Entomologist for the year 1887, page 129, and from that article I have gathered the following information: It is properly a southern resident, but has been gradually extending northward, until it has now become well established in most of the eastern States. Its body is when full grown, about an inch in length, with a uniform width of a quarter of an inch, but rather narrower at the hind end. It has fifteen pairs of long legs which terminate in a black, sharp hook. The front pair of legs are about half an inch in length, the others gradually increasing in length to the second last pair, which are about an inch and a quarter, whilst the last pair are an inch and a half or more. It is known to be carnivorous, feeding upon insects, for which it enters and frequents houses, and when seen for the first time, is sure to attract attention by its grotesque attitude and rapid movements, and may even create alarm; but for which there is no cause, as it is extremely timid and anxious to escape. Yet, from its anatomical structure it is suspected that it may be poisonous, but there is no authentic instance recorded of its ever having inflicted injury to a human being. From Insect Life, Vol. 3, P. 85, I copy the following: "Mr. Webster spoke of the predaceous habits of *Cermatia* and its preying upon the Croton bug. Mr. Fletcher had observed the insect with Mr. Howard, at Washington. Its mode of capturing the Croton bug before devouring it was remarkable. It sprang over its prey which was thus encaged between its many curved legs."

The unusually warm weather in October, had the effect of bringing to maturity great numbers of the Tomato Sphinx, and many were captured on the wing. I secured a fine, fresh specimen on a shop front in the principal thoroughfare of the city on the morning of the 19th.

Anosia Archippus was noticably scarce through the season, as compared with the previous year, and yet Messrs W. E. Saunders and H. Gould saw them on the 19th of September, accumulated in such multitudes on the trees at Point Pellee, as to put the green of the foliage out of sight, whilst the lower branches were drooping with their weight. On the 27th of October, the janitor of the Y. M. C. A., brought me a living specimen which he had taken from a bush, helpless from the coldness of the day; bright and fresh, as if newly hatched. It was very lively in warmth and sunshine, and fed freely, but dormant when the room was cold. On two occasions it remained in the same position from about four o'clock Saturday afternoon, until near noon on the Monday following. On the 13th of November, I allowed it to remain too long on a frosty window, from which it never fairly recovered, and it died on the 16th. It retained its bright colors to the last. It was a female. I opened the abdomen and made a microscopic examination. It was very fat, but I could see nothing whatever to indicate the presence of eggs.

ANOSIA ARCHIPPUS, YET AGAIN.

By J. Alston Moffat, London.

In a series of most interesting and instructive articles on the Migration and Dispersal of Insects, by J. W. Tutt, F. E. S, editor of "The Entomologist's Record and Journal of Variation," London, England, after a reference to the methods of many different insects, he arrives in due course, in the July number, 1900, to a consideration of what has been written upon the movements, spring and autumn, of *Anosia Archippus*, Fab. (Fig. 7) and the claims that have been put forth for it, as differing in many respects from all other butterflies. The opinions that he has formed from a consideration of what has been written upon the subject, and the conclusions he has arrived at upon it, can be gathered from the following extracts taken therefrom:

"So far as one is able to get at the real facts (i. e., apart from the opinions of observers,) one is able to conclude that the movements of *Anosia Archippus*, in North America, are very similar to those of *Pyrameis cardui*, (the Thistle butterfly) in Europe." After quoting from various sources, Mr. Tutt adds: "All these irregularities of habit will be certain to strike one who has studied the subject, as being readily paralleled during a series of years by the immigrants of *Colias edusa* and *Pyrameis cardui*, and their progeny in our own country." That is, Britain.

After quoting a diversity of individual opinions and contentions, he continues, "However little definite information there is about the spring migration of *A. archippus*, a great number of observations have been recorded of a habit that is certainly unknown in any of our most observed Palæarctic migrating species. This is the habit of swarming in the autumn." He then gives a large number of instances that have been observed by different persons, of autumnal swarms passing over various parts of the continent; then continues, "One other observation may be added, that of Bowles, who states that he has himself seen the shores of Lake Ontario, near Brighton, strewn with hundreds of their dead bodies, cast up by the waves, and which no doubt had formed part of a swarm, which from weakness or some other cause had perished while flying across the lake." Then Mr. Tutt sums up his conclusions upon the subject thus:

"From these and similar observations it has been concluded that the swarming of this butterfly in autumn is analogous with that of birds before commencing their [flight

Fig 7.

southward, and that, after swarming, the butterflies return to the sub-tropical lands whence their grandmothers and great grandmothers set out in spring. It is admitted that the climate is such, in the northern territories to which the species annually spreads, that the butterfly cannot possibly exist in the winter, and Riley, who first propounded the return theory, himself confesses that "under the most favourable conditions a large majority perishes." As we have said, Scudder accepts the theory as fact, and practically writes as if it were proved beyond question of dispute. For ourselves, although we know of no exact analogy among butterflies of a similar swarming habit, yet, in every other respect the similarity between the habits of this species and our own European migrating species, *Pyrameis cardui*, *Colais edusa*, etc., is so great, both as to the continuous-brooded habit, and also as to Dr. Thaxter's observation that the males and females in the autumnal swarms pair, that we are inclined to doubt the conclusion. It has never yet been shown that the journey has been successful. The swarms are sometimes noted as going in a different direction from that assumed by the theory, and much more evidence is necessary before even an approximation to success can be admitted. For ourselves, we doubt whether the return journey has ever been successfully made, and we consider that there is altogether insufficient direct evidence to warrant the assertion that the autumnal swarms of *Anosia Archippus* migrate from the more northern parts of its summer range in America, to the south, in order to winter there. Some of the quotations which we have just reviewed, and others mentioned by Riley, show distinctly that the swarms do sometimes fly more or less from north to south, or from north-east to

south-west; but the general opinion that one is compelled to form, after reading most of the notes relating to the autumnal swarming of this species is, that the large congregations of butterflies that then collect will, given fine calm weather, stay long (in swarms) in one place, and the evidence is altogether insufficient to show that these go south-west rather than in all (or any) directions apart from weather conditions."

When one's opinions are distinctly challenged, one naturally feels a desire to vindicate them; and as there is much in these quotations that is in direct opposition to my belief on the subject, which has been largely formed upon actual observation, influenced no doubt by what I have read, I shall review them somewhat in detail, in an attempt to make it clear that I, and many others on this continent, have not wholly misunderstood what we have seen. Mr. Tutt seems to be needlessly skeptical on some points, in view of what he informs us of the wonderful performances of this butterfly, which he appears to accept; and I doubt not that a little personal observation would convince him of it.

I know nothing of the habits of Pyrameis cardui in Europe except what I have read; but in this country, my attention was soon attracted by its periodicity when I began collecting. I have seen in some seasons, cloverfields just alive with fine, large, rosy specimens; whilst in others I have watched carefully for them all summer and not seen one. I have seen its larva in such numbers as to consume all the thistles in one field, and cross the road in masses to another for fresh food, whilst the whole neighbourhood became alarmed that their crops were to be destroyed by an invasion of the army worm. I came to the conclusion that they appeared every third year; and sometimes then only in very moderate numbers, yet I never observed anything in any of its peculiar habits, to in any way correspond with those of Anosia Archippus. It is rather unsafe to draw, confidently, conclusions from analogy when dealing with insects.

In the quotations made by Mr. Tutt from the few recorded observations made by different individuals, of the movements of Anosia Archippus; their gathering together in swarms preparatory to their migrating, and their passing over the country in flocks, have got somewhat mixed, some of them referring to the one, and some to the other. All admit their assembling; the purpose of their assembling has to be inferred, which gives plenty of scope for the play of the imagination. The butterflies take weeks in collecting before they depart. Having chosen their rendezvous, they have to come together from a considerable extent of territory around, to accumulate the multitudes they often do, and that takes time. How those at a distance get to know of the spot is a very interesting and puzzling thought, but that they do in some way is a fact. Now, it is during this gathering process that the coming in the evenings and the going in the mornings has mostly been observed, and is usually kept up for a length of time, regardless of the weather. No one observing these movements could help wondering and enquiring what the object of such conduct could mean; and if informed about their migratory habits, and watching them to the end, he would be satisfied that it was in some way intimately and directly associated with their intention to leave, and was preparatory to that very purpose. We cannot tell how their minds act in connection with the subject; we can only express our convictions in accordance with the operations of our own, drawn from observation. As the time approaches for their departure, which for this locality is about the first of September, the great majority that compose the swarm, gets into that singular dormant and listless mood, which is another very perplexing state of mind to account for, but which no doubt is also intimately associated with their future intentions; they will remain for days in what appears to be a state of semi-hybernation, when they show no great desire even for food. I have only once had the pleasure of watching one of these swarms assembling, but from all accounts it was quite characteristic of their doings at such a time. Some of my published observations will allow of expanding and commenting upon.

The woods where I saw the assembling of *A. Archippus* as recorded in Can. Ent. Vol. 12, p. 37, was that in which the asylum buildings at Hamilton now stand. My visits to it were made every other day. I saw the butterflies there three times, which would cover five days, and to the last they were perceptibly on the increase. I would get there about half past one, when I would find them hanging in clusters, quite motionless except when disturbed. That they should be there at that time of day, in that condition, caused me to wonder greatly. Whether they had been out in the morning or not I cannot say;

but when I would be leaving about half past five, individuals were still arriving, and some of them had to descend quite a distance to the tops of the trees as if they had traveled from afar, and not at all like ones that had been feeding in the vicinity. During these observations the weather was fine, what it may have been when they left I do not know as I did not see them go, which must have occurred within three days after my previous visit. The swarm that I saw just starting out on its journey, Can. Ent. Vol. 20, p. 138, was in a locality about thirty miles east of Hamilton. I was there upon a visit, and had gone out to a field, with many bushes about stumps and fence corners, to look for moths and beetles. Whilst engaged in my search, my attention was diverted by the numbers of *Archippus* that were floating around me. When I looked up I at once realized what was going on. My eye traced the stream to a wood from whence it was issuing, which was on the far side of the field, and thither I made my way. As soon as I entered the wood I was struck with the contrast which the attitude of these presented to those of my former observation. There, quiescence; here, animation. Everywhere I looked there was movement; but not of the wings. The whole swarm was evidently controlled by one impulse; and in presence of it I could not resist the conviction that it was associated with their going. Were they just arousing themselves from a previous state of lethargy? The seemingly few that were on the wing and making for the open were coming from the far side of the wood, which was out of my sight, as well as of those that were near the front, and were closely following those that had already started. And this gives us a clear idea of how these long drawn out flocks that are so often seen passing over different parts of the country are produced, and I have always considered myself as particularly fortunate in seeing this illustration of how it is done. Although those high in the air were keeping to a comparatively direct course, there were hundreds of them in sight that were swooping and swirling around the bushes in the field; yet they never allowed a gap to form in the procession. The weather at the time was fine; no storms in view, past, present or prospective, to influence their movements.

That swarms will encounter storms, both while forming and upon their travels is certain, and that their movements will be to some extent modified by them is also certain. But my conviction is, that they will invariably choose fine weather for starting on their pilgrimage. Here is what Mr. J. A. Allen has to say of their movements in Iowa. Trans. Chic. Acad. Sc., i. 331. "This extremely abundant butterfly seems to prefer the open prairie, but is driven to the groves by the winds which sweep furiously over the prairies in the summer months, and especially in September; here the butterflies are collected in such vast numbers on the lee sides of trees, and particularly on the lower branches, as almost to hide the foliage, and give to the trees their own peculiar colour. This was seen not in one grove alone, but in all of those that were visited about the middle of September. If unmolested, they remained quietly on the trees; if disturbed by blows upon the trunk or branches of the tree they would rise like a flock of birds, but immediately settle again, either on a contiguous tree or upon higher branches of the same. At New Jefferson, a little later in the year, when the gales had abated, they were seen leaving the groves in vast flocks, and scattering through the air almost beyond reach of the eye." There we have a picture presented of collecting swarms. But I suspect that Mr. Allen has slightly mistaken the purpose of their collecting, which was not so much to obtain shelter from the furious winds, as to prepare for their future journey, as disclosed by their leaving later on. My impression is, they rather enjoy a stiff breeze, and understand well how to manage themselves in it. But what interests us most in this connection, is, that they did not start out until the gales had abated.

That these autumnal swarms of *Anosia Archippus* leave the northern portion of the continent and go southerly, is, I think, the firm conviction of most, if not of every entomologist in North America. Which is not surprising when we know that they have never been seen going in any other direction in the northern portion of it. That but few observations have been recorded by competent persons, compared with the importance of the subject, is acknowledged by all. That there are so few interested and competent individuals on the routes these swarms travel, to make observations, compared with the extent of territory over which they have to pass, is confessed and lamented by many; yet the few observations that have been made, defective as they are, when dates and localities are tabulated, exhibit a progressive movement in that direction, which sus-

tains and confirms the general opinion on the subject. Take these which are referred to by Mr. Tutt:

Saunders, Port Stanley, September 1st.
Scudder, New Hampshire, do 2nd.
Peabody, Wisconsin, do first week in.
Dr. Hamilton, New Jersey, do do do
Mundt, Illinois, do 7th.
Anonymous, Ohio and Indiana, September 19th and 20th.
Dr. Ellzey, Maryland, do 23rd and 25th.
Dr. Neal, Texas, October 4th and 6th.

Dr. Thaxter, Florida, being without date, may be placed anywhere between 1st November and last of February; whilst he is reported in another place as having said, "that he had found *Archippus* wintering along the Gulf of Mexico in immense numbers." Which taken in connection with the fact that there is not enough of their foodplant there, to produce a tithe of them, is strong presumptive evidence that those there seen had come from the north, where we know they are bred in countless numbers. That many of the travellers will perish by the way is what is to be expected, but that the bulk of one of these swarms could not complete the journey from their northern limit to the Atlantic coast, is not to be thought of in connection with a butterfly that has succeeded in reaching a land 2000 miles across the ocean from the American continent.

In reference to Mr. Bowles's observation, Can. Ent. vol. 12, p. 134, which was a valuable addition to our information of its habits at that time, but proves nothing, except that the butterfly is a wanderer and liable to be overtaken by a storm and perish, whilst in the act of crossing our great lakes; I have seen specimens of it that were thrown up with the drift on the north shore of Lake Erie. I have seen the west shore of Long Point strewed for miles with their wrecks after a storm. And I have picked up some of them, apparently dead, placed them in the sunshine and seen them revive and fly away. These were bright fresh specimens of that season's production. But that any of them had fallen into the lake from exhaustion by long continued flight, I would say for that butterfly; never! Its mode of flight is so easy and graceful, that it looks as if it could remain on the wing indefinitely without tiring; it indicates amusement rather than labour. It never appears to be in a hurry; unless it has got a fright, and then, racehorse speed is slightly suggestive. During oviposition, the female gives one the impression of her being intent on business; and moving from place to place with great speed; but her progress is made in long sweeping curves, with scarcely a flutter of the wings, which does not suggest exertion. It has a dexterous way of using a strong breeze to help it along. I have seen one go up the side of a two-storey house and over the roof without a flap of its wings. All it required to do, was to set itself at the proper angle and the wind did the rest. Even when they have started out upon their long journey southward, those near the ground do not reserve their strength by refraining from amusement. With many a sweep and swirl they are up and down, here and there and all around, yet never allowing themselves to fall behind the steadily advancing stream. Mr. Alexander of Her Majesty's Customs Department, Hamilton, informed me that on one occasion he was crossing Lake Erie from the American side, and that they sailed for hours through a flock of *Archippus* going in the opposite direction; and when the steamer reached Port Dover the butterflies were still going out over the lake. And from his description of their behaviour on the water, it corresponded exactly with what I have so often seen upon land; some high in the air, others skimming over the surface of the lake, or dotting the space between, whilst many found time to come on board, and investigate the mysteries of the deck.

As to its "continuous-brooded habit," I have never seen the slightest indication of such a thing in Ontario. From the time that freshly emerged specimens appear in July, to the time they depart in autumn, they never show the least regard for each other sexually. So marked is this feature of their conduct during that time, that it was asserted by some, that those great gatherings of them were composed entirely of one sex, but this was soon proved to be not the case: yet it brings to view how much that peculiarity attracted attention. Dr. Scudder claims "that no Anosia Archippus born northward ever lays eggs the same season;" and I am quite prepared to believe it. On one occasion I obtained a chrysalis of that butterfly in the latter part of October, which matured by the

6th of November. Was this an attempt at producing a second brood? Reasoning from analogy one would unhesitatingly say, yes. But from all my observations of that butterfly, I as unhesitatingly say, no It was but a retarded specimen from a more southerly born parent; and would probably not have matured in nature at all. It is no unusual thing to find dead chrysalids after frost that give no indication of being parasitised. Although Dr. Thaxter saw some of them in Florida making an attempt at producing a brood there, yet the fact that they were still in swarms, clearly indicated that their time for breeding had not yet come, or they would have been dispersed. Now then, seeing that fresh hatched specimens begin to appear here about the middle of July, and continue on the wing in increasing numbers to the beginning of September, when a great proportion of them takes their departure; and that portions of these same swarms may reach the latitude of Maryland about the end of September, Texas and Florida in October and November, that they winter along the Gulf of Mexico, or even further south, and that it will be the end of February or the beginning of March before their regular time of breeding begins, and that we have not the slightest reason to believe that they hybernate at all, anywhere, as *Antiopa* and the *Graptas* do; there seems to be a reasonable excuse for the belief that *Anosia Archippus* is a long lived butterfly, and that continuous-lived would be quite as appropriate for it, as continuous-brooded.

That any *Anosia Archippus* leaving Ontario in the autumn, will return to it in the spring to propagate its species, is a matter upon which we have no information whatever; and seems quite improbable. But that the first ones that appear here do come from the south of us, admits of no question. Yet the terms "north and south," are often used in such a loose and ill defined manner, as likely to cause confusion. Hence Mr. Tutt has tripped over my "doubtful logic," when speaking of their going south in the autumn, and returning in the spring; when it was the "species" that I meant, and not the individuals; which I ought to have made more clear.

There are but two statements that I can find, that provide any basis upon which to form a calculation as to the distance from which our first arrivals may have come. Edwards speaks from West Virginia, Riley, from Missouri. West Virginia is a long way south of Ontario; so we are not warranted in concluding that the behaviour of *Anosia Archippus* there will be identical with what it is here. Edwards in his life history of *Danais Archippus* (Psyche, Vol. ii, Dec. 1878, p. 169,) says: "In this part of West Virginia, *D. Archippus* is, I have reason to believe, four-brooded, and the butterflies of the last brood, and these alone, hibernate. The survivors appear very early in the next spring, and are always faded and more or less broken." And through that whole history, he makes his estimates upon the principle that it is a hibernating butterfly. Now the fact that Dr. Thaxter found it wintering along the Gulf of Mexico, utterly precludes the idea of its hibernating in any true sense of the word. So Mr. Edwards's "survivors" came from a good way south of West Virginia. Riley also speaks of it in the same way; which was quite excusable at that time, as facts to the contrary had not been disclosed, and they reasoned from analogy, and so the habit has been kept ever since; but we must now view it another light. Edwards's spring dates are, butterflies appear the last of March. Eggs laid the second of May, butterflies from these, thirtieth of May. Riley, 3rd annual Missouri report, p. 144, says: "They commence depositing eggs in the latitude of St. Louis during the fore part of May . . . Butterflies from these eggs begin to appear about the middle of June." These are the only observations made in the south, giving dates, that I find to estimate time and distance by. Now *Anosia Archippus* makes its appearance in Ontario about the first of June and before, according to the season. Are our first arrivals specimens that were born in either of those localities, or there-about? Certainly not from the Missouri broods. But West Virginia is the most likely direction from which our first visitors would come; and here again we see, that there is not sufficient time for the first Virginia bred specimens to make the journey to Ontario. Then whence do they come? Our only answer must be; from some broods born much further south than West Virginia.

As to "swarms going in the opposite direction," we have no spring swarms in the north. And those observed and recorded in the south, do not seem to seriously conflict with observations made in the north. The "bevy" that was seen in Texas the last day of March, containing thirty individuals, would not be considered in the north of sufficient importance to notice which way they were going. The report received by Riley from

Mr. Wells of Kansas, of a swarm which he saw in the middle of April, "that came rapidly with a strong wind from the north-west," seems to be of somewhat uncertain interpretation. But there is one thing I feel quite certain of, let Anosia Archippus, wherever, or in which ever direction it might be going, get caught in a gale it would head against it. I have seen individuals of them out in a gale that I could hardly hold against; low down, slowly but steadily making their way in the opposite direction, and that with little apparent flutter of the wings but with them closely reefed, until tired of the monotony of the procedure, or not wishing to go any further in that direction, they would suddenly shoot up and get hurled fifty or more feet in the direction they had come, then turn and go through the same performance over again. They may do the same in flocks, who can tell?

If I were undertaking to draw up a programme of the proceedings of this butterfly from my abundant lack of information; and filling in what I don't know with what I think is most likely, it would be something like this: *Anosia Archippus* is a southern butterfly, which has inherited a powerful migratory instinct, and is endowed with a capacity to indulge it to the utmost limit of its inclination. The northern portion of the American Continent, is where it finds the conditions most favourable for the multiplying of its species to an unlimited extent. But it cannot endure frost, therefore goes southerly in autumn, and with that purpose in view gathers into immense swarms before it starts out. It makes the journey in easy stages, spending months on the way. As it does not hibernate, it keeps on the move south-west until its breeding season comes round, when these, or more southerly bred specimens, start the northerly movement. Reference has been made to the habit of birds; an excellent comparison for my purpose. We know that they leave their southern residence for the north at a suitable period of the year, and by the time the species has reached its northern limit, the whole continent is uniformly stocked. No part missed, no part burdened with an over supply, and we know that the southern ones will be breeding before the northern ones have commenced building. Apply the same principle to our butterfly; only she has no building to do, and no care to take of her young, so she is not required to settle down in one locality, but may place one egg here and another there as she finds it convenient and pass on. Now I will accept and be guided by Mr. Edwards's observations in West Virginia, as to her conduct there, but not his conclusions. He says, (Psyche as previously quoted,) "The survivors (from hibernation) appear very early in the next spring, and are always faded and more or less broken (From much exposure and long travel as I believe.) They may be seen * * * the last of March; * * the females deposit their eggs the last of April and early in May on the leaves of different species of Asclepias, beginning as soon as the plants are well out of the ground, and thereafter, without doubt, soon die, after the manner of their kind" In that we learn, that our southern born butterfly was not in a condition when she reached West Virginia to oviposit. That it took a month to mature her eggs. How many of those who started out with her, spent that month in going further north, and so have reached Ontario about their usual time? A few butterflies will stock a locality with a species, if eggs are all laid together at one time; which I think is not the case with this one, hence the absence of well defined broods. And Mr. Edwards proved that they do not "soon die" after finishing egg laying by capturing one on the 2nd of June, with her ovaries quite empty. So here we have still an interesting question to settle, how long do they live before finishing, when they survive for sometime after? Again Mr. Edwards says, "every female from which I have obtained eggs in confinement, later than May, and all those which I have noticed as they were ovipositing in natural state, have been fresh colored, and evidently not long from chrysalis; (I have witnessed similar phenomena in Ontario during the first part of July.) So I have no idea that this species differs in this respect from other butterflies. One brood of *D. Archippus* succeeds another the season through, the females of each brood depositing their eggs within two or three weeks after emerging from chrysalis, and soon after dying; and the last brood of the year hibernates, the females not to be impregnated till the next spring" Which would be all correct, if we were dealing with a species that goes the round of its life's history in one locality, hibernating there in winter, and producing its kind in summer, year after year as so many do. But analogy fails us here; for we have to do with a species that requires the continent for a home, ranging from a defined northern limit on the one hand, to an undefined southern extension on the other, with no apparent attachment to

a locality but what suits its present needs; seemingly conscious of its being but a transient resident anywhere; chased from the north by the approach of winter, it is compelled by a necessity of its nature to return to it in the spring. Leaving the north in united multitudes in the autumn, it returns to it by independent units in the spring; and believing that there are several broods of it in the south, and that each of them is controlled by the same strong desire to travel, which at that season means northward; and that these will follow the same route as did the previous ones, depositing eggs where some had been laid before; I get an explanation for the comparative freshness of the butterflies that are late in arriving at the north, and in the great disparity in the size of caterpillars found on the milk-weeds during the season. But where to draw the line between north and south for them, I will not undertake.

PARASITES IN THE EGGS OF CHRYSOPA.

By J. Alston Moffat, London.

On the 19th of June, 1900, whilst strolling in Victoria Park, London, my attention was arrested by an unusual looking object on the underside of a linden leaf, attached to a projecting branch a little above the level of my eyes. I plucked the leaf to closely examine it, but could not decide as to whether it was an animal or vegetable production. Afterwards remembering that I had seen an illustration somewhat resembling it, I turned it up, and found that singular object to be an egg cluster of the delicate lace-winged fly of the genus *Chrysopa*.

Fig. 8.

The Rev. J. G Wood, in Insects at Home, page 281, thus discoursed upon the eggs of this insect: "They are generally deposited upon leaves, but, instead of being laid directly on the leaf, every egg is fixed to the end of a slender footstalk about half an inch in length. This footstalk is formed from a viscous matter secreted by the female, and is delicately white and translucent. Mr A. G. Butler, of the British Museum, told me that he has kept lace winged-flies, and often seen them lay their eggs. The end of the abdomen is first pressed against the leaf, and a tiny drop of the viscous matter deposited. The abdomen is then raised quickly so as to draw out a thread, which becomes stiff and hard almost as soon as it comes into contact with the air. Then the insect pauses a little, and rapidly places an egg on the end of the thread, fixing it there with another drop of the secretion. The eggs are always laid in groups. . . . They bear a curious resemblance to the capsules of certain mosses, and indeed have been described and figured in books as specimens of British moss". Which is not very surprising, as they instantly suggested a moss in fruit, but much more slender than any moss that I had seen.

There were thirty-four eggs in the cluster, and a single one placed on the upper side of the leaf. The eggs were about the thirtieth of an inch in length, and about as long again as they were wide. The stalks would bend to every breath, like a field of heavy laden grain before a breeze; giving the impression that they were top-heavy. I placed the leaf in a box and awaited developments. In a day or so the eggs changed colour, becoming darker, and I fancied larger. One morning on taking my accustomed view, some of the eggs had become white, and upon applying a lens I found they were empty, nothing but an extremely thin shell left with a hole in the top, out of which an insect had come. I then made diligent search to find them, when I at last discovered three tiny creatures in a depression of the leaf near the mid rib, as if they had therein sought safety and shelter. They were about three times as long as they were wide, and each armed with a pair of tremendous jaws which appeared to form quite one half their entire length; reminding me of the ant lion, to whom it is said to be related. That was my only view of them, for the next time I looked they had all disappeared. Having no Aphides to feed upon, probably the stronger devoured the weaker and then escaped from the box. Six of the eggs had matured and given forth their contents, whilst in the meantime the others had assumed a leaden hue. On the 28th of the month I was looking at them to see if there were symptoms of change, and wondering what might be the cause of their present

appearance, I observed a dark speck moving rapidly on the white paper with which the box was lined, and on examing with a lens I discovered it was a fly. It was honey-yellow in colour; its head was wide and squarish, with thorax of similar width, and abdomen tapering suddenly to a point. Its eyes were situated on the outer corners of its head, like those of a *Cicada*, dark colored and prominent. Its wings lay flat on its back, and projected half their length beyond the abdomen. It was very active, running rapidly and disappearing by flight every now and again, to reappear in another part of the box. I now turned my attention to the discolored eggs, and found several of them had holes in their sides out of which Ichneumons had escaped; and probably that fly was one of them. Upon making a closer examination all the discolored eggs had on their surface, what were in all probability Ichneumon eggs, and upon one of them I counted six. Clean-cut round holes out of which Ichneumons had escaped were found, variously located on some of the Chrysopa eggs, but in no instance had there more than one parasite matured in any one egg, and the great majority of them had not given forth any. There was abundant evidence to prove it a clear case of overdone parasitism, and that the most of the parasites had failed to mature from lack of sustenance. Many of the *Chrysopa* eggs exhibited several circular markings on their shells, as if they had been made on the inside preparatory for the escape of the fly, which had died before accomplishing it; whilst others shrunk and cracked upon drying.

A manifestation of this sort seems like a great waste of energy in nature, and a lack of intelligence on the part of the creature committing it, which is hardly in accord with the theories promulgated by some writers about the forethought exercised by forms of life, for the progress and improvement of their kind. In this instance we see merely a female ichneumon, constrained by the controlling impulse of her nature to deposit her eggs. Having found a cluster that answered her purpose, she fulfilled her mission regardless of consequences; and whilst she overlooked some of the eggs, she deposited far too many upon others, which came very near exterminating a whole brood of this useful insect; whilst at the same time she nearly extinguished the life of her own offspring. Therein giving us a fine illustration of how the works of nature are carried on under an established government by law; when each individual is strictly following the controlling impulses of its own nature, and yet is not prevented from taking a departure from routine in case of an emergency.

THE DRAGON-FLIES OF THE PROVINCE OF QUEBEC.

By Rev. T. W. Fyles, D.C L., F.L.S.

Among the most beautiful of the insect tribes are the dragon-flies. The imposing size of many of the species, the brilliant colouring of their eyes and bodies, their wide-spreading, closely-reticulated wings, the rapidity of their flight, the dash and *elan* of their approach, the rustle of their wings as they sweep around, fill the intruder upon their haunts with admiration.

This admiration is increased when an opportunity is afforded for a close examination of one of these remarkable objects. The head of the insect seems to be made up mainly of eyes and mouth. The innumerable facets of the protruding, compound eyes glow with prismatic hues. In Æschnidæ and Libellulidæ these eyes are contiguous, and there is but a very small space between them and the mouth organs; but in this small space there are three ocelli or single eyes. The dragon fly can see above and below, behind and before. It detects every motion of its enemy or its prey, and its powers of flight enable it to escape from an assailant and overtake a fugi ive.

The mouth of the dragon-fly is furnished with two large flat lips, which work up and down, and enclose the mandibles and maxillæ like a visor. When the creature is feeding this motion of the lips would lead one to think that the jaws move vertically, instead of horizontally, as is really the case.

Besides its powers of sight and its formidable mouth-organs, the dragon-fly has an advantage which many other insects have not—its head moves freely on its neck. It can turn its head half way round. Woe to the unhappy insect that comes in the way of so formidable a spoiler!

The thorax of the dragon-fly is capacious and somewhat barrel-shaped. It contains

the powerful muscles necessary to move and control the four ample wings and the six legs of the creature.

The abdomen extends far behind, to steady the insect, and to aid in steering its flight; but in the Libellulidæ it is somewhat flattened and ends with a point. In *Corduligaster* the cylindrical abdomen ends with a knob or swelling, hence the name, a club, a paunch In *Gomphus* the abdomen is spatulate at the end.

July and August are the months in which the dragon-flies abound. Then every pool, every stream, is frequented by them. Sometimes the observer may see them in the act of depositing their eggs. They alight upon the flags, arrowheads and other aquatic plants, and taking suitable positions dip their abdomens into the water, and deposit their eggs in masses upon the stalks and leaves beneath the surface.

The embryos, in different stages of their growth, have been observed and figured, and the larvæ of various kinds are known. To the possessor of an aquarium the study of the habits of the dragon-fly, in its early stages, would afford great pleasure.

A dragon-fly larva is a wonderful thing. At first sight the uninstructed observer does not see much to admire in it, but closer examination reveals features of exceeding interest. One of these is the extraordinary under lip of the creature, which takes the form of a jointed arm, furnished at the extremity with nippers for securing its prey. When not in use this instrument is neatly folded under the throat of the larva—it is called "the mask" (Fig 9). Then too, the peculiar arrangements by which the insect obtains oxygen, its vital breath, from the water, are worthy of notice. It has no head gills, as the fish has; no branchiæ like the larva of the Horned Corydalis; no breathing tube like that of the rat-tailed maggot of Eristalis. The respiratory organs lie within the abdomen, and the water is admitted to them through an orifice furnished with five angulated plates, which open or close as need requires. Ordinarily the process of the alternate admission and expulsion of the water goes on with easy regularity; but when the creature is alarmed or stimulated by the sight of its prey, the water within its body is expelled with sudden force, and the tiny current, impinging upon the inert volume around, sends the insect forward with a rush, as the rocket is sent through the air by the pressure of the gases suddenly generated by the combustion of the materials with which the case is filled.

Fig. 9.—The left figure represents the larva with its protruded lip in the act of seizing its prey; the right shows the perfect insect emerging from its pupal case.

The metamorphoses of the dragon-fly are incomplete. At the pupal change the insect does not become quiescent, nor does it cease to feed—it retains its active habits and voracious appetite. When the time comes for it to assume the imago state, it climbs some plant or other object till it is clear above the surface, and then its skin bursts along the thorax and the perfect insect crawls out of the opening and leaves its old habit, attached by the claws, as a memorial of its former state. (See Fig. 9.)

Having thus introduced the Odonata, and given some glimpses of their habits, we will now notice their classification.

They are divided into four families: AGRIONIDÆ, GOMPHIDÆ, ÆSCHNIDÆ, and LIBELLULIDÆ. These are easily distinguished each from the others.

The Agrionidæ have the eyes wide apart and placed apparently on pedicels.

The Gomphidæ have large eyes, near together, *but not touching each other.*

The Æschnidæ and Libellulidæ have eyes that are contiguous. In the former *the labial palpi have three joints*; in the latter the joints of the labial palpi *number o w*

The following is a list of the Dragon flies accredited to the Province of Quebec:

AGRIONIDES.
- Calopteryx, Leach.
  - *Splendens*, Selys.
  - *Virginica*, Drury.
  - *Maculata*, Beauv.
- Lestes, Leach.
  - *Unguiculata*, Hagen.
- Agrion, Fab.
  - *Hageni*, Walsh.
  - *Ramburii*, Selys.
  - *Iners*, Hagen.
  - *Positum*, Hagen.
  - *Saucium*, Burm.
  - *Civile*, Hagen.
  - *Durum*, Hagen.

GOMPHIDES.
- Gomphus, Leach.
  - *Vastus*, Walsh.
  - *Fluvialis*, Walsh.
  - *Fraternus*, Say.
  - *Exilis*, Selys.
  - *Spinosus*, Selys.
  - *Rupensulensis*, Walsh.
  - *Colubrinus*, Selys.
- Corduligaster, Leach.
  - *Lateralis*, Scudder.
  - *Obliquus*, Say.
- Petalura, Leach.
  - *Thoreyi*, Hagen.

ÆSCHNIDES.
- Anax, Leach.
  - *Junius*, Drury.
- Æschna, Fab.
  - *Constricta*, Say.
  - *Vinosa*, Say.
  - *Verticalis*, Hagen
  - *Heros*, Fabr.
  - *Janata*, Say.
  - *Septentrionalis*, Ramb.

LIBELLULIDES.
- Macromia, Ramb.
  - *Transversa*, Say.
  - *Illinoisensis*, Walsh.
- Epitheca, Charp.
  - *Yamaskanensis*, Prov.
  - *Forcipata*, Scudder.
  - *Princeps*, Hagen.
  - *Elongata*, Scudder.
  - *Albicincta*, Burm.
  - *Linearis*, Hagen.
- Cordulia, Leach.
  - *Uhleri*, Selys.
  - *Lateralis*, Burm.
- Plathemis, Hagen.
  - *Trimaculata*, De Geer.
  - *Subornata*, Hagen.
- Libellula, Linneus.
  - *Quadrimacula*, Linn.
  - *Pulchella*, Drury.
  - *Exusta*, Say.
- Diplax, Charp.
  - *Rubicundula*, Say.
  - *Scotica*, Donovan.
  - *Hudsonica*, Selys.
  - *Intacta*, Hagen.

Many of these species are reported to have been taken on the Yamaska River.

Space would fail me to give particulars of all these species. Their acquaintance can be made by degrees. But a few words on the appearances of some of the most common and most noteworthy species may be acceptable.

First then, the beautiful "Demoiselles" (as the French call them) will be readily brought to mind. They may be found, in their season, on the banks of all our streams, and they are particularly abundant along the brook that crosses the road at St. David. These insects of the genus Calopteryx have wide-spreading equal wings, and long, slender, stainy and deep green bodies.

Much smaller, but equally beautiful, are the various species of Agrion. They frequent our quiet pools, and flit with ease and grace, from tuft to tuft of the herbage that abounds in their favourite haunts. *A. saucium* is bright red, like sealing wax. *A. civile* is a beautiful blue—one might fancy that it was a thread fallen from the mantle of the summer sky.

One of our most common dragon-flies is *Gomphus vastus*. It may be known by its black and yellow livery, and by the remarkable widening out of the three abdominal segments immediately before the last. This species abounds in the woods around Fort No. 2, Levis. I have no doubt that its larvæ may be found in "Mer-de-Papon" and other pools in that neighbourhood.

The Æschnidæ are large and handsome insects. The rarest of them in these parts is *Anax junius*. I saw a pair of these sporting over a sheet of water near Spruce cliff last season, but they were careful never to come within reach. Æschna septentrionalis is often met with. It is that large black and bright blue dragon-fly with hyaline wings of a faintly green cast—the stigmata being long and brown. I always look upon this as the typical dragon-fly, "the Devil's darning-needle, the "Horse-stinger" so dreaded by children. I need not say that it is quite incapable of injuring either horse or man.

The species of the genus Libellula are all handsome insects. Their abdomens are dagger shaped, ridged down the middle, sloping to an edge on either side and pointed at the extremity. The female of *Trimaculata* has three brown patches on each of its wings —one patch at the base, one in the centre, and one at the tip. The spaces between are clear. The male (Fig. 10) has a patch at the base of each wing, but the tip of each is clear, and there is a large brown patch in the centre extending from the costa to the inner margin. The abdomen of the male is of a bluish white, as if it had been painted. A much larger and more beautiful insect is *Pulchella*. This also has three patches on each wing, but of a richer brown than in the last instance, and the spaces between the patches are clear white. *Quadrimaculata* is another very beautiful insect in this genus. It may be known by the golden yellow streak, and the two rich brown spots on each wing, and the angulated patch at the base of the secondaries. The abdomen of this handsome insect is brown, and has a row of yellow spots on either side. Quadrimaculata is found in Europe as well as in America. It was named by Linneus. It is very plentiful at the "Gomin." It breeds, no doubt, in the pools that lie to the south of the swamp.

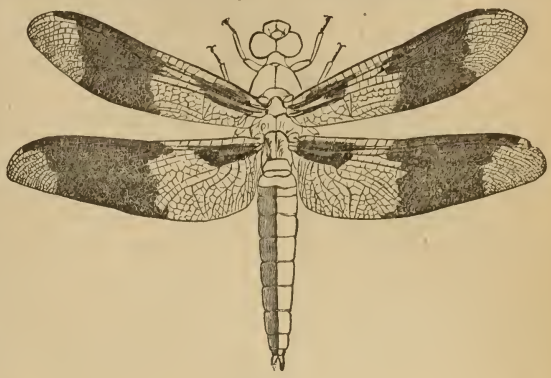

Fig. 10.

Of the genus Diplax, *rubicundula* seems the most common of our species. It abounds on the Chaudiere River. Insects of this genus may be readily known by their smaller size, their awl-shaped abdomens, and the very distinct stigmata of their hyaline wings. (Fig. 11 is the male of Diplax Berenice; Fig. 12 the female; Fig. 13 Diplax Elisa).

Fig. 11.

Fig. 12.

And now it may be asked, what useful purpose do the dragon-flies serve in the economy of Nature? We will take the liberty of meeting this question with one or two more. Did you ever go into the woods when the mosquitos were in strength, and thirsty for blood? Did you ever sail on one of our rivers —the Ottawa for example—when the shad-flies covered every inch above the tide of the vessel you were in? If you have, you will have said to yourself, if not to others, what a nuisance these things are! Now the dragon-fly spends the whole of its existence in the endeavour to keep down the numbers of such pests as these. It is a sportsman ever on the watch for its game, and when this comes in view it pursues it with energy and success. If it were not for the dragon-flies and other predacious tribes the troublesome insects would increase to an intolerable extent.

Fig. 13.

THURSDAY, NOVEMBER 15TH, 1900.

The Entomological Society resumed its sessions at 11 a.m, the President, Rev. Dr. Fyles, in the chair. After the reading of a paper by Mr. Henry H. Lyman, of Montreal, on "Specimens of Spilosoma Congrua, Walker, and kindred species in the British Museum," the meeting proceeded to the election of officers for the ensuing year, which resulted as on page two.

A number of papers were then read, followed by brief discussions in each case. After an intermission for lunch the meeting continued till five o'clock p.m., when the members from a distance left to catch their respective trains. Votes of thanks were adopted to Dr. Fletcher, Mr. H. Hague Harrington, and Mr. C. H. Young, of Ottawa, for their kind donations of rare specimens to the society's collection. Letters of apology for non-attendance were received from Dr. Wm. Saunders and Mr. Harrington, Ottawa; Mr. J. D. Evans, Trenton, and Mr. D. G. Cox, Toronto.

A large case of rare Lepidoptera was exhibited by Dr. Fletcher, special mention being made of many of the specimens. These had all been taken in Canada, mostly during the past year, and those of which special mention was made are the following:

Papilio Brucei. A specimen of this rare butterfly was taken at Regina by Mr. T. N. Willing, and along side of it was shown a bred specimen which Dr. Fletcher received from Mr. W H Edwards. This Dr. Fletcher believed to be the first record of this insect having been taken in Canada, although it is mentioned in a list received from Mr. J. W. Cockle, of insects he has taken at Kaslo in the Kootenay mountains.

Vanessa Californica. Some beautiful bred specimens were exhibited, pupæ of which had been sent from Kaslo by Mr. Cockle. This is a seasonal insect which is usually rare but occasionally very abundant.

Attacus Ceanothi. A specimen of the moth bred from cocoons received from Mr. E. W. Haines, who formerly took a female at New Westminster, B.C. and has since bred two broods of the species in confinement in England. A fine series of inflated larvae showing every stage was also exhibited.

Memythrus (Sciapteron) *tricinctus* bred from cotton-wood twigs sent from Cotton-wood, N W.T.

A fine series of Arctians, including a beautiful series of *Arctia phalerata* with inflated larvae in all stages, which were described in full in a paper by Mr. Arthur Gibson, *A. Caja*, var *Americana*, *parthenos*, *Parthenice*, *Yarrowi*, from Hudson Bay, *determinata*, *vittata*, *Anna*, *figurata*, *Williamsi*, *Blakei*, etc, were shown.

Colias Eurytheme. Some interesting specimens of this species showing all the recognized forms and all collected at Ottawa, were shown. This has been one of the characteristic insects of the year and has been unusually abundant throughout Ontario.

Terias Lisa A nice female taken at Ottawa by Mr. Gibson on the 18th Oct

Pseudolimacodes littera. A fine specimen of this pretty little moth, also taken at Ottawa by Mr. Gibson was shown.

Thecla Damon. A specimen taken at Picton on the 24th May last, by Dr. Fletcher.

Pieris rapae. An interesting series showing many variations was exhibited, including the buff female, and the very rare yellow female, the variety *novangliae.* The males of this variety are not uncommon, but the female is extremely rare. Dr. Scudder mentions that Curtis took a yellow female in England many years ago, and there are doubtless others but they are not recorded. Taken at Ottawa by Mr. Gibson, 18th Sept.

Peridroma saucia and *Noctua C nigrum.* These were the two devastating cut-worms of the year. The former throughout the Province of British Columbia and the latter in Central Ontario. Beautifully inflated larvae in the last two or three stages were exhibited, with the moths

Pamphila Zabulon and *P. Hobomok* were shown in both sexes and the differences pointed out. It was claimed that these were distinct species and that *Hobomok* was probably the only one that occurred in Canada. The members were asked to be on the lookout for specimens of *Hobomok* which had not the veins darkened where they crossed the yellow colour of the disc. If they found one it would probably be the true *Zabulon.* *Zabulon* has no yellow female, but *Hobomok* has both a yellow female and a black female variety, which is called *Pocohontas.*

Euptoieta claudia bred from violets from Kinistino, N.W.T. Butterfly, larva, and pupa.

Pyrameis carye, butterfly pupa and larva. The larvae of this species were found by Mr T. N. Willing feeding on Nettle at Regina.

Cacœcia parallela. Larva, pupa and moths. A troublesome pest in a greenhouse at Hamilton.

Anacampsis lupinella. A new species of tineid bred from lupin collected at Toronto. Larva, pupa and moths.

The following specimens of insects were kindly presented to the Society by Dr. Fletcher:

Vanessa Californica,
Plusia rectangulum,
Plusia mortuorum,
Xylina contenta,
Lithomia germana,
Arctia phalerata,
Culex pungens,
Culex stimulans,
Anopheles quadrimaculatus,
Anopheles punctipennis,
Anthophilax malachiticus,
Arctia Williamsi.

A beautiful collection of inflated larvae was exhibited by Mr. Gibson. These had been collected during the past summer and showed several of the species in all their moults.

A fine case of rare moths taken at Ottawa was sent for exhibition by Mr. C. H. Young, of Ottawa, who kindly presented the Society with a beautiful pair of *Plusia aereoides.*

A box containing twelve species of rare *Proctotrypidae* not in the collection of the Society was presented by Mr. W. H. Harrington, of Ottawa.

THE SILKWORM INDUSTRY IN ONTARIO.

By Prof. W. Lochhead, Ontario Agricultural College, Guelph.

The purpose of this article is to answer the question: Is a silkworm industry possible in Ontario? This question has been asked frequently during the past season, and invariably by persons residing in the county of Essex. The question is a very important one, for if the conditions be favourable for the establishment of such an industry considerable additional revenue would soon flow into the county, and enrich those engaged in the industry.

The various factors bearing on the successful establishment of a silkworm industry will be briefly considered.

During the past season Rev. W. M. Fleming, of Essex, reared a large number of silkworms from eggs, and had remarkable success in the production of silk cocoons. So gratified was he with his success that he naturally began to ask himself the question: Why cannot a silkworm industry be established in this country? In letters to the Department of Agriculture he advocated the breeding of silkworms as an industry which might be carried on very profitably by persons in poor circumstances, who had no regular employment, where the women and children could attend to the feeding and care of the worms.

The writer had occasion recently to visit Essex, when he made a point of inquiring into the silkworm conditions of the locality. Several prominent persons of business persuaded by the success of Mr. Fleming were of the opinion that cocoons could be produced in paying quantities, and were anxious to try further experiments next season. Moreover, many persons, uninformed as to the market conditions, felt that the Government should start a series of experiments to determine the feasibility of the whole project, and give aid in the form of a bonus.

The conditions necessary for profitable production of raw silk are: 1. Cheap labor, and many laborers. The chief silk-producing countries are those bordering on the Medi-

terranean, and in the far East where labor is very cheap. Experience, moreover, has shown that many laborers are required to provide food for the silk worms during the last ten days, just prior to the spinning of the cocoons. 2. Suitable food-plants upon which the worms may live and grow. The mulberry leaves are the staple article of diet in Europe and Asia, but in the United States it has been shown that the leaves of osage orange form just as good a diet as the leaves of mulberry. 3. Suitable climatic conditions of ten perature and moisture. Experience again has shown that the silkworms may grow well in many countries, and slight changes of temperature do not affect their well being to any appreciable extent, although of course they thrive best in warm, semi-tropical countries. 4. A ready market for the cocoons, or rather the reeled silk. Here again the cheaper labor of the Old World tells against the development of silk industry in this country, and to sell the reeled silk in France or Italy means such a great reduction in profits that our people could not compete.

On inquiry in Essex regarding the extent to which the county could fulfil the foregoing conditions, the writer learned that the labour was to be done chiefly by the women and children, and only during the last few days would extra help be required. Skilled help would be secured at this critical period, for many factors enter into operation during the last few days which are of vital importance in successful rearing. The worms are ravenous, and the amount of food consumed is simply marvellous. Fresh leaves must be secured and given regularly so that the worms may feed continously. When the food-plants are not close by, the task of feeding many thousands of worms becomes too heavy for women and children, and extra help must be obtained. Again, the worms must be carefully watched at the time of spinning the cocoons to prevent two worms forming one united cocoon, as is often the case where the worms are kept too crowded Then, again, the cocoons must be secured and the enclosed pupae killed within the cocoons. The best method of killing the pupae is to place the cocoons in an oven heated to about 194 degrees F. All this work involves care, and if the silk growers procure their own supplies of silkworm eggs for the following season some additional care is necessary. The moths are allowed to escape from the cocoons which they usually do about two weeks after the spining of the cocoons.

Essex county is fortunate in having a mild climate, one in which the mulberry and osage orange trees grow quite readily. Both the Russian and the native species are common, and two or three years would suffice to grow mulberry trees of such a size as to feed the silkworms of a large industry. Osage orange trees, too, are very abundant, and miles of hedges can be seen by driving along the roads of central Essex.

Through the kindness of Director Stupart, of the Meteorological Office, Toronto, the writer is able to give a comparison of mean temperatures of Essex county and Central France, the great silk-producing region of France. The mean temperatures for the months of April, May, June, and July are given below :

	Claremont, France.	Moulins, France.	Windsor, Ontario.
April	51.1	50.0	45.7
May	56.1	56.8	58.0
June	62.2	63.1	67.7
July	66.6	67.6	68.5

During the last week of May and the whole of June the silkworms are feeding, and by the first week of July the cocoons have been spun. From the table presented above it will be seen that the temperature of Essex differs but a little from that of Central France during the critical period.

The practical experiments carried on by the United States Department of Agriculture from 1884 to 1891 show conclusively that a most excellent quality of silkworm cocoons could be raised over most of the United States; and Dr. Howard, U. S. Entomologist, states as his opinion that the silkworm could without doubt be grown successfully in lower Ontario ; but the absence of a home market for the cocoons puts the industry for the present out of the region of possibility. There are no establishments in the United States for reeling silk from the cocoons. No person could be induced to start reeling establishments for the reason that "no silk reeler could afford to pay a price for cocoons which would induce even the poorest of our citizens (or even non-producing mem-

bers of the family) to undertake the more or less arduous labors of raising worms. It was found impossible to convert the cocoons into raw silk, namely, to reel them in this country in competition with the cheap labor in foreign silk-producing countries."

In 1890 it was shown that even with the introduction of improved automatic, electric silk-reels it was impossible to compete with Europe and Asia without the imposition of a customs duty of not less than $1 per pound on reeled silk imported into the United States.

A few facts regarding the weight of silk-moth eggs and cocoons may be interesting to persons who intend experimenting with silkworms. One ounce of eggs contains about 40,000 eggs (in France a family usually undertakes to rear this quantity). From these are obtained from 80 to 120 pounds of cocoons, which yield from 11 to 17 pounds of reeled silk. About 300 medium-sized cocoons weigh one pound, while the silk reeled from these weighs about one-eighth of a pound. In other words, 2,500 medium-sized cocoons will yield one pound of reeled silk.

The life-history of the silkworm (*Bombyx mori*) is very instructive and interesting. Each female moth lays nearly 500 eggs in a cluster soon after she emerges from the cocoon about the first or second week in July. The fertilized eggs are drab-colored, while the unfertilized ones are white or grey. The young worm on its first appearance is nearly black, covered with stiff hairs, and is about one-eighth of an inch in length. It becomes full grown in about twenty-eight days, during which time it has moulted four times, becoming lighter in color with every moult. When mature it is creamy white, has a prominent projection on the dorsal surface near the end of the abdomen, and is two or three inches long. The spinning of the cocoon occupies nearly three days. The threads of silk are viscid for a few days and consist of two fibres secreted by two glands which run along the sides of the body and open together on the under lip of the worm. This double thread is said to be about 4,000 yards in length.

The pupa moults once within the cocoon, the skin of the first moult usually remaining attached to the inner surface of the cocoon. The color of the cocoon may be white, or yellow, or orange, and investigations fail to reveal the cause of the variation in color. In four or five days after the cocoon is made the silk is ripe, when the pupa may be killed by heating the cocoon to a temperature of 194 degrees F. in an oven as already mentioned. If the moth is allowed to escape one end of the cocoon is broken, thereby injuring the continuity and excellence of the silk threads.

The moth is whitish or cream-colored; its fore-wings are falcate, with one or two brownish lines crossing the wing. The moths are not inclined to fly much, and are easily kept in confinement until the eggs are laid. There is but one brood a year, but the greater part of the year is spent in the egg state. The active period covers little more than six weeks, of which four weeks are spent as worms.

Concluding, the present market condition for reeled silk precludes the possibility of the establishment of a silkworm industry in Ontario, and "serious disappointment will surely follow exaggerated ideas upon the subject of silk-raising for profit, and if any person is contemplating such a course he is very strongly dissuaded therefrom."

Dr. Fletcher spoke of the interesting character of the paper and said that the Government at Washington had given up its experiments with silkworms because the French manufacturers would not pay for the cocoons a price that would remunerate American labor. In France they kept the eggs in a cool place so that they might not hatch till the mulberry trees were in leaf; if they should hatch too soon they could be fed upon lettuce, but this food was not safe, as it often produced diarrhœa in the caterpillars. He referred to the fact that most schoolboys in England reared silkworms for amusement, and in consequence a very large number became deeply interested in entomology.

RESULTS OF SOME APPLICATIONS OF CRUDE PETROLEUM TO ORCHARD TREES.

By F. M. Webster, Wooster, O.

The varying and sometimes disastrous results obtained from the use of refined petroleum, on growing trees, as an insecticide, and especially against the San José scale, has led to the suspicion that the crude product might be less variable and drastic in its effects.

But so far as it has been used it would appear that we have yet much to learn, before we can, with safety, recommend the application of the crude product to the different varieties of fruit trees. That it is efficient in destroying the San José scale, if it is brought in contact with this insect, seems now quite probable. But the hundreds of dead trees that mark the areas where it has been indiscriminately used, point very clearly to the fact that great caution is necessary, and no one is, as yet, able to say just where safety ceases and danger begins Then, too, when no permanent injury is apparent, as in the case of the seedling apples on the grounds of the Ohio Agricultural Experiment Station, at Wooster, Ohio, who can say that this unnatural retardation may not, after the first application prove to be a menace to the life or general vigor of the trees? It is well known that, in nature, these retardations sometimes occur, but nature seldom, or never, covers the bark of a tree or a shrub, and then only in part, with vegetable growths like lichens, and even these are known to be detrimental, a smooth, clean bark being always desirable.

In the use of refined petroleum, one of the most perplexing phenomena observed was the fact that, equally careful applications, made by the same person, with the same grade of oil, would give almost opposite results. Hence, recommendation of the refined product for general use has, in many cases, resulted disastrously and brought no little disrepute to the entomological fraternity of this country. The most that can now be said for the refined product is that a ten to twenty per cent mixture with water constitutes a fairly successful summer wash and destroys the young scale, thereby checking the increase and spread until applications of whale oil soap mixtures can be made.

In the use of the crude product, I have seen some of the most astonishing results obtained, but, as with the refined, I have seen also the most disastrous effects. Perhaps the uncertainty of effects in using crude petroleum in the orchard may be best illustrated by giving the results obtained, this year, by Mr. N. A. Hadden, of Catawba Island. Mr. Hadden used crude petroleum on the strength of recommendations from New Jersey, including those published by Prof. John B. Smith, and contrary to the advice of some of his neighbors. As I knew nothing of the matter until some weeks after the latest applications, nothing could have been said or done by me to in any manner influence Mr. Hadden, who followed his own course, and, I may add, has offered me every facility for observing the final results.

About 50 peach trees of the Crawford's late variety were sprayed March 10, 1900, with 100 per cent crude petroleum from an oil well near Gypsum, Ottawa County: Distillation B. The spraying was carefully done and none of the petroleum was allowed to run down the trunks of the trees. The effect on these trees was to kill every one of them. Two other blocks of peach trees on which crude petroleum from the same well was used, were also totally destroyed. On the same day, March 10, 1900, six plum and one peach tree were sprayed with crude petroleum from the same well and of same strength. Two unhealthy plum trees died; the other four were uninjured, as was also the peach, which not only made a vigorous growth but bore several peaches. Several rows of Smock and Salway peaches were sprayed April 7th with 100 per cent. crude petroleum, and, though not showing serious injury on May 16th, in July 90 per cent were dead and the remainder fatally injured. Crawford's Late, sprayed March 8th with 10 per cent. crude petroleum, and another block sprayed with a 40 per cent. mixture, were not seemingly injured, but bore no fruit. Eight apple trees and several peach trees, sprayed March 8th with 10 per cent. crude petroleum, were uninjured.

On the premises of C. W. Shoemaker, at Waterville, Ohio, there stands a Wilder Early pear tree, that for several years was badly affected with the Scurfy Bark louse. The tree was stunted and made little growth each year. Two or three years prior to 1900 the tree was sprayed in spring with kerosene emulsion, which killed many of the insects, and the tree afterwards made a better growth than it had previously done. April 2nd, 1900, this tree was painted with crude petroleum, the analysis of which I have not been able to secure On August 17th, 1900, I saw the tree, and the bark still gave good evidence, by its colour and shining appearance, of the presence of the petroleum. The growth has been vigorous and the foliage was of the most healthy colour. The Bark-louse seemed to have been quite exterminated.

On March 23rd, 1900, a row of three year old seedling apple trees, on the Station grounds near Wooster, was treated with crude petroleum of different strengths, applied with a Deming kerosene attachment, the applications being made by two of my assist

ants, Messrs. Newell and Roudebush. This petroleum was taken directly from oil wells at Lodi, Southern Medina county and its chemical composition is shown in "analysis A." Different trees were sprayed with different strengths of the oil, varying from 10 per cent. crude pretroleum and 90 per cent. water, up to 100 per cent. crude petroleum. In no instance were the trees permanently injured. The effect was simply to retard the development of the foliage, until about the middle of May. May 7, many varieties of apples were in full bloom. The Winesap and Rome Beauty were showing their first unfolding blossoms.. Strangely enough, the effect was rather more marked where the 10 per cent. solution was used. Where we used the 40 per cent. the retardation was less than where we used the 20 and 50 per cent. crude petroleum; the effect of the 40 per cent. being about the same as the 100 per cent. The 30 per cent. was almost the same in its effects as the 10 and 100 per cent. mixtures. June 13th, an examination of the trees showed that the normal amount of foliage had been put forth, and the leaves were exceedingly healthy in appearance and seemed larger than those on the unsprayed trees. An examination of the trees the middle of October showed that the first sprayed trees were really holding their foliage better than the unsprayed. Nearly all of the leaves had dropped from the latter while scarcely any had fallen from the sprayed trees. The tree sprayed with the 100 per cent. crude petroleum seemed to have held its foliage better, and the colour was more fresh and vigorous than on those sprayed with the diluted petroleum.

While all this indicates that crude petroleum may be used once upon apple with a strong probability of no detrimental results occurring from its use, nevertheless, the question is yet to be settled as to whether one or more additional applications will result in the same way.' It seems to me that this whole matter has not yet reached the point where we will be justified in saying to the public it will be safe to use the crude petroleum. The practical question is not whether an expert can use this as an insecticide with safety, but whether it can be safely trusted in the hands of inexperienced men who are not trained in exactness of methods or quantities. I do not wish to be understood as in the least denying that there may be something in both crude and refined petroleum that may, in the future, have great value as an insecticide, but that, for the present, we should be content with investigations, and be exceedingly cautious in regard to recommendations until we have at least found out the reason for such widely diverse results being obtained from applications so nearly alike in point of materials and methods.

It must be remembered that our experiments with crude petroleum at Wooster, Ohio, were made upon seedling apple trees, which, though they might have possessed different degrees of resistibility, might, on the other hand, have been less susceptible than any of the grafted varieties. The selection of these trees was not a matter of choice, for they were the only ones available at the time. Next year, we shall endeavour to reverse the experiment; that is, where the 10 per cent. mixture was used this year we shall use 100 per cent. next year, and vice versa. A large number of experiments are also to be carried out upon different varieties of apple, in different parts of the State, using different strengths of the crude petroleum.

Petroleum Distillations.

	A	B
Specific Gravity	35°B	34°B
Light Naptha, 80°C	1.49%	.14%
Heavy " 80° to 120°C	4 35	1.63
Benzine, 120° to 150°C	5 03	3 82
Light burning oil, 150° to 200°C	7.64	13 48
Heavy burning oil, 200° to 250°C	13 54	12 03
Residue from 250° Dist	68.70	68.62
	100.74%	99.72

A, from Lodi, Ohio, well. B, from Gypsum, Ohio.
Distillations by J. W. Ames, Asst. Chemist, O.A.E S.
B contains sulphur compounds.

INJURIOUS INSECTS IN ONTARIO DURING 1900.

By Dr. James Fletcher, Dominion Entomologist, Ottawa.

The practical entomologist has had his hands full during the past season in Ontario. The season has been a most unusual one—hot and dry in some sections, but unusually wet in others. There have not been, however, any very remarkable outbreaks of injurious insects which have been the cause of widespread loss; but some of the old and well known pests have done a considerable amount of harm, much of which could have been prevented if farmers would only recognize that they have every year to reckon with the generally forgotten but always present tax collectors belonging to the insect world and that these always work in the same way. Orchard insects, which could have been controlled by spraying, were neglected in many places, and Cutworms caused losses which could have been prevented. The Pea Weevil, every year abundant and destructive, seems this year to have been more so than usual, but the Destructive Pea Aphis was not so injurious as at one time it was feared it would be. Late in the season it was found that great harm was being done by the Hessian Fly throughout western Ontario, most particularly in early sown wheat. The Turnip Aphis was only locally prevalent. The San José Scale has spread over many orchards which were only slightly affected in the beginning of the season. The so-called Buffalo Moth is becoming a serious pest and is spreading.

Cereals.

By far the most serious outbreak among cereals was by the Hessian Fly (*Cecidomyia destructor*, Say, Fig 14, highly magnified) in fall wheat. Specimens of young wheat plants infested to a remarkable degree, some of the shoots containing nearly a dozen puparia, were received from Waterford, Ferguson, and other places. Very few reports of injury by the summer brood came to hand, so that this sudden appearance of the insect in such large numbers was somewhat of a surprise. Reports from correspondents show that late sown grain was to a marked degree less infested than that sown at the usual time in the beginning of September. The appearance of the perfect insects,—tiny blackish gnats not expanding more than a quarter of an inch from tip to tip of the outspread wings,—and the life history are so well known that it is not necessary again to go into details here with regard to these; suffice it to say that there are two broods in the year, the perfect flies of the first appearing in May and June, and laying their eggs on the leaves of the growing wheat plant. The small maggots work their way down inside the sheaths of the leaves and attack the tissues of the growing stem, weakening it and frequently causing it to fall down, bending over just above the point of attack. The brown flax-seed-like puparia may frequently be found in straw or under the machine at the time of threshing Some of these flax seeds the number varying according to the season, produce the flies the same autumn, chiefly in the month of September; these lay their eggs on the newly sown fall wheat. Some of the flies of the summer brood, however, do not emerge until the following spring—at the same time as the flies of the autumn brood—and these lay their eggs on the young plants of spring wheat. This attack is frequently overlooked, owing to the fact that, if the wheat plants are not sufficiently advanced for the eggs to be laid upon the stem leaves, they are laid upon leaves close to the ground and the larvæ attack the root shoots and kill them before they have produced stems at all. I find that, as a general thing, there is a great deal more injury done in this way than on the stems of wheat. Farmers, as a rule with this attack, do not recognize their enemy and attribute the thin crop to "cold or wet springs," "late frosts," "hot suns," or other imaginary causes of which no exact record had been kept. As stated above, there is this autumn a very serious attack by the Hessian Fly in our Ontario wheat fields, particularly in those sections where fall wheat is most largely grown. As a matter of fact, fall wheat can be grown in every county of the Province, and the Hessian Fly is liable to occur in any of these. Certain areas, however, from the

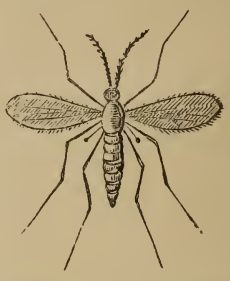

Fig. 14.—Hessian Fly.

satisfactory results are recognized to be particularly well suited for the cultivation of this cereal.

Many experiments by agriculturists have shown that better crops are reaped if the seed is sown early, that is, about the 1st of September. This, however, is only true in such years as the Hessian Fly is not prevalent. Therefore, it is decidedly advisable for growers of fall wheat to remember in such periods as the Hessian Fly is abundant, what the life-history of this insect is, and, instead of trying to sow their fall wheat seed by the 1st of September, delay this operation until after the 20th, being content to get a slightly smaller yield and to be sure of it, than, in the effort to get a bigger crop, perhaps run the risk of losing half or even the whole from the attacks of the Hessian Fly. By postponing seeding until the end of September, the appearance of the young plants above the ground is delayed until after the egg-laying flies of the second brood are dead. Where fall wheat has been sown in August and is already well up, it is considered advisable when the Hessian Fly is known to be prevalent to feed off a good deal of the green top with sheep during the month of September, in which manner it is claimed that many of the eggs are destroyed. Care must be taken that the fields are not cropped too closely nor too late in the season. Late sowing therefore may be claimed to be the most important preventive remedy against the Hessian Fly. There are, however, other methods of reducing the numbers of this insect, among the more important of which are the treatment of stubble and the burning of refuse. The treatment of stubble is of most use in such districts as Manitoba, where there is only one brood of the Hessian Fly, which is restricted to spring-sown grain. In 1899 the Hessian Fly appeared for the first time in Manitoba, where no fall wheat is grown, and did an enormous amount of harm. Fortunately, this year there is no recurrence of this attack. The insect passes the winter in Manitoba, for the most part, in the stubble, although some of the puparia are carried from the field with the straw. Therefore, if stubbles be burnt over or ploughed down deeply in autumn and the straw is fed to stock or burnt at any time before the flies emerge in spring, there being no autumn brood, this pest should not be difficult to control. The burning of refuse which is thrown down beneath the threshing machine, will also dispose of many flax-seeds of the summer brood which did not emerge in the autumn and were carried in the straw. If this refuse were not destroyed, these would give forth their flies the following spring.

In cases where fields are found to be infested with Hessian Fly, it is sometimes difficult to decide what a farmer's wisest course is. If the infestation is only light, it is sometimes possible to stimulate the crop by the use of a light application of some quick acting fertilizer. Where, as is generally the case, there are patches in the field which have been destroyed, it is desirable to save such parts of the field as are uninjured. These patches can be sown in spring to some crop which will not require cultivation, e.g. an early ripening barley, which can be cut at the same time as the fall wheat and the whole threshed as mixed feed If, however, it is necessary to save the wheat separately, peas may be sown on these patches, which can either be cut after the wheat, or the grain can be separated after threshing. In cases of bad infestation it would sometimes pay better to use the land at once for some other crop.

The usual practice of simply cultivating deeply so as to produce a good seed bed is an improper one, because the flax seeds are present and, if the land is only cultivated, the flies will emerge in spring and prove a source of infestation to the uninjured remainder of the wheat crop and also to any spring wheat or barley which may be sown nearby. Infested areas should be ploughed down deeply so that the flies when they emerge from the flax seeds shall be unable to work their way out Then any crop may be sown except spring wheat. Barley and rye are also sometimes liable to attack; consequently, other crops are preferable to these, such as oats, peas, corn or roots There will sometimes be cases where the farmer is uncertain what it is best to do, owing to the occurence of uninjured patches in an otherwise badly infested field. In these cases it will be best to wait and see how the wheat will turn out. If at last something else has to be substituted as a crop, probably the best returns will be obtained by sowing early ripening corn where a cultivator can be used, or early peas where the patches are surrounded by wheat. Both of these crops may be sown as late even as the middle of June and will give good results. Mr. N. H. Cowdry, a very careful observer,

of Waterford, Ont., has noticed that different varieties of wheat are not injured to the same extent; for instance, in one field of Clawson wheat about eighty per cent. of the plants contained Hessian Fly puparia, while Democrat wheat near at head was only injured to an extent of thirty per cent. Again, Clawson wheat was as a rule attacked in the upper and earlier sprout which was killed, but an uninjured sprout was growing from the seed. Democrat wheat, on the other hand, showed the original sprout uninjured or to a much less degree than the other variety, and the secondary shoot had not by the end of November so far been produced. Of the two fields the Democrat looked green and healthy, but the Clawson looked yellow and faded, and there was a great deal of rust on the leaves.

A yellow colour so often referred to by farmers as an indication of the presence of Hessian Fly is a sign by no means always to be relied on, for, as Professor Webster, of Ohio, has pointed out, infested plants are for a time of a brighter green and more stocky than those in a healthy condition. However, there are frequently in the autumn enough dead leaves and shoots to give the fields a brown and unhealthy appearance, and these together with leaves attacked by the fungous disease rust, which sometimes, as during the present autumn, is very abundant, may have been the cause of the appearance which is so often described as "yellow from Hessian Fly."

Cutworms in Grain.—There have been reports from restricted localities chiefly in the western counties, of injury to grain fields by the larvæ of the amputating brocade moth (*Hadena arctica*, Bdv.) and other cutworms.

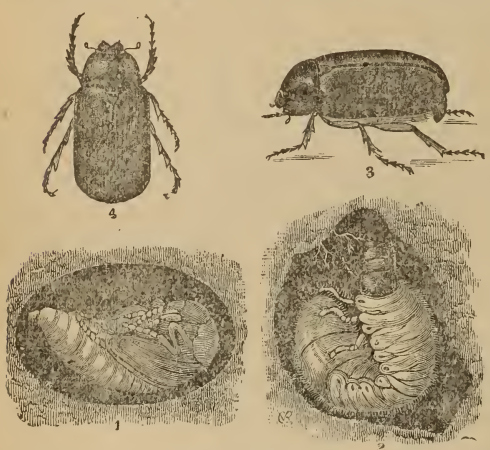

Fig. 15.—White grub: 1. pupa; 2. larva; 3 and 4. June beetle.

Wireworms are mentioned in several localities but no specimens have been sent in.

White Grubs. The larvæ of the June beetles (*Lachnosterna*), (Fig. 15, 3 and 4), have done a good deal of harm not only in pastures but to some field crops in different parts of the province. Notwithstanding the very different appearance of these two kinds of grubs, I find that they are very frequently confounded with each other by farmers. Wireworms (Fig. 19), the larvæ of the Click Beetles (Figs. 16, 17, 18), are slender cylindrical shaped, tough-skinned, bright yellow, grubs, about one inch long by one-eighth of an inch, or less, wide. The two ends of the body are somewhat similar in general appearance; Fig. 20 represents the pupa of a wireworm, upper and under side. White Grubs (Fig. 15, 2) on the other hand, are much larger, heavy-bodied, almost sack-shaped, white grubs with yellow heads having the end of the body enlarged, curved down and brown from their earthy contents showing through the thin skin. If the body were straightened, it would measure an inch and a half or more, by three-eighths of an inch wide at the widest part. The duration of the larval life of these two insects is probably about the same. The eggs of the June beetles are laid in spring, and the young grubs feed all the first summer and through the second one, attacking the roots of all kinds of plants, but being most numerous in fields where there are trees, or round the edges of fields near trees. By the end of the second summer they become full-grown and change to beetles, but do not emerge until the spring of the third year. Wireworms begin their lives much less regularly at any certain time of the year; the perfect beetles belong to a very large number of genera and species, which occur through the season, and the eggs

Fig. 16. Fig. 17. Fig. 18.

Fig. 19.—A Wireworm.

of some kinds may be laid at any time. The food of wireworms has a much larger range than is the case with the white grubs, many, and these are the most injurious species, feed upon the roots of grain and other crops, grass, shrubs and trees. Some feed on decaying wood and other vegetable matter, and some, at any rate occasionally, are even predaceous. On the whole, however, the class must be considered as decidedly injurious. In the beetle state Click-beetles (Fig. 21) are not considered very destructive but one species, *Corymbites tarsalis*, Melsh, has of late years been detected as a rather frequent enemy of the apple, feeding in the flowers and destroying the essential organs, and also eating the young foliage. As a general remedy for both of the above named classes of insects, late ploughing has been found beneficial, by breaking up the pupal cells at the time the insect is in a tender condition and exposing it to many dangers when it is either a pupa or an immature beetle, and unable to make another cell. The trapping of the mature Click-beetles by using pieces of potato poisoned with Paris green placed on the ground near where the beetles seem to be abundant is claimed by some experimenters to have been attended with considerable success. The June beetles are largely foliage eaters and are specially attracted to certain kinds of trees. Many may be destroyed by spraying these attractive trees with Paris green and lime, which may be applied as strongly as one pound of Paris green with two pounds of lime in 100 gallons of water.

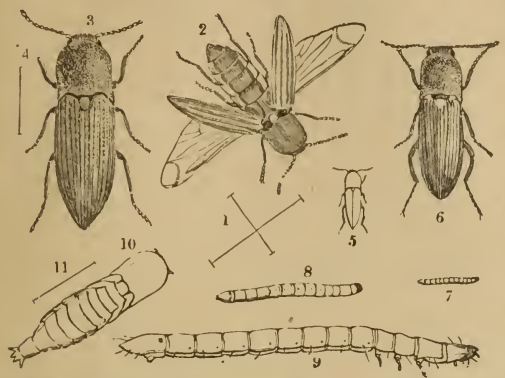

Fig. 21.—Click-beetles and Wireworms—2, 3, 6, 9, 11, magnified.

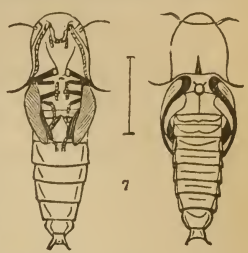

Fig. 20.—Pupa of Click-beetle.

The Pea Weevil (*Bruchus pisorum*, L., Fig 22).—Year after year, the loss in the pea crop from that old and well known enemy, the Pea Weevil, is simply appalling. The life history is well known and it must be claimed that the remedy is practical, that is, effective, cheap and easy, and yet it is not applied regularly by pea growers as it ought to be. As far as I can learn, the large seed merchants and the large growers do fumigate their pease with bisulphide of carbon and destroy the contained insects. The trouble seems to be with the small growers and farmers who save a few bushels for seed and do not take the trouble to treat these small quantities. As is well known, the Pea Weevil comes to maturity in autumn and if the season is favorable emerges at that time of the year and passes the winter under rubbish and in out-buildings. Many, however, remain in the pease and do not emerge until the following spring, when they are frequently sown with the seed. The perfect insects are very active little beetles which fly easily to the pea fields about the time the blossoms appear. They feed for some time on the flowers and leaves. As soon as the young pods are formed, the females lay their eggs upon them, from which the grubs hatch and eat their way into the pod and penetrate the forming seeds.


Fig 22.—Pea Weevil—greatly enlarged, and of natural size.

Remedies: The best remedies for this insect are the treatment of the seed with bisulphide of carbon, late sowing and the holding over of seed. Fumigating with bisulphide of carbon is the method now generally adopted by seed merchants and most of them have special houses for "bugging pease." Farmers can easily make use of this same method by taking an ordinary 45 gallon coal oil barrel which will hold five bushels of pease. According to the quantity of seed to be treated, one ounce of bisulphide is used to every 100 pounds of pease, that is three ounces if the barrel is filled. The chemical may be either placed in a flat open basin on the top, or it may be poured

directly on to the grain. The top of the barrel must be quickly replaced and covered up with cloths, etc., as tightly as possible. This treatment should be carried on in a shed out of doors, and the barrel must not be opened for 48 hours. Bisulphide of carbon is a colourless malodorous liquid which volatilizes readily at ordinary temperatures. The vapour is quite invisible, but being heavier than air it sinks readily and permeates the contents of the barrel. It is very inflammable and care must be taken when using it that no light of any kind is brought near. This treatment should be done in the autumn as soon as possible after the pease are threshed and before the weather has become cold. The sooner the treatment is done, the less injury the weevils will have done to the seeds, and, if the bisulphide is not used until cold weather has set in, its effect upon the insects is very much less than when they are in an active condition. Moreover, by delaying treatment there is the risk in mild autumns that the beetles may have attained full growth and left the seeds. The late sowing of peas is useful in preventing attack by weevil, but the method is not in favour with farmers because late sown peas in certain seasons are liable to be so much attacked by mildew as to reduce the crop sometimes more than would be done by the weevil. The holding over of pease until the second year, keeping them in close bags to prevent the escape of the beetles, is certainly a good remedy and is not practised by those who use small quantities of seed as much as it ought to be. The reduction of vitality of seed pease held over for one year is very little indeed. Unlike the Bean Weevil, the Pea Weevil cannot propagate in the dry seed so that every beetle which emerges dies inside the sacks. Before sowing, the injured seeds must be separated and only those which are perfect planted.

The Pea Moth (*Semasia nigricana*, Steph., Fig. 23).—In the eastern counties of Ontario and extending down through Quebec into the Maritime Provinces, much harm has been done by the caterpillars of the Pea Moth. They have been particularly abundant at Ottawa this year in late peas. As this insect resembles the Codling Moth very much in its methods of attack, some experiments were tried at my request by Mr. J. E. Wetmore, of Clifton, N.B., by spraying the vines when the young pods were forming with a Paris green mixture which had been rendered adhesive by the addition of whale-oil soap. The results from these experiments, although not conclusive, are of a hopeful character and will form the basis of further experiments next year.

Fig. 23.—The Pea Moth—natural size and enlarged.

The Destructive Pea Aphis (*Nectarophora destructor*, Jnsn.).—This insect which was the cause of such extensive injury to the pea crop last year not only in the southern States but extending further north into Canada, has this year not been so bad as in 1899 but still has caused considerable loss. In the eastern counties the larger number of attacks have been noticed. The J. H. Allan Seed Company, of Picton, reports that "this season it has done considerable damage in New York State, Michigan and Wisconsin. Last season as well as this it caused injury in Prince Edward County as well as in Lennox and Addington. We are also told that it did much damage in Renfrew County." Last year in the State of Maryland the loss from this insect was put at $3,000,000, and during the past summer the loss in the same crop much exceeded that amount. Moreover, not only did this insect attack the pea crop but it was found to be much more distinctively an enemy of clover. This attack upon clover was not serious in Canada, and at Ottawa, where plots of peas were entirely destroyed by it, clover plots closely contiguous showed no sign of the presence of the aphis until very late in the season, when all peas had been killed by frost (November), and when a few were found. Many remedies were experimented with by Prof. Johnson, State Entomologist of Maryland, the describer of the species, and it was found that what has been called "the brush and cultivator method" was the most effective. For this it is necessary that the peas should be sowed in rows from 24 to 30 inches apart, and not broadcasted. He says, "The vines were brushed backward and forward with a good pine switch ahead of an Iron Age cultivator, which was drawn by one horse, and in this manner the insects which leave the vines freely when

these are shaken were covered up and a large proportion of them destroyed." The cultivation was not repeated until the third day, as it usually required 48 hours to destroy the insects when covered with earth. Another method which was tried with considerable success, consisted of a brush which dislodged the insects so that they fell into a pan containing coal oil and water, and dragged between the rows. In this way a bushel of plant lice were caught to each row of peas 125 rods long. Spraying was tested, but it was abandoned because no spray could be found which would destroy a large enough percentage of the insects to warrant the expense of the operation. An extensive experiment, however, covering 600 acres where the plants were brushed and cultivated every third day for a period of two weeks, forty men being employed, was very successful. In this manner the entire field was saved, netting the owner from 25,000 to 30,000 cases of peas of two dozen tins each. It is also stated that a field not far distant where nothing was done, was to ally ruined. As is usually the case with all kinds of plant lice when they occur in excessive numbers, the Destructive Pea Aphis has been vigorously attacked by many kinds of parasites, which at Ottawa, at any rate, have had a remarkable effect in reducing its numbers Although the plant lice were extremely abundant in some places, they were almost totally wiped out on one or two occasions by certain of these enemies. The most useful parasite at Ottawa was a small dipterous fly, probably of the genus *Diplosis*. The small orange maggots of about a sixteenth of an inch in length crawled about among the colonies of plant lice and destroyed them in large numbers, piercing their bodies with their mouth parts and sucking out their juices in the same manner as is done by the larvæ of Syrphus flies. When full-grown these larvæ spin a small close cocoon either in the angles of the leaves or stem, or falling to the ground make a cocoon of silk with particles of sand attached. There were continuous broods of this useful parasite throughout the season, and the minute gray midges could be seen about the infested plants at all times. The last brood spun their cocoons in the middle of October, and the larvæ will remain in them until next spring. Several species of lady-bird beetles, Syrphus flies and lace-winged flies were also abundant, as well as species belonging to the hymenopterous genera *Praon* and *Aphidius*. The first of these emerges from its host and spins a cocoon beneath the dead body. The latter passes through all its stages inside the body of the plant-louse and when mature eats its way out through a circular hole.

Fodder Crops.

Fig. 24.—Clover Root-borer.

The Clover Root-borer (*Hylastinus obscurus*, Marsh=, Hylesinus trifolii, Muell., Fig. 24) —The Clover Root-borer generally occurs in a few localities in Canada every year, but is seldom the cause of much harm and this will be more and more the case not only with this species, but with the Large Clover Weevil (*Phytonomus punctatus*), as farmers get more into the way of sowing clover to a larger extent as a green fertilizer and plough it down after the first crop. During the past summer the Clover Root-borer was observed doing some harm in old fields of clover but also in some new ones right across the province. The worst occurrences were near London, at Picton and in a small patch at Ottawa. Clover which is infested flowers irregularly and the plants have an unhealthy appearance. The insect may be found in autumn in all stages in the roots of clover plants ; the beetle comes to full growth late in autumn and remains in its burrows until the following spring. The remedy for this insect is a short rotation. The value of clover as a fertilizer is now so well known that farmers do not hesitate to plough down their meadows as soon as they find traces of this insect. This should be done as soon as there is a pretty good growth on the ground after the first crop of hay has been removed.

The Large Clover Weevil (*Phytonomus punctatus*, Fab.) was found to be abundant in the larval condition in a field, near Picton, Ont., which

was also infested by the Clover Root-borer. These larvæ, however, were almost all attacked by the fungus *Entomophthora phytonomi*, Arthur. Almost every blade of grass rising above the clover had at its tip a dead or moribund larva, and of a large number which were apparently healthy, collected for rearing, there was hardly a specimen which produced the beetle. The diseased grubs were of all sizes from very small to full-grown. This was on the 24th of May. A few of the full-grown larvæ taken at that time spun their lace-like cocoons in the beginning of June and two beetles emerged about the end of the month. The beetles measure over four-tenths of an inch in length, are oval in shape and of a brown colour with four pale punctured lines on the sides. The beak is rather short and blunt, the thorax smooth and swollen with three pale lines. The wing cases each bear ten deeply impressed lines of punctures, from which the species takes its name.

Roots and Vegetables.

A great number of insects have been complained of during the past season as having attacked more or less root crops and vegetables. Some of the more important of these are the following :

Cutworms —The Spotted Cutworm, as the larva of *Noctua C-nigrum*, L , Fig. 25, has been inappropriately called, was extremely abundant in many localities along the north shore of Lake Ontario, injuring all kinds of garden and root crops. This is never a rare insect, but this year it was enormously abundant. The brood of which larvæ are found during July, was the one this year which did most harm. This species seemed to take the place in Ontario and resembled very much in its habits and time of appearance, the Variegated Cut-worm, *Peridroma saucia*, of which there has been a disastrous outbreak this summer all through the Province of British Columbia. The larva of *Noctua C-nigrum* is grey or pale brownish of varying shades. When full-grown it is nearly an inch and three-quarters long, rather slender, being less than a quarter of an inch at its widest part. The markings are difficult to describe, and vary very much in intensity. There is always a pinkish sub-stigmatal stripe, and the whole of the dorsal area is more or less crossed and darkened by indistinct blackish blotches or mottlings, which on each segment on the dorsum take somewhat the shape of the letter "M" with the top pointing towards the anal end. In some specimens there is a supra-lateral row of spots on each side gradually increasing towards the anal end both in size and intensity of velvety black. On the last segments these are elongated angular blotches with the apex pointing forward. There is also a narrow medio-dorsal pale line and a pale lateral line on each side. However, no two specimens agree exactly in ornamentation, but all have the appearance of being covered with a course network of black more or less obsolete over a pale brown ground colour. The moths appeared in large numbers from July till the end of the season and it is most probable that the eggs are laid in late summer and autumn and that the larvæ hibernate half-grown.

Fig. 25.—Moth of Spotted Cutworm.

Fig. 26.–Variegated Cutworm: pupa.

The Variegated Cut-worm (*Peridroma saucia* Hbn.) was also found in considerable numbers, the large caterpillars nearly two inches long by over a quarter of an inch wide, attacking all garden plants and also doing harm in orchards upon apple trees. Some pupæ of this species (Fig. 26) with the moths ready to emerge were found at Ottawa in the beginning of November, but the weather changed immediately afterwards, and it is hardly likely that the whole of this brood produced moths before winter set in. The life history of this species in Canada as to hibernation is not definitely known from actual observation, but from the above incident it would appear as if moths which emerge in July and August, must lay their eggs (Fig. 27) and the larvæ hibernate partially grown. Moths which emerge in October and November probably pass the winter in that condition, and it would also appear as if some must remain in pupa until the following spring.

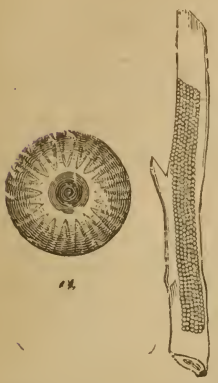

Fig. 27. — Variegated Cutworm: *a*, single egg, highly magnified; egg cluster on twig.

The remedies for cutworms which have given the best results are the banding of freshly set out annual plants, either with rings of paper or tin, so that this protection extends down about an inch beneath the surface of the soil and an inch and a half or two inches above it. Faded leaves which hang down and touch the ground must be cut off. This protection is particularly applicable for cabbages, tomatoes and tobacco. For clearing infested land either just before planting or when a crop is found to be attacked, the now well known mixture of bran and Paris green gives excellent results. This mixture may be applied either wet or dry. In the latter method the bran should be slightly dampened with water containing 2 or 3 ounces of sugar to the gallon of water. After mixing thoroughly so that the whole mass may be slightly moist, but at the same time feel dry to the touch, dust over it a sufficient quantity of Paris green, green arsenoid, or some other similar poison, to give the mixture a slightly green colour. In the former recommendations it was advised to add the Paris green to the bran in a dry condition; but this is not satisfactory, because on account of the weight of this poison it sinks at once to the bottom when stirred. The bran or meal mixture should be sufficiently dry to run through the fingers easily. It should then be placed in small heaps a few feet apart where the cutworms are thickest and will be greedily eaten by these insects. This is merely a modification of Prof. Riley's trap remedy which has been used successfully for many years. This consists of tying up in small bundles any green succulent vegetation such as any luxurient weed which may be growing by roadsides, and after dipping them in a strong mixture of Paris green and water, distribute them over the land or along the rows of a crop. The greatest drawback to this method of fighting cutworms is the fading of the plant used. This may be prevented to a certain extent by placing a shingle on the top of each, which has the double advantage of attracting the cutworms as a hiding place, and of preventing evaporation from the bundles. It is seldom that plants attacked by cutworms can be treated successfully by spraying, except in the case of climbing cutworms in orchards.

Cabbage Worms —The cabbage crop during the past season has suffered from several enemies. The root maggots caused great havoc in many places among cauliflowers and early cabbages. The Diamond-back Moth (*Plutella cruciferarum*, Zell) was abundant and destructive in dry districts to cabbages, turnips and rape, but the worst enemy of the cabbage crop this year was the White Cabbage Butterfly (*Pieris rapæ*, L.), the green caterpillars of which were so numerous from Peterborough westward almost to Hamilton and also at Ottawa and other places, as to reduce seriously the crop of turnips which, owing to the leaves being destroyed, could not "bulb" Cabbages in fields and gardens were also seriously injured. There are always every year certain insects which are liable to increase and do harm, but the Cabbage Butterfly is one which may be treated with comparative ease. The caterpillars are particularly susceptible to the effects of pyrethrum insect powder, and, if a mixture be made of one pound of this powder with four pounds of cheap flour and the whole be kept for twenty-four hours in a tightly closed jar or canister, and then dusted over the plants, it will kill all of the caterpillars upon which it falls, without injury to the plants and without danger to those who consume them. The proprietary mixture known as Slug Shot has also proved very deadly against "cabbage worms," as these caterpillars are generally called, but this must only be used early in the season while the plants are small, as it contains poison. This insect was probably more abundant during the past season than it has ever been noticed before, but toward the end of the summer it was destroyed in enormous numbers by an epidemic bacterial disease. Caterpillars which were attacked, first assumed a pallid or bluish white appearance and then gradually turned brown in blotches which enlarged until the whole body was a putrid mass. This disease was at its height in the beginning of September and continued to the end of the season. The spread of the White Cabbage Butterfly has been very rapid. It is said to have been imported into America first at Quebec about 1858, from which point it has spread in every direction. Although it had reached the Pacific coast in the United States some years ago, it is only during the past summer that it has appeared as an enemy of the cabbage grower on the coast in British Columbia.

The first record for that province was by Mr. J. W. Cockle who found it at Kaslo in the Kootenay district last year.

The Diamond-back Moth (*Plutella cruciferarum*, Zell.) seldom does very much harm in Ontario but in the West it is terribly destructive to all crops belonging to the Cabbage family, and, owing to the fact that the caterpillars feed almost entirely beneath the leaves, it is extremely difficult to apply an effective remedy. The best results have been obtained with dry powdery mixtures containing poison, blown between the leaves by means of agricultural bellows and insect guns. For this purpose, a strong mixture of one pound of Paris green in 25 pounds of air-slaked lime, or perfectly dry flour, gave good results If liquid applications are used, a sufficient quantity of soap must be added to make them adhere to the foliage of such plants as turnips and cabbages, and a nozzle on an angled support must be used so as to throw the spray well up under the leaves. A knapsack sprayer with a cyclone nozzle answers well for this purpose.

The Root Maggots (*Anthomyidæ*).—These troublesome insects have as usual done a great deal of harm and many experiments have been tried to secure a practical remedy. Unfortunately no very good results have been obtained. Onions, cabbages of all kinds, beans, corn and radishes have suffered. Mixtures containing carbolic acid in some form seem to be the most hopeful. Whale-oil soap gave tolerably good results. The most satisfactory experiments were with early cauliflowers which were protected to a large extent by means of the Gough Tar-paper Discs. These consist of a disk of ordinary tarred building felt with a split from the margin to the centre so as to allow of their being placed around the stems of newly planted cauliflowers. The odour of the tarred paper preventing the flies from laying their eggs, and the tarred paper disc also had the effect of holding moisture around the roots and inducing a copious growth of young rootlets, which were of great service in helping lightly attacked plants to outgrow the injury.

Asparagus Beetles.—The two species of Asparagus Beetles which were mentioned in our last report are still present in the Niagara district and together with the Asparagus Rust have done a certain amount of harm. Fig. 28 represents *Crioceris asparagi*, L, eggs on plant, larva and beetle. They have not,however, spread through the district to the same extent as it was thought they would last season, judging from their sudden appearance in the country in such large numbers. Asparagus growers seem to have grasped the idea of fighting them as larvæ, and a great many beds were dusted regularly with fresh lime when the larvæ were upon them. This seems to have been the remedy which was most used.

Fig 28.

Turnip Aphis (*Aphis brassicæ*, L.).—There has been a decided absence of the Turnip Aphis in most parts of the Province during the season of 1900, except up in the north-western counties. In some places in Huron County the loss has amounted to about half or more of the crop. The eggs for this species are laid in large quantities on the old leaves of the turnips,and where these are cut from the plants and left in the fields it would be well to plough them down deeply, so that the young plant-lice when they hatch in spring would be unable to get out. It would of course be well also to avoid planting a crop of the Cabbage or Turnip family on the same land the following year.

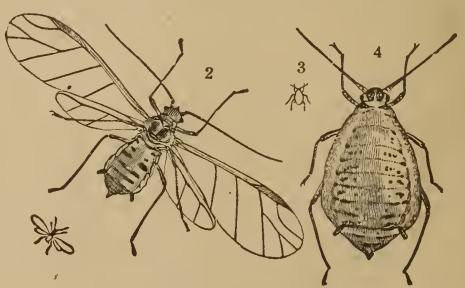

Fig. 29.—Turnip Aphis.

Fruits.

The large amount of attention which has been devoted to fruit trees and orchard pests consequent upon the accidental introduction into Canada of the San José Scale, which is discusssed fully in another part of this Report, has had a decidedly good effect in stirring up fruit growers to attend more carefully to their orchards. Spraying has been more regularly and generally done for leaf-eating insects and Codling Moth Late fall

and early spring applications have been made for scale insects and all the operations of the orchard seem to be better attended to than was formerly the case. Fruit growers are learning the habits of many of their regular pests, and there is a much greater demand for information about injurious insects than was the case only a year or two ago.

The Codling Moth and Plum Curculio do not seem to have been so destructive, judging from reports received, as usual. The Tent Caterpillars which have been so abundant all through the Dominion were decided less destructive last spring. The Eye-

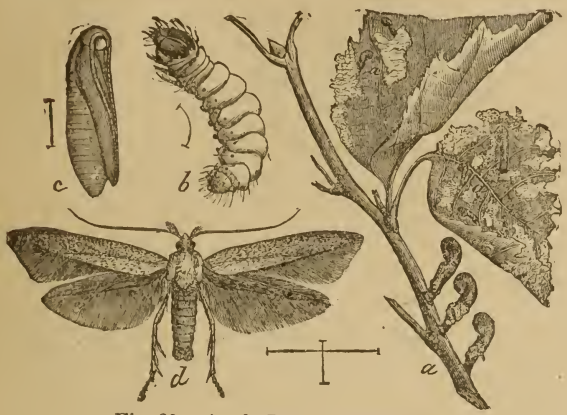

Fig. 30.—Apple Pistol Case-borer.

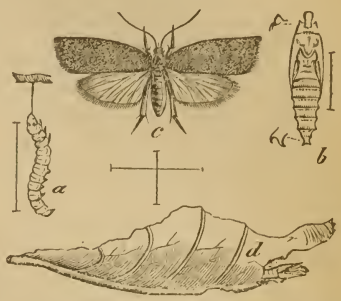

Fig. 31.—Apple Leaf-Roller (*Teras minuta*, var. *cinderella*.

spotted Bud moth and Oblique-banded Leaf-roller did their share of mischief, and early spring insects were rather more than usually troublesome along the shores of Lake Ontario. The Cigar Case-bearer, the Apple Pistol Case-bearer (Fig. 30) and leaf-rollers (Fig. 31) were about equally abundant and where neglected did harm. The species of leaf-roller which seemed to do the most harm was *Lophoderus quadrifasciana*, Fern. From Hamilton larvæ of the Palmer Worm (*Ypsolophus pometellus*, Harr.) were sent at the end of June, and a little later the same thing was sent in from Oakville. This is rather an unusual pest in Canada and had attracted attention from the extreme activity of the caterpillars. The Rose Chafer was reported as troublesome on apple trees at Niagara and Grimsby, and the Clover Mite did considerable harm to fruit trees all through the western counties where it was generally reported as "Red Spider." Canker-worms were destructive in restricted localities during May and early June. The species of which specimens were sent in, proved to be the Fall Cankerworm. The Basswood Looper (*Hybernia tiliaria*, Harr.) Fig. 32 was particularly abundant in the Ottawa district, attacking not only apple trees but various forest trees, especially the maple, elm and basswood. In western Ontario, especially in the Niagara district, an interesting little moth, the larva

Fig. 32.—The Basswood Looper.

of which mines in apple leaves and sometimes does rather noticeable injury when abundant, is *Nepticula pomivorella*, Pack. The larva when full-grown leaves its mines in the foliage and spins small scale-like brown cocoons on the twigs where it passes the winter. This insect was formerly placed in the genus Micropteryx but it has been discovered by Mr. Busck of Washington that it is a true *Nepticula*.

Pear trees have suffered rather more than usual from three of their enemies. The Cherry Slug in some places has stripped the green cellular parts from the foliage to such an extent as to render the leaves quite useless to the trees, and as a consequence the fruit was ruined. This insect can be very easily kept in check either by spraying with arsenical poisons or by dusting constantly with freshly slaked lime. The Pear Psylla was particularly troublesome at Freeman, near Hamilton, and through the western counties. Mr. Geo. E. Fisher considers this an insect which requires much more attention than up to the present it has received. The mature insect hibernates beneath the flakes of bark on the trunks and larger limbs and can be destroyed during the winter by a 30 per cent. mechanical mixture of crude petroleum and water, or by the ordinary kerosene emulsion. The Pear-leaf Blister-mite is not quite as bad as it was a year or two ago but still is much more abundant than is good for the pear trees or the pocket-book of the fruit grower. On the Pacific Coast this insect is kept well in check with the lime, sulphur and salt mixture. This mixture has not been used very much in Ontario but the well-known kerosene emulsion sprayed over the infested trees just as the buds are bursting has been found very effective. Doubtless the mixtures of crude petroleum and water which are now coming so much into use will be found very effective against the Pear-leaf Blister-mite as soon as the proper portion to use with safety has been discovered.

INSECTS OF THE SEASON OF 1900.

By Prof. W. Lochhead, Ontario Agricultural College, Guelph.

In looking backward over the entire season of 1900 it would appear that insect pests were more numerous and produced greater losses than usual. It is very difficult to determine the exact causes which were operating to produce the results, and valuable indeed would be trustworthy observations along this line. Perhaps the dryness of the season which prevented serious outbreaks of fungous diseases operated on behalf of the insects; perhaps the mildness of last winter enabled many more forms than usual to pass through the dormant season; perhaps parasites were not so numerous as usual; but whether there was one cause or a combination of causes the number of injurious insects was on the increase during the past season. Mention will be made of a few of the most injurious forms brought to the writer's attention chiefly by farmers and others in correspondence with the Biological Department of the Ontario Agricultural College.

Orchard Insects.

The Fruit Bark-Beetle (Scolytus rugulosus). Complaints have reached us from Kingsville regarding the injuries done by this beetle. It attacks especially plum trees, and many of Mr. J. D. Wigle's trees died from the injuries. It is probable that trees in other sections are likewise affected, and watchfulness is required to prevent surrounding trees from becoming infested. From breeding experiments carried on at the College the writer finds that the adults appear about the middle of May. They bore holes through the bark into the wood, and proceed to make burrows in which to deposit eggs. The young grubs also make burrows, and within a month the beetles appear. Several broods may appear in a season so that the trunk soon becomes honeycombed with tunnels and dies. See Fig. 3 (on page 35) which represents the work of an allied species (S. destructor).

Badly infested trees should be cut down and burned, while those but slightly infested should be sprayed with whitewash, or with a mixture of whale-oil soap and carbolic acid.

The San Jose Scale (Aspidiotus perniciosus). This pernicious scale is still with us in abundance, and in spite of the treatment of last spring it is just as numerous as it was last fall. Many new infestations have also been discovered, so that the whole problem of treatment will have to be taken up anew. Mr. Fisher, Chief Inspector, considers crude petroleum more effective than whale-oil soap in killing the scale, but Prof. Webster, of Ohio, maintains that crude petroleum is too dangerous a remedy to put in the hands of the ordinary fruit-grower, and accordingly prefers whale-oil soap. The scale is here to stay and the sooner the orchardist recognizes this fact, and the need of effective treatment to keep it in check the better will it be for the fruit industry of the Province. A great industry is at stake. Can we afford to lose this great industry?

Garden Insects.

The Bean Fly. (Anthomyia radicum)—In June many complaints reached the office regarding the attacks of grubs on beans in Lambton County. One correspondent wrote that hundreds of acres of beans were being destroyed. Many of the beans did not germinate at all, due to the fact that the maggot ate the interior of the seed, and many of the stems never developed leaves through the destruction of the central portion of the stem. Figure 33 shows very well the nature of the work of the maggot both in the seed and the stem. The maggots are about one-fifth inch long and yellowish-white in color. They taper to a point in front and broaden out behind. After feeding for a while the maggots descend into the ground, and change into barrel-shaped pupae. A week or ten days later the flies emerge from the pupa cases and proceed to mate and deposit eggs. After June no further complaint was made, although many growers had replanted their fields. No remedies could be suggested beyond replanting as early as possible, and not as deep as usual. It is just probable that the deep planting of the seed beans was the direct cause of the injury by the maggots, for the usual food of these creatures is decaying matter. The beans began to show signs of decay, and the maggots took kindly to their new food-supply.

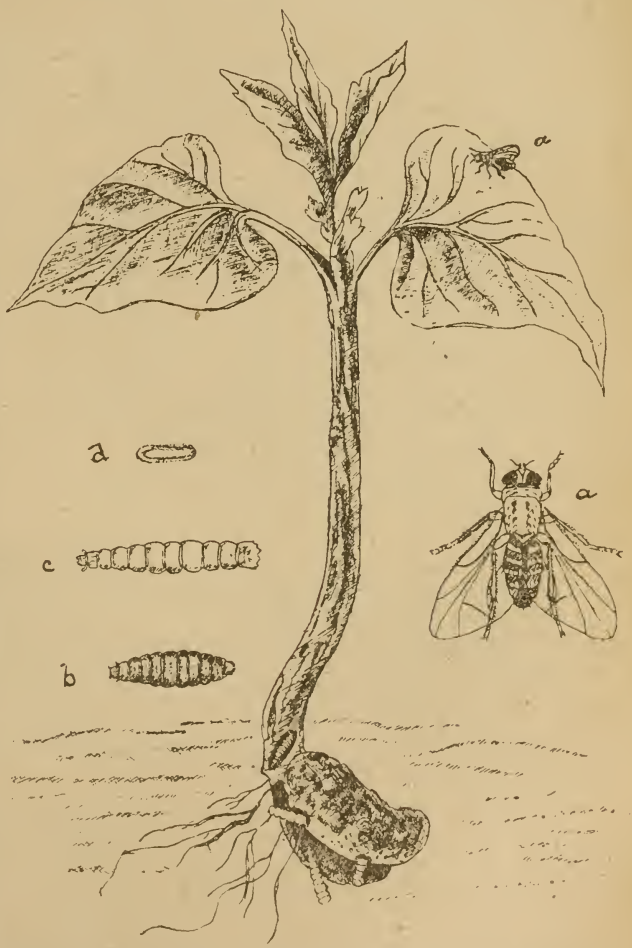

Fig. 33.—The Bean Fly— (a) adult flies; (b) pupa case in ground; (c) maggot; (d) an egg. (After Lugger).

Cutworms. (Noctua c-nigrum, Peridroma saucia, and others.) These night-intruders worked considerable damage in gardens and fields during June and July, but the spreading broadcast of handfuls of bran mash, poisoned with Paris green and sweetened with a little sugar, generally put a stop to their depredations in gardens. The most common forms sent in for identification were The Variegated Cutworm (Peridromia saucia), and The Spotted Cutworm, (Noctua c-nigrum).

Asparagus Beetles. (Crioceris asparagi, Fig. 34, and C. 12-punctatus).—Mr. W. N. Hutt, B. S. A., of Southend, reports to me that C. asparagi appeared very early, just as the first young shoots of asparagus were pushing through, and were three or four times as numerous as last year. The C. 12-punctata appeared two weeks later than the common species, and were even more numerous. The Department sent out a circular in early spring to the newspapers of the Niagara District, which explained clearly the methods to be adopted in combatting the asparagus beetles, but it would seem as if many gardeners failed to pay much heed to the instructions.

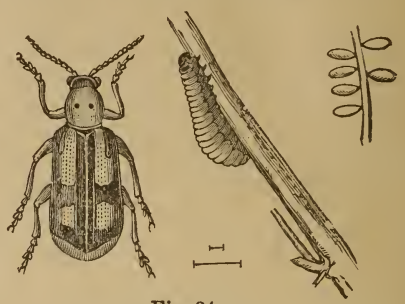

Fig 34.

The westward progress of these beetles has not been very noticeable this year, for although abundant around St. Catharines and Niagara, they have not been observed at Grimsby or Winona. Mr. Johnston reports them, however, from Bartonville, which lies between Winona and Hamilton.

The Bumble Flower-Beetle (Euphoria inda). Fig. 35. This beetle was very common in September and did considerable damage by eating holes in pears and tomatoes. Although the beetles occur in sufficient numbers occasionally to do considerable damage, yet this visitation is but periodical. Recent observations at Washington show that this insect is injurious only in the adult state, and that the grub feeds on manure and humus.

Fig 35.

The beetles hibernate, and eggs are laid in the early part of May, and the grubs mature in about two months. The pupa stage lasts about 16 days. The beetle is readily recognized by its triangular thorax, the yellowish-brown wing-covers mottled with black markings, and the grayish pubescence on the under surface of the body and on the legs and thorax.

The only practicable remedy is to collect these beetles.

Farm Insects.

The Hessian Fly (Cecidomyia destructor). The most serious insect pest of farm crops during the past season was the Hessian Fly, which destroyed the wheat crop in many sections. So far as we are acquainted with the conditions surrounding this pest, it is safe to say that the most available remedy is Late Sowing. Wheat sown as late as the last week in September has been found unaffected, while that sown before was affected. It is evident that farmers as a rule do not make any serious attempt to carry out the recommendations of practical entomologists in the matter of late sowing, trap crops, or uniformity in time of sowing.

The writer urges that this question, a most important one for the Province, be taken up by the Government, and extensive experiments be carried on in various sections to determine the most favorable conditions for sowing to avoid attack. These conditions have not yet been determined for Ontario.

Among the other serious insects infesting farm crops this past season were *Cutworms* which were abundant in root crops, and even in wheat fields (according to some correspondents). The more common species were the *Variegated Cutworm* (Peridroma saucia), the Spotted Cutworm (Noctua c-nigrum), and the Glassy Cutworm (Hadena devastatrix). The use of poisoned bran mashes has been found very beneficial in those cases where the remedy is practicable. A knowledge of the life history is often necessary to know the best time to sow grain to escape the cutworm.

The *Pea-weevil* and the *Pea-aphis* have made the growing of peas an uncertain crop in many localities. There is a practicable remedy for the weevil in the use of carbon bisulphide, or in the holding over of the seed peas for another season, when the weevils will have disappeared and the good seeds can be picked out. With regard to the Pea-aphis, should it become destructive it will be necessary for the pea grower to change his method of cultivation, and adopt drill planting, instead of planting broadcast as is done at the present time.

Fig. 36. An Ear of Corn affected by Corn-Worm; Caterpillars are very variable in their markings. (Original).

The Corn Worm (Heliothis armiger). Fig. 36. This worm has been more numerous this season than usual, and appears to find Ontario conditions quite congenial. The green corn offered for sale in the Guelph market was frequently injured by the worm, and the Experimental Department of the College Farm found many ears badly injured at time of harvesting. The Trent Valley Canning Co. of Trenton reported on October 1st, that they had received a few loads of sweet corn containing many badly injured ears; and that in one locality from which they received corn the worm was very prevalent.

Observations point to the view that the Corn-worm is single brooded with us, but it may be double-brooded in some of the southern localities. Late fall-plowing will do much to break up the cells in which the pupae winter, thus causing the death of the pupae.

Grasshoppers were abundant in late summer, not only in meadows and cultivated fields, but also in gardens where tomatoes, cabbage, celery, and other vegetables were often destroyed. Very likely the dryness of the season and the absence of frost were important factors which contributed to their abundance.

The Cabbage Butterfly (Pieris rapae). This insect was more abundant than usual in cabbage and turnip fields, especially in the region lying to the east of Toronto. "Thousands of these winged insects could be seen flying over turnip fields." Although parasites are usually very abundant, it will not do to leave the work of extermination to them alone. A good practicable method of killing the cabbage-worms on small areas especially is to dust a mixture of one pound of insect powder and five pounds of flour through a cheese-cloth bag upon the infested plants.

NATURE STUDY LESSONS ON THE SQUASH BUG (ANASA TRISTIS).

By Prof. W. Lochhead, Ontario Agricultural College, Guelph.

Introduction. That a great awakening in the study of nature is in progress must be evident to every person who is watching the signs of the times. Both parents and teachers are demanding the introduction of nature-study into the daily course of the school, and scholars are becoming earnest nature seekers and observers.

The last Annual Report contained Nature-study Lessons on the Cabbage Butterfly, written in response to a desire for information about this common insect by several teachers who had been induced to introduce object lessons of such a nature into their schools. It appears that the lessons were helpful to many teachers, for frequent requests were made for the article during the past year. Believing that an information-article on some other common insect would be acceptable, the writer ventures again to outline a few lessons on the common Squash Bug of our cucumber and melon patches.

Fig. 37. The development of the Squash Bug. (*a*) The bug soon after it escapes from the egg; (*b*) the bug after the first moult; (*c*) the bug after the second moult; (*d*) the bug after the third moult; (*e*) the bug after the fourth moult; and (*f*) the adult bug after the fifth moult. (Original.)

Occurrence. Who has not seen the dull, smoky-brown insect or bug which hides under the wilted leaves of squash and cucumber in late summer? Or who has not thrown the bug down in disgust when the penetrating foul odour reached his nostrils? In the dead of winter one frequently comes across these bugs in crevices and corners of outbuildings and sheds, where they live in a torpid condition far into the warm weather of the next season. If outbuildings are not to be found the Squash Bugs hide under rubbish, bark and chips, which are usually present in carelessly kept gardens.

General Characters. When one can examine these bugs in spite of the offensiveness of the odour, many characteristic features will be revealed. The three pairs of legs, the two pairs of dark wings, a pair of feelers or antennæ, and the three divisions into head, thorax and abdomen (fig. 37, f) can be readily distinguished, and the thoughtful student will see at once that so far as the major characters are concerned the Squash Bug is similar to the Cabbage Butterfly. It is only when the minor characters, such as the texture of the wings, the shape of the mouth parts, and the size of the feelers and legs are considered that differences sufficient for classification purposes are seen.

Colour.—As to colour the adult winged squash bug is rusty-black, or smoky-brown above, and ochre-yellow below. If a magnifying glass be used it can be readily seen that the ground colour of the whole insect is ochre-yellow, and that the rusty-black colour above is produced by innumerable black dots which cover the legs as well as the wings and upper surface of the body.

It is interesting to notice the change in colour which the young bugs undergo as they pass through successive moults. When the bugs are young the under side of the abdomen is first greenish, then ashy-grey, and finally ochre-yellow. (Are the head and legs always of the same colour as the body?)

Head.—The study of the head of an insect is always instructive. The most prominent part of the head of a squash bug is the feelers or antennae, which are long, and divided into segments, the first and last being the stoutest. (Fig. 38.)

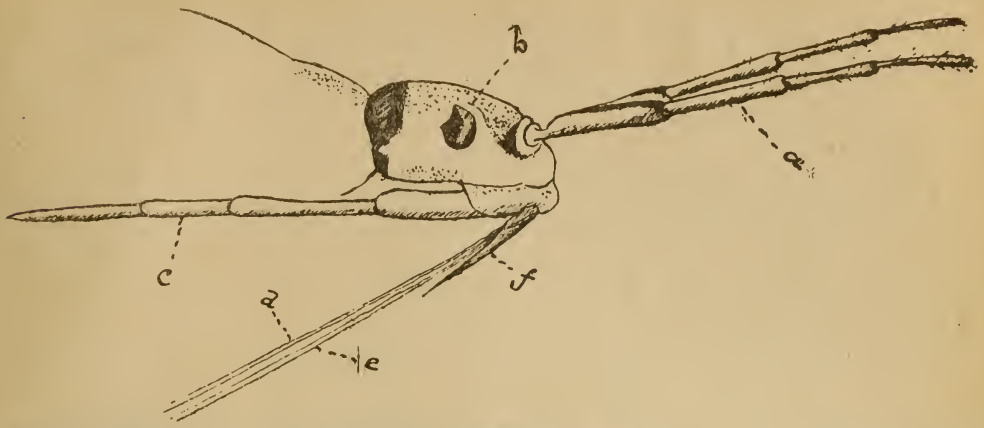

FIG. 38.—The head of the squash bug showing the antennae (a), the eyes (b), the 4-jointed beak (c), the four lances (d) and (e), and the labrum (f), (Original.)

The two large compound eyes situated behind the foot of the antennae are very similar to those of the cabbage butterfly, described and illustrated in last year's Report. In addition to the two compound eyes two simple eyes or ocelli may be seen with the aid of a magnifying glass between the large eyes. They look like minute glass beads.

If the under side of the head be examined a slender beak-like organ can be seen extending from the head backwards beyond the second pair of legs, (Figs 38 and 39), and a magnifying glass will show that this beak-like organ is a 4-jointed sheath, slit along one side. With the aid of a needle further information can be obtained by exposing the contents of the sheath. These are four fine lance-like structures which are apparently attached to a broader appendage near the head. (Fig. 38.)

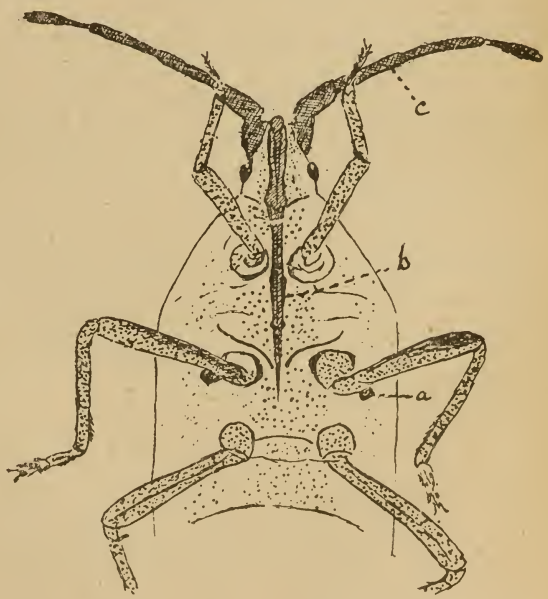

FIG 39.—The under surface of the squash bug showing the position of the two glands, (a) which secrete the foul odour, the beak (b), the antennae (c). (Original.)

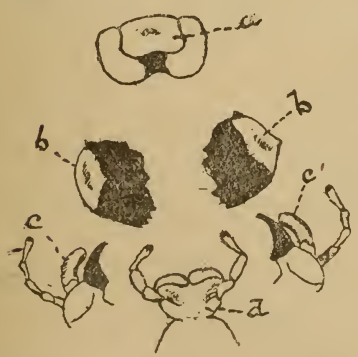

Fig. 40.—The mouth parts of the common locust dissected out, the upper lip or labrum, (a) the mandibles, (b) the maxillæ, (c) and the under lip or labium, (d) (Original.)

The mouth-parts of the common locust are shown in figure 40, and it is evident that the different parts are adapted for biting and holding the object while biting. With the squash bug, however, the parts are not adapted for biting, but for sucking. The lower lip or labium forms the 4-jointed, grooved sheath, and the mandibles and maxillae form the four lance-like piercers, while the labrum is a scale-like flap to which, apparently, the piercers are attached. It will be observed that there are no palpi on either the maxillae or labium, but the parts have been modified for piercing and sucking.

The piercers penetrate the tissues of the leaf or stem, and by means of muscles at the base of the beak the fluids are drawn up. While the insect is puncturing the tissues with the piercers it drops in a little poison which causes the cells close by to wilt and die. Some observers consider the amount of damage done by the poison to be greater than that produced by the loss of sap.

Odour—The cause of the very disagreeable odour of squash bugs is a fluid which is secreted by two glands through two openings on the under surface of the body, situated close to the second pair of legs on the last segment of the thorax. (Fig. 39, a.)

Wings.—The wings of the squash bug are characteristic of the large order of insects to which it belongs,—the Hemiptera, that is, the basal half of each of the outer pair of wings is thickened, while the outer half remains thin, membranous, and veiny. (Fig 41) The under pair of wings are thin and membranous, and are folded under the larger outer pair.

Eggs.—During July and even later the eggs are laid on the under side of the leaves in groups varying from 4 or 5 to 30 or 50. They are dull-red in colour, smooth and shining, about one twenty-fifth of an inch in length, and slightly flattened on two sides.

Nymphs.—The young bugs escape from the eggs in about ten days, and proceed directly to abstract nourishing fluids from the stems. The nymphs may be found in all stages of development under wilted leaves during August and September. (Fig. 37). It will be observed that the nymphs are broader in proportion to their length than the adults are, and their head and first segment of the thorax are small. As the nymphs develop by moulting the wings become longer.

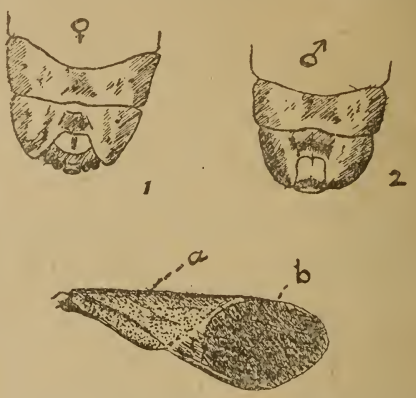

Fig. 41.—The outer wing of the Squash Bug showing the thickened inner half (a) and the membranous outer half (b). (Original)
The last segments of the abdomen showing the differences between the female (1) and male (2).

Remedies.—From the fact that the squash bug does not eat its food, it may be inferred that Paris Green placed on the stems or leaves is of no use in killing the pest. Many substances have been tried, but most have been found unsatisfactory. Kerosene emulsion diluted with 9 parts of water and sprayed upon the vines has given fairly good results, but perhaps the best plan is to clean up the squash patches thoroughly in the fall; to place pieces of boards and chips during the summer among the vines to decoy the bugs, when they may be readily killed; and to pick the old bugs and eggs in early summer and destroy them.

Topics For Observation.

1. The month, and day of the month when the young squash bugs are first observed.
2. The location of the eggs on the leaf,—their number, colour and shape.
3. The hatching of the eggs,—the duration of the egg state, the way the young bugs escape from the eggs.
4. The moulting of the nymphs,—the number of moults, the changes with each successive moult, and the duration of each stage.
5. The offensive odour,—the position of the secreting glands, the use of the fluid to the insect.
6. The best methods of controlling the insect in melon patches.
7. Males and females,—distinction and relative numbers. (Fig. 41, 1, 2).
8. The development of the wing.
9. Parasites.
10. Other insect enemies of the melon patch.
11. Mode of feeding,—the way the fluids are drawn up.

THE BREEDING OF LEPIDOPTERA, WITH NOTES ON THE INFLATION OF LARVÆ.

By Arthur Gibson, Central Experimental Farm, Ottawa.

The value attached to the breeding of insects cannot be over-estimated. The facts concerning the life-histories of species, resulting from careful work in rearing specimens, are of the greatest importance, and any person having a taste for this branch of study has many opportunities of doing excellent work. There is so much yet to be done in studying out the life-histories of insects, and so few people who care to take the time or trouble to do careful work, that those who are disposed have a field in which employment of a useful nature can be found. In the Order Lepidoptera alone there are hundreds of species which have never been properly worked out, and information of an authentic nature in regard to such is much desired. Facts concerning certain stages or habits of even some of our commonest butterflies and moths are badly wanted.

In breeding Lepidoptera from the egg to the imago, there is much of interest to observe. Some of the stages are intensely interesting, as everyone who has attempted breeding with any degree of success knows. The true object of breeding insects is not to get perfect specimens of the imago, but to study their earlier stages, taking careful notes of observations made, and giving the result of information thus obtained to others, through the medium of entomological publications. It cannot be said that such work is hard, but at the same time great care and accuracy are required, without mentioning the need of a good stock of patience.

To meet with the best results, two very important points must be borne in mind, and these are to see that the jars are kept thoroughly cleaned, and that sufficient, but not too much, of fresh food-plant is always present. The larvæ of butterflies, especially, require extra care and attention to see that the breeding-jars are always clean, and that the food-plant is kept fresh. Carelessness in this respect oftentimes causes failure. Breeding-jars should be washed out at least every day, if the best results are desired, even twice a day is not too often for delicate larvæ. It is also often best to change the food plant twice a day.

In studying the earlier stages in the life-history of a butterfly or moth, as soon as the eggs hatch, it is well to put one of the larvæ in a small jar, keeping it separate from the others, so as to watch it carefully through its different moults. Two could be kept in the same jar, but instead of this it is better to have two small jars, one for each caterpillar. These should be kept beside the remainder of the brood, if any, so that they may also be watched, as many vary in the same stage. It is important that careful descriptions of the egg, the larva (in all its stages), the chrysalis, or pupa, and cocoon, if there is one, should be made, noting in fact everything of importance bearing upon the life-history of the species.

For the most part ordinary jelly jars with tin lids will answer for breeding lepidoptera ; those with the rounded bottoms are preferable, as they do away with the chance of moisture gathering in the corners. Two or three different sized jars are more convenient than having them all the same. Of course if a large number of the same larvae are being reared bigger jars or breeding cages, will be found necessary. Some writers recommend tin boxes of various sizes. These also are excellent receptacles, and it is claimed that it is not necessary, when breeding sphingids, to put earth in the tin as the larvæ will readily pupate on the bottom of the box.

Careful watch must be made for the moults of the larvæ. Before moulting the caterpillar, as a rule, stops feeding for a day or so, during which time the front segments become swollen, so much so that they appear larger than the head, which with the cast skin, soon afterwards, usually during the following or the next day, is thrown off. As soon as the larva has moulted, a careful description should be taken, noting its length, shape, colour and arrangement of markings, size and shape of head, etc., etc. The cast skin and head should be preserved in a small bottle, or box, with careful data. The empty cocoon, pupa, or chrysalis, should also be preserved, as well as the egg shells.

A method by which the eggs of many moths may be secured is to capture a female, enclosing her alive in a small box for a day or so, and if she has not already laid eggs, it

is probable that she will do so in confinement. All females, however, will not lay eggs in confinement; from some it is exceedingly difficult to obtain ova. Eggs from butterflies especially are hard to procure, and extra inducements have sometimes to be offered. A good plan is to feed the female with a sweetened fluid, such as honey diluted in water. This can be accomplished by touching the tongue with a fine camel's hair brush which has been dipped in the fluid. Another method to secure eggs is to imprison the female in a bag made of muslin, or some such material, placed over the plant upon which the larvæ feed. In the case of larvæ which feed on low plants such as grasses, etc., if a small plant is transferred to a flower-pot, a covering of muslin, with the aid of two pieces of wire bent into a hoop, can be placed over the plant and the living female enclosed. It is best to have a portion of the plant touching the muslin at the top, as many species will leave the plant and deposit some, if not all, of their eggs on the muslin. If eggs can be secured through a friend living at a distance, they will travel safely through the mail. The present summer several batches of eggs were received at Ottawa from points in the Rocky Mountains, Northwest Territories and other distant localities.

If a number of specimens of the same species are being bred it is nice to have a specimen or two of each larval stage inflated, as it is important that as much of the life history as possible be preserved for the cabinet. If the first stages are too small to inflate, they can of course be preserved in alcohol,or some other fluid, or they may be dried on hot sand with some success. There are various methods of inflating larvæ, and some experience is needed before satisfactory results will be attained. Hairy caterpillars especially are difficult to inflate, but experience will teach the beginner that great care and much patience are required in order to do good work.

For inflating larvæ very few appliances are necessary, and these are not at all expensive. They can easily be had from most of the dealers in entomological supplies.

When the larva has reached the stage at which it is to be preserved the first thing to do, of course, is to kill it, and this can be done by dropping it for a minute or two into a receptacle containing methylated spirits. When the caterpillar is dead it can be taken out of the liquid with a small pair of forceps, and placed on its side on a piece of blotting paper. When this is done take a small piece of the same paper in the left hand placing it over the larva, gently pressing the front segments, with exception of head. A small sharp pointed instrument should then be inserted into the anal orifice, so as to admit of some of the liquid contents coming out. For all except minute larvae a large needle, or a pair of small forceps with curved points, may be used for this purpose. Further pressure will now be necessary in order that the remaining contents may be squeezed out. Just sufficient pressure should be applied to remove the contents; if too much is given the skin will be bruised.

When the viscera have all been removed, insert the necessary-sized glass inflating-tube into the anal orifice. The larger of these tubes have clips or spring attachments to hold the larval skin. If the caterpillar be small it can be fastened to a smaller tube by means of a thread of fine silk wound around the posterior segment. The inflating-tube can now be inserted into the rubber tube of the double bulb inflator and the empty skin gently inflated. If everything is all right it can then be placed in the oven and slowly dried. A suitable oven can be made by any tinsmith, and is simply a tin box about 6 inches long by 4 inches wide and 2½ inches deep, supported on legs to allow of the lamp being placed beneath it, and having an opening in one end to insert the larva, with another at the bottom for the circulation of air or to allow the escape of some of the heat. A sheet of glass let into the top enables the operator to see what he is doing. The drying process should be carried on over the hottest place, commencing with the front segments and working backwards. Care must be taken not to hold the same portion of the larval skin too long over the heat, but the segments that are being dried should be kept turned, so that all sides may be dried about the same time. While this is going on too much air must not be pumped into the skin; if this is done it will stretch the larva and give it an unnatural appearance.

Any small spirit lamp will do to supply the heat, which must be regulated according to the nature of the species being inflated. Too great a heat will destroy the colors of many larvæ, and this is especially so in the case of delicate green caterpillars. Hairy larvæ, as already mentioned, are rather difficult to blow, as the hairs are very easily rubbed off, and unless care is taken in the inflating the segments will be sure to expand

too much and thus be puffed out unnaturally. When the skin is ready for the oven a pair of forceps will be found a means of help in inserting the inflating-tube into the vent.

After the larval skin is thoroughly dried care should be taken in removing it from the inflating-tube. This can easily be done in most cases by simply forcing the skin off the tube by means of the thumb-nail of the right hand. The caterpillars may then be mounted on a piece of fine wire wound tightly around the pin five or six times, the lower end of the wire being neatly cut off. The portion on which the larva is to be mounted may be cut according to the size of the caterpiliar. Any good cement, such as that used for repairing insects, may be employed to fasten the blown skin to the wire.

NOTES ON TWO LONGICORN BEETLES AFFECTING GROWING NURSERY STOCK.

By F. M. Webster, Wooster, O.

With the rapid changes in the flora of the country, brought about by advance in our civilization, there must of necessity come changes in the habits of such of the animal life as is dependent upon this flora for their food supply. Nor do the influences stop here, for it is frequently not difficult to observe the effects of such changes even in the parasitic enemies of these animals.

Hardly a season passes but that some old and well known insect exhibits some characteristic not before observed. Sometimes this, to us, new phase of its sociology may not again be noticed for years, or it may continue and indeed increase to such an extent as to become a normal characteristic of the species. As instances of this change of habit, the adult of the Western Corn Root Worm, *Diabrotica longicornis*, was formerly known only as a green beetle found on the blossoms of thistle and golden-rod; whereas, now, it swarms over the corn fields of the middle West in myriads, and the larvæ are one of the worst pests of the corn field. It is only within the last three years that the two ground beetles, *Harpalus caliginosus*, and *H. pennsylvanicus*, have come into prominence as strawberry insects.

The first species here considered is the coated Saperda, or the Linden borer, *Saperda vestita*, Say (Fig. 42) described in 1824, from specimens taken near the southern extremity of Lake Michigan, but was also known at that time to occur in Pennsylvania. Though common, the insect does not appear to have anywhere become seriously destructive though it was well known to Harris as early as 1832 and said by him to have been destructive to the European Linden in Cambridge, Massachusetts, in 1843 and 1844.

1 2 3

Fig. 42.—*Saperda vestita* Say; 1, larva; 2, pupa; 3, adult; all slightly enlarged.

Dr. Paul Smith, in a letter written May, 1844, quoted by Dr. Harris in his "Insects Injurious to Vegetation" gave an account of an attack upon European Linden trees in Washington and Independence Squares, Philadelphia. The trees were attacked about seven years before but within two years it had been found necessary to cut down forty-seven of these European Lindens in Washington Square alone. The American Lindens were also injured but apparently to a less degree. One of the Lindens mentioned by Dr. Harris was very large, the trunk measuring 8 feet, 5 inches in circumference 5 feet from the ground. A strip of bark two feet wide at the bottom, and extending to the top of

the trunk, was destroyed, and the exposed surface of the wood was pierced and grooved with countless numbers of holes where the borers had been bred, and whence swarms of these beetles were supposed to have issued in past times. Some of the larger limbs and a portion of the top of the tree fell down, apparently in consequence of the ravages of these insects.

Fig. 43.—Bases of affected trees, about natural size. Original, after photographs by P. A. Hinman.

In the American Entomologist, New Series, Volume I, page 271, Dr. C. V. Riley cites the species as very injurious to the European Linden in Cambridge, Massachusetts, and Philadelphia, Pennsylvania, quoting Harris as authority, and also adds "boring at the base of young European Lindens and gouging two parallel rings around the trunk which form annular swellings." Thus it will be seen that the insect exhibits a partiality for the European Linden, but its injuries during later years do not appear to have attracted the attention of entomologists to any large degree. Last year, my former assistant, Mr. Mally, while inspecting nurseries, found a number of small Linden trees in the nursery row that had been very seriously injured by larvæ burrowing in the trunks below ground. Mr. Mally, from the appearance of these larvæ, thought they might be those of the Round-headed Apple Tree borer, *Saperda candida*, the adult of which is shown in Figure 44. These young trees growing in the nursery row were cut and transplanted to the insectary on the 28th of August. On the 15th of January, 1900, examination of these trees (Fig. 43) revealed one larva still active in the rotten wood, and about four inches below the surface of the ground. On April 4th one adult *Saperda vestita* emerged. It must be remembered that this was under insectary conditions. The next day the entire lot of material was examined. One additional larva (No. 1.) and a pupa (No. 2.) were found. These larvæ had worked in the wood at the root, entirely below the surface of the ground, and, in fact, the upper limit of their burrowing was from two to four inches below the ground. When ready to pupate the larvæ evidently burrow their way upward in the wood to the level of the ground surface, or within an inch or two of it. They pupated in cells cut

Fig. 44.—*Saperda candida* Say.

diagonally across the grain of the wood at an angle of about 45 degrees to the upward channel.

So far as known to me this is the first instance of this insect having been observed attacking nursery trees, and also the first record of their working below the ground. All previous records represent them as working above the surface, their attacks being confined to the trunk and larger branches.

Dr. Harris states that the adult *Saperda vestita*, after having emerged from the trunk and larger branches of the trees, will fly into the top and there feed upon the epidermis of the tender twigs and the petioles of the leaves, often wholly denuding the latter and causing the leaves to fall. It may not be out of place to state that a few years ago a specimen of *Saperda candida* (Fig. 44) was sent me, accused of gnawing into the young growing apples, and specimens of these that accompanied the insect gave abundant evidence of the truth of the statement.

The species under consideration is said to deposit their eggs, two or three in a place, upon the trunk and branches, especially about the forks, making slight incisions and punctures for their reception, with their strong jaws. As many as 90 eggs have been taken from a single beetle. The larvæ, hatching from these eggs, undermine the bark to the extent of six or eight inches, often penetrating the wood an equal distance.

This appears to be an instance of an old and well known species taking on a new habit, as I can find nothing on record of their having ever been before observed depredating in the nursery row, and there is certainly nothing on record relative to the larvæ working below the surface of the ground.

The second species, with which this paper has to deal is *Oberea bimaculata*. While this is, perhaps, more of a small fruit than a nursery pest, nevertheless, we have come in contact with it in our nursery inspection, although not especially as affecting nursery stock. In Bulletin 96 of the Ohio Agricultural Experiment Station, pages 20-22, I gave an account of this insect and stated that we had reared it from witch hazel *Hamamelis virginiana*, also from apple twigs. The specimen is shown in Figure 40. A further study of this insect has shown that it is *Oberea tripunctata*. Specialists make this a variety of *bimaculata*. Since this work was done, I have twice reared the true *Oberea bimaculata* from raspberry, which it is known to infest. There seems now to be a dividing line between these two forms, *tripunctata* having a variety of food plants, while *bimaculata* appears to confine itself to canes of *Rubus*. The object in presenting this matter is to correct a possible error in Bulletin 96, in terming the species there reared from witch hazel and apple twigs, *Oberea bimaculata*, without further qualifications. Although as stated, the two are considered to be the same species by systematists the rearings at the Station imply that there is a sharp distinction between the two in the matter of food habits, and it seems to me that this would be very strong evidence at any rate, that may, some day, be used in separating the two insects. Any one wishing to follow up our studies of these species will find them recorded in Bulletin 96, of the Ohio Agricultural Experiment Station, pages 20-22, and the Journal of the New York Entomological Society, Volume V, pages 203-204, with illustrations, and Volume XI, pages 437-438 of Entomological News. It will be a very interesting study, and one fraught with some economic importance, to carry on a large number of rearings, both from *Rubus* and other plants. If this food distinction between the two forms holds good throughout, *Oberea tripunctata*, Swederus will be entitled to rank as a species.

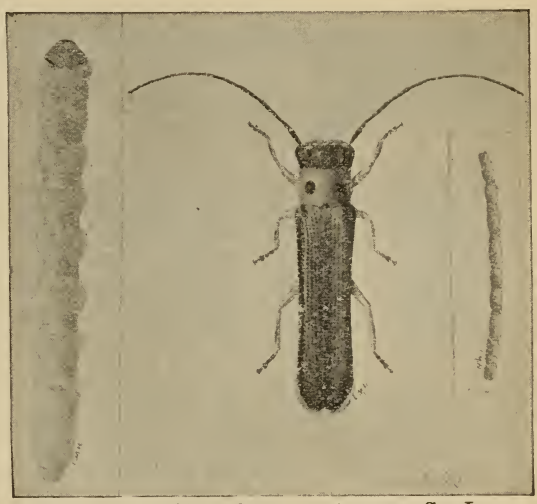

Fig. 45.—*Oberea bimaculata* var. *tripunctata* Sw. Larva enlarged at left; Section of excreta at right, all enlarged.

A very valuable contribution to our literature upon these insects will be found in Bulletin 23, Agricultural Experiment Station, Cornell University, pages 120-24, by Professor Slingerland. The two forms are so exceedingly alike in appearance that none but expert entomologists have been able to separate them. As relating to this matter Mr. F. H. Chittenden, Assistant Entomologist in the Department of Agriculture, wrote me Feb. 8th, 1899, also stating that he had been unable to avoid the impression that the two insects were distinct, notwithstanding the opinion of specialists to the contrary. I speak of this more in the way of a suggestion, as it seemed to me a problem which a careful entomological student may well take up and solve.

HABITS OF THE LARVÆ OF DERMESTES TALPINUS (MANN.)

By Percy B. Gregson, Waghorn, Alberta.

To fur trappers in the far North West the larva of this beetle, which Dr. Fletcher has kindly identified for me, is but too well known. (Fig. 46.) It seems to be ubiquitous and almost omnivorous. Hitherto, however, it has been understood to feed only on dead things, such as fur hide, skin, bacon, wool, dead insects, etc., but in rearing it, as I have in considerable numbers, I have noticed features which show the larva in its very early infancy to be endowed with a very extraordinary activity, or to be a parasite of living insects. These features I should like now to record.

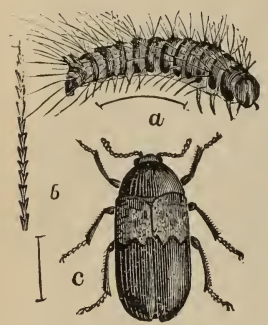

Fig. 46 represents the beetle and larva (magnified) of *Dermestes lardarius* — a most familiar species.

My practice when spreading lepidoptera is to place the setting-boards within a box with closely-fitting door, but the frequent destruction of the insect by the Talpinus larva, before the insect itself had become sufficiently set for removing, determined me to investigate the early existence of the larva. I noticed that the butterflies I caught in May and early June (*Colias occidentalis, E. discoidalis*, etc.) were peculiarly liable to attacks by this pest. Others caught later in the year were free from them. When I discovered the larva on the setting-boards (generally on the second or third day after setting the insect) the largest of the larvæ did not exceed one line in length, and from the dust-like frass under the body of the butterfly and the excavation made in the body, the larva had evidently been at work for some time. It being easily possible for such minute creatures to have crept through some small crack into the interior of the box, I decided this year (1900) to rear a few, as soon as I could get any, in a tightly closed tin tobacco box three inches deep, for I found they could not crawl up the tin sides of such a box. They cannot crawl up tin at any slope greater than 30 degrees. Placed on the higher part of such a slope, they slide down to the bottom.

On the 12th of May, 1900, I found a *D. talpinus* larva on a hybernated specimen of *Vanessa cardui* which I had captured and spread on the 10th. This little larva (not a line in length) I at once placed in the empty tin tobacco box, with the carcase of the *V. cardui*, and closed the lid and saw that there was no space for ingress of even the minutest insect, assuming that it first could scale the tin sides of the box. Being much occupied for the next few days, I simply added a Colias or two (caught in the manner I shall presently describe) without disturbing the little grub which was within the carcase of the *V. cardui*. On the 25th May I introduced to him a *Colias occidentalis* caught that morning. I always carry with me when hunting near home for lepidoptera, a shallow ($\frac{1}{2}$ inch deep) tin cigarette box whose lid fits very tightly, requiring an effort in fact to open, and into this box I at once place, direct from the net, my captured specimens, folding them in papers on the spot (first, however, killing the Colias, Erebias and such sized insects by pressure on the thorax in the net) and it is therefore impossible for

any foreign insect to gain access to the interior. I followed this course on the 25th May, and the *C. occidentalis* I introduced to the Talpinus larva I took direct from its paper in the shallow box, as I did all the insects with which I fed my Talpinus, and dropped it into the larger tin box. On exploring the interior of this box in the evening of the 25th I found a second Marmoratus larva (very minute) feeding on the body of the newly introduced Colias.

On 28th May I introduced another *C. occidentalis*, caught under and treated in precisely similar fashion to the others above mentioned, and soon afterwards observed a third little Talpinus larva on the bottom of the tin box. There were now three of these larvæ, and for the first time I introduced to them a small piece of coyoté fur. This, however, was not touched until the carcases still remaining had been devoured, and there was no further increase in the family. On the 4th June, however, I placed two more fresh *C. occidentalis* in the box (both caught as before) and as I had now become accustomed to mysterious additions to the family I presently observed without surprise a minute Talpinus crawling from just under the right wing of the last introduced butterfly. Here then were four larvæ, all of which had been obtained through freshly captured butterflies, and none of which could have possibly crawled into the deep, close-lidded tin box, nor can I imagine that they could by any possibility have gained admission to the shallow tin collecting box and to the folded papers within, unless they were already on the bodies of the butterflies when captured. In which case their activity seems little short of marvellous.

Although on subsequently ceasing to feed the larvæ with butterflies they ate the fur hide, they nevertheless deserted it again for bodies of insects when I once more introduced that kind of food. I have even found one in the dead body of a common house-fly.

In closing these few remarks I may add that I procured a dozen of these larvæ from butterflies in the above described fashion this year. The first to pupate did so on 7th July and hatched on 9th August.

OBSERVATIONS ON SEVERAL SPECIES OF DERMESTIDÆ.

By F. M. Webster, Wooster, O.

The necrophagous habits of many of the species of this family of insects are well known, but it is doubtful if the phytophagous habits are very much less emphasized in other species.

Byturus unicolor Say, is, perhaps, best known as the Raspberry Fruit beetle, and I have observed it feeding, usually in pairs, on the blossoms of *Geum*, either *rivale* L, or *album* Gmel. *Byturus tomentosus* Fab., is destructive to the Raspberry in England.

The common introduced species, *Dermestes lardarius* Linn., while affecting dried skins, meats, etc., is also fond of bread and other grain products, and has twice been reported as destroying honey comb. *D. vulpinus* Fab., has been reported as damaging tobacco.

Perimegatoma cylindricum Kirby, var. *angulare*, has been reported as a possible enemy of the Fluted scale, *Icerya purchasi* Maskell.

Attagenus piceus Oliv., has become so destructive to woolen fabrics and carpets as to receive the name of Pitchy or Black Carpet-beetle. It has been sent to me from Indiana breeding in beet seeds, larvæ, pupæ, and adults all being present in the seeds when received.

Trogoderma ornatum Say, though beyond a doubt a museum pest, is a vegetable feeder as well. From the seed of the garden sunflower, collected May 28, 1899, this beetle emerged, in the insectary, June 17, 1900. From seeds of *Ambrosia trifida*, collected October 10, 1899, a specimen emerged in the insectary, May 19, 1900. From seed cluster of *Euthemia graminifolia*, collected October 12, 1899, beetles emerged in the insectary, March 31, 1900. These seeds were infested by unknown larvæ when collected.

Anthrenus scrophulariæ Linn, so well known as a carpet beetle, I have, for years, found in abundance during early spring, in the blossoms of the Tulip, and almost invariably in those of a pure white color, or nearly so. I fully believe that this is more

of an out of door insect in this country than we at present suppose, though we know that, at home in Europe from whence we received it, the insect is unknown as a household pest.

Anthrenus varius Fab., I have taken in the blossoms of Tulip, in connection with the preceding, and also by itself in the Peony blossoms in June. A single individual was found in a breeding cage, supposed to be secure against the ingress as well as the egress of the smallest insects, in which were thorns of the Honey Locust, infested with lepidopterous larvæ. Of course, in this case, the beetle might have made its way into the cage, though the probabilities are that it did not. I have reared either this species or *A. musæorum* Linn., from masses of spiders' nests mingled with the bodies of dead insects, as well as the living, in hibernation, under the loose bark of a hickory tree.

NOTES ON DANAIS ARCHIPPUS.

By C. W. Nash, Toronto.

During the past season (1900) I have made the following notes of the movements of this butterfly in the neighbourhood of Toronto :

June 14th.—Saw first Archippus butterflies. There were three of them loitering over the willow bushes near the shore of Lake Ontario. They were much faded and ragged ; all of them were flying eastward.

June 20th.—Archippus butterflies are now common. All are very dull coloured ; their scales being worn off and wings ragged, they look old.

July 21st.—I examined a large number of Asclepias for Archippus larvæ, but found only one, about half-grown. The butterflies are common, but all seen are dull and worn.

July 22nd.—On a small patch of Asclepias, near my house, I found a number of Archippus larvæ of various sizes, some very small and ranging up to full-grown ones ; also found several chrysalids.

I watched several of these chrysalids for some time, but not one of those I kept under observation produced a living butterfly. In each case the insect reached the perfect stage, or nearly so, and then died in the shell. None of these appeared to be parasitized ; they simply dried up.

August 5th.—Archippus butterflies are now congregating about the trees near my house, where they roost; some of the flocks contain over one hundred. These are all large, bright coloured specimens, evidently produced this season.

September 4th.—Archippus butterflies were streaming along the lake shore in myriads all this afternoon. I travelled through the flock for about five miles, and in that distance there was no break in the flight; all of them were flying westward. At times individuals would alight on the ground, always with their heads pointing westward. They seemed generally to select a shady spot to alight on, and in some places the ground was covered with them. After resting a few minutes they would get up again and go on with the flying crowds. The wind was from the north-west, very light, in fact scarcely perceptible.

Just at sunset I visited the trees they frequent near my house and found a great many roosting there.

September 6th.—Very few Archippus butterflies about to-day.

September 7th.—Only saw a few individuals.

September 28th.—Saw a few Archippus butterflies to-day, perhaps half a dozen.

October 6th.—A few Archippus still about.

Prof. Comstock and some other entomologists say that no birds will eat the D. Archippus. This is a mistake, so far as the butterfly is concerned, for I have myself taken them from the stomach of cuckoos. So far I have not identified the larvæ in the stomach of any bird, and it may be that they are never eaten by them.

[At London, Ontario, this year the Archippus butterfly was seen as late as November 2nd. A specimen captured on the 27th of October lived for over a fortnight in the Society's room and died apparently from a chill, as it had been left on the windowsill one cold night.]

THE PRESENT STATUS OF THE SAN JOSÉ SCALE IN ONTARIO.

By Prof. Wm. Lochhead, Guelph.

It will be remembered that the Government relaxed its strong policy of extermination in May of 1899, owing to the great opposition which was encountered. Nothing was done by the owners of the infested orchards to prevent the spread of the scale until the spring of the present year, 1900, when the Government came to their help and offered to provide whale-oil soap and crude petroleum at half price. While many orchard men took advantage of the liberal offer, it is yet a regrettable fact that many failed to buy soap or crude petroleum, or to use any other remedy. Inspection of the treated orchards, moreover, reveals the fact that the spraying was often done carelessly, or too little of the soap was used per tree. As a result of such careless treatment the scale is even more abundant at the close of this season than it was at the close of last season and the infested trees are more plainly detected. It may be said with a great deal of truth that in the infested areas of Guilds and Niagara no orchard is free from scale, and orchards which had not more than ten per cent. of the trees marked for scale last year have now scale on nearly every tree. While careless treatment has done so little to check the spread of the scale, yet some good results have been secured by careful spraying with good whale-oil soap and crude petroleum. Where whole blocks were treated carefully the intensity as well as the spread has been checked appreciably, and some of the best fruit was picked from trees which had been marked for one or two years.

In the Niagara and St. Catharines districts the owners are, as a rule, indifferent, and the impression seems to have spread that the scale is not any worse, if as bad, than some other evils against which the fruit-grower has to contend, and which are infesting orchards, such as *Yellows*, *Rose-Leaf*, small peaches, *Blight*, etc. A cursory inspection fails to show many apple trees which have given way, but many dead limbs can be found, as well as many dead peach trees.

In the Guilds district, Kent county, the scale has gained great headway and moderately infested orchards of last spring are now badly infested, for no spraying was done to check the progress of the pest. There, however, the owners are beginning to realize the necessity for action, and several have already purchased spray pumps and are preparing to combat the scale with vigor this coming winter and early spring. Time is evidently required to educate the fruit growers to give their orchards proper care.

It is difficult to state with any degree of certainty the extent of spread of the scale to new districts since the work of inspection of orchards was discontinued. Two new locations, however, have been discovered accidentally—one noted in London East by Mr. J. Dearness, and another at Essex Centre by the writer. The latter case was a very severe one, and it is probable that the scale has spread a considerable distance from this new centre.

Opinions differ as to the relative merits of good whale-oil soap, and crude petroleum. Some consider the latter a too dangerous remedy to be applied by careless sprayers, and prefer to continue the whale-oil soap treatment. Others, again, maintain that crude petroleum has given better results, both in controlling the scale, and in invigorating the trees. As a result of the experiments this year some valuable points have been gained. The whale-oil soap must be of a certain standard of quality to give results at all effective, and in the application of the crude petroleum good results depend on the method of spraying—i.e, in the handling of the nozzle, rather than on the percentage of oil, as Mr. G. E. Fisher has already explained to this meeting.

A PARASITE OF THE SAN JOSÉ SCALE.

By John Dearness, London.

Last year I received a packet of twigs bearing scale insects, mostly San José, from Mr. John Gordon, Guilds P.O., Kent Co., on some of which there were parasitic mites preying at least on the well-grown females of the species of scale insect named. On some

specimens received this year from the same neighborhood these mites were very numerous. I mounted some specimens and with a female S. J. put them in the Society's collection of microscopic slides. As many as eighteen larval mites were observed under one large scale.

Mr. N. Banks, Washington, a well-know expert on mites, reports it *Tyroglyphus malus*, Skinner, which is known to prey on the larvæ of the oyster-shell bark louse. Dr. Howard writes that J. Lignières published a valuable article on this mite in the proceedings of the Societé Zoologique de France in 1893. The habits of the mite are given accompanied by excellent anatomical figures.

"The San José scale is spreading very fast this year" in Ontario. This statement was made again and again last season, and it is repeated this year. Some people who have heard it, have inferred that since the suspension of the cutting and burning of affected trees the insect has multiplied at a more rapid rate than formerly. The discovery of new areas and new locations of infestation does not prove that the scale has increased abnormally last year and this one. That the pest was not in these newly discovered infestations in 1898 or in previous years is only an assumption ; to say that the township or even the orchard was inspected in that year does not by any means prove that the scale was not there.

The officers' assurance in 1899 that the scale was well-nigh "surrounded" was based on the belief that by tracing the deliveries of stock from the few infested nurseries all initial points of its distribution could be located. The possibility, nay the probability, of a more general introduction may be reasonably suspected from a consideration of the methods adopted by some nursery agencies. For several years past, as a county school inspector, I have received one or more circular letters asking for a list of the addresses of the teachers in the county, the reward usually offered for the trouble was one or more young trees or flowering shrubs. The teachers whose addresses were thus obtained were urged to do some canvassing in their respective neighborhoods, or, in some cases, to send a list of orchard owners or probable purchasers in consideration of a like reward to that just mentioned. The badly infested New Jersey nurseries were as likely as any others to supply stock to the jobbers who sought to use the teachers as distributers of it.

In addition to the stock imported and scattered all over the country by jobbers there is no doubt that individual farmers here and there imported young trees direct from the nurseries. Dealers would not put and keep their advertisements in the papers without seeing some benefit from them. These are some of the facts to be considered before accepting the conclusion that all or nearly all the centres of infestation in Ontario were known in 1899 and that new ones are due to the interruption of the methods in operation in the spring of that year. Incalculable good came from the tracing and destroying of affected nursery stock. Upwards of a hundred centres of evil were thus probably rendered harmless. All that the San José scale has cost Ontario has been doubly and trebly repaid by this action alone. On the other hand harm came from the sense of false security begotten of reliance on the reports of immunity based on a superficial examination of the orchards in the fruit growing townships.

The hope for the future successful disposal of the scale-insect difficulty lies not in legislative intervention but in education. Every farmers' institute and every schoolhouse should be a point from which light should be thrown on the nature, life-history and method of treatment of our insect and fungal pests. Lessons on the scale insects could be made as useful and made to yield as good training for the observing and reasoning powers as an equal number of lessons in spelling, algebra, arithmetic, etc.

In August Rev. Mr. Seaborne discovered an infestation of San José scale in London East. In September Mr. Ellwood of St. Thomas sprayed the trees with a very dilute solution of coal-oil to which some common salt was added. He claims that the salt makes the solution more effective against the insect without correspondingly endangering the vitality of the tree. I visited the place twice since Mr. Ellwood's treatment. The leaves of the sprayed trees were injured more or less, but I found no living scale. On one branch I took away there were two females found which did not appear to be dead. On a branch taken subsequently no living scale insects were found. The developments of next spring will tell whether the treatment is effective.

THE ASSOCIATION OF ECONOMIC ENTOMOLOGISTS.*

The twelfth annual meeting of this society, which was founded in Toronto in 1889, was held at Columbia College, New York, on the 22nd and 23rd of June, 1900. In the absence of the President, Prof. Bruner, the chair was taken by the Vice-President, Prof. C. P. Gillette, who read an address on "the objects of the Association of Economic Entomologists." The first of these is "to discuss new discoveries." This implies, the speaker said, that new discoveries are to be made. It takes for granted that the members are to be scientific workers and not mere book students, content to thrash over old straw or to step exactly in the footprints of another. After referring briefly to Dr. Riley's "introduction of the Vedalia to the relief of disheartened fruit growers" in California, and to Dr. Howard's having made possible the successful culture of the fig through the establishment of *Blastophaga grossorum*, he stated that it would be difficult to find so small a body of workers, with so meagre an amount of time to be devoted to original research, in any other science who can show larger results in the way of new discoveries in so short a time.

A further object is "to exchange experiences and to carefully consider best methods of work. No one can be a toiler in any special line for a year without encountering experiences that might be related to a fellow-laborer to his profit. We are scattered over a large territory, having widely varying conditions of climate, altitude, and plant and insect life. Each can bring from his particular field some points of peculiar interest to all the others. While we may read one another's publications and perhaps exchange frequent letters until we almost feel acquainted, it is only occasionally that we can enjoy these meetings together, and it is a great inspiration to talk freely over one's experiences and plans of work face to face with those who are interested with him in similar lines of labor."

"The student of applied entomology is supposed to have a good general knowledge of agricultural affairs, particularly in regard to plant growth. He must be informed upon all the insecticide materials and be able to tell what insects they are suited to kill, in what strength they may be applied to different plants, what their physiological effects will be on both plant and insect life, and when they can best be applied. He is supposed to be able to tell at a glance what any insect is that may be handed him, and whether or not it is injurious or beneficial. He is expected to be able to recommend the cheapest and best pumps or other machinery for the application of insecticides. Is it any wonder that we need to get together and exchange experiences and discuss methods of work, particularly when we remember that different results are obtained in different localities? Lime, salt and sulphur, so valuable for the destruction of San Jose scale on the Pacific coast, were found to be of very little value in the moist atmosphere of the eastern portion of the country; the codling moth, said to have one brood in Maine, is reported to have two in Colorado, and three or four in other places; insects fairly common but never seriously abundant in one portion of the country are often found to be great pests in others. In view of these conditions it is important that we obtain all the ideas possible from fellow-laborers in different localities, that we may make as few mistakes as possible, and that we may not bring down upon ourselves the distrust of those whom we labor to benefit."

"We are also 'to consider best methods of work.' Method is always important, and particularly is it to be sought for in a young science or industry where long experience has not yet determined the best plans of procedure. It was well at first that a large amount of individuality should enter into the work and a variety of methods be employed. Then, by a process of natural selection, the poorer methods would gradually drop out and the better ones be retained. It is time for this Association to lay aside its swaddling clothes and assume the garb of maturer years. It should be one of its objects to determine upon best methods as soon as expedient to do so. One recommends Paris green or London purple in the proportion of 1 pound to 200 gallons of water, while another will make it one pound to 160 or even 100 gallons for the destruction of the same insect. One recommends two sprayings for the codling moth, another three,

* The Editor desires to acknowledge his indebtedness to the official report of the proceedings of this meeting published by the U. S. Department of Agriculture.

and another says spray often enough to keep the fruit covered with a layer of the poison, so as to be sure of killing the second brood. Some advise hellebore for the pear slug, while others prefer one of the arsenites, and still another would use quicklime or simply road dust. Surely there is need for more method and uniformity in our work and in our recommendations for the control of particular insects. By free discussions at these meetings much can be accomplished to this end."

The next object laid down is 'to give opportunity to individual workers of announcing proposed investigations, so as to bring out suggestions and prevent unnecessary duplication of work.' "This brings upon us the importance of systematic co operation in our investigations; it has been often urged upon us, but not much progress has been made. One of the chief difficulties is that each one wishes to plan his own experiments and publish the results, in order that he may not have to share honours with another. Such a feeling is not altogether to be condemned; neither is it necessary to so plan our co-operation as to make it essential to remove credit from him to whom it belongs. Let us suppose two entomologists are planning independently to test the effect of insecticides upon foliage. Each carries through his experiments and publishes the results of his labors. They are still independent experiments, the results of one not supporting or contradicting to any great extent the results of the other. Had each known what was being planned by the other, they could have arranged to carry out their experiments so that they would be largely duplications of each other, and when the results were published we should have double evidence upon the points under consideration where results agreed; and where they disagreed, we might be able to find in the different conditions the reason for it. Such a co-operation would bring results of far greater value than those obtained by independent experimentation, and neither party would lose any glory; in fact, each would receive more credit because of the better conclusions that could be drawn from the work. And then how carefully every conclusion would be reached and backed by positive proof for fear that the other party might get different results! Such duplication as this is of the utmost importance to establish scientific truth, and the more we can have of it the better. It is only the 'unnecessary duplication of work' that our constitution deprecates."

"It is frequently the case that one is working out with considerable care the life habits of an insect, and a little information from exact observations upon some particular point in other localities would be of great service to him. The person giving the information would have full credit for what he did, and the world would have the benefit of the combined results. When time can not be taken by the head of a department for this aid, it may often be the case that a special student in entomology would be glad to get his name into a bulletin for doing a little good work. I have a case in mind to illustrate. The speaker is working on the life history of the codling moth. His observations make him wonder how it can be possible that there can be so few as one brood or so many as three or four anywhere. He would be greatly aided if a few entomologists in different parts of the country would make the following observations and report results this year. First, obtain date of blooming of the earliest apple trees. Second, determine the time of appearance of the first moths of the second brood by collecting a few of the earliest wormy apples and rearing the moths from them. Third, determine when the brood of worms that go over winter without pupation begin to leave the fruit. This can be done by placing cloth bands on the trees about July 15th, and removing the larvæ that appear under them once a week until those have been taken that do not change to a chrysalis within a short time. Then, with the other facts that have been well worked out, it will be possible to state with considerable definiteness the number of broods in different portions of the country."

The speaker next referred to the importance of having at each Experimental Station as complete collections as possible of insects in all their stages that are serious pests, and said that the only way in which this could be accomplished was by a system of mutual exchanges. After speaking very briefly on the third clause of the constitution 'to suggest, when possible, certain lines of investigation upon subjects of general interest,' he went on to the last clause, 'to promote the science and advance the study of entomology.'

"The usefulness of any applied science depends upon man's knowledge of the natural laws operating in that science. An astronomer could not determine the very day, hour, and minute when an eclipse of the sun would be visible at a particular spot on the earth's

surface, or the exact date of the return of a comet, if he did not thoroughly understand the operation of the laws by which these marvellous phenomena are brought about. Neither can applied entomology accomplish its highest mission in the world for man's benefit until he succeeds in thoroughly working out and interpreting aright the laws which prevail in the insect world, and they are many and intricate, and some of them difficult of solution. Whatever we can do to interest others in the study of insect life, in any of its phases, to the end that new facts are recorded, will help to the more perfect understanding of our favorite science and consequently to its usefulness. We are greatly indebted to the pure systematist in entomology who never attempts to make a practical application of his knowledge."

"It would greatly promote the science of entomology if each member of this Asssociation would make a special systematic study of some groups of insects, however small, and publish the result as a personal contribution to the pure science of entomology. We would be better workers in economic problems for so doing. A study of the habits of insects in nature's laboratory fits one for a grade of systematic work that he never could attain as a closet naturalist."

"A knowledge of food plants, of broods, of local variations, and of variations occurring among the offspring of a single pair, determined by careful observation in nature's haunts or by breeding in the laboratory, is as essential to enable one to establish true specific differences as is a thorough knowledge of structural character."

"To promote a science it is necessary to make known its relations to human interests. If men can be shown that their health, wealth, or happiness depends upon a knowledge of insect life, there will be no trouble to interest people in the study of entomology. Show the farmer, the gardener, and the horticulturist the importance of knowing the habits of insects in order to successfully combat the pests that destroy their crops; bring to the attention of the preacher the inexhaustible fund of evidence and illustration with which to teach his flock the power, wisdom, mercy, care, and omnipresence of the Creator of all; make known to the artist the boundless field which a study of insects opens to him for the display and developement of his powers in portraying graceful and fantastic forms and in preparing and blending colors of the most exquisite beauty and harmony; teach those that instruct the young what a wealth of interesting and easily obtained objects are always at hand from insect life with which to fascinate the child and secure his lifelong interest in natural history study; make it plain to all that the very laws of life that prevail in the higher realm are equally patent among the creeping, crawling creatures of lower rank and smaller size—do all this, and the science of entomology will quickly take the rank it deserves among its sister sciences."

"In closing let me urge that we keep in mind the worthy objects for the promotion of which we are banded together. Let us keep the standard of work up to the ideal conceived by those in whose minds the organization had its birth. Let us show a willingness to sacrifice self-interest when it is necessary for the general good,-and let us do all in our power to preserve and strengthen the fraternal feeling that has ever existed among our members."

In a subsequent discussion of the address, Prof. Webster said that there were very many features in it of vital importance to working entomologists. One thing he considered entitled to especial emphasis and that was the matter of duplication of work. The fact that one member was working upon a given species in one State or Province and another member was working upon exactly the same species in another region of country, while apparently a duplication of work is not really so, because in all probability very different results would be obtained. No two men see the same thing in the same light, and climate, latitude and elevation also have a great deal to do with the action of insects. As to the matter of mapping out work, it must be remembered that most entomologists are limited in their powers, and, while they can plan work, it is not always easy to carry it out, as a station director or a board of trustees might greatly revise his plans. In regard to the introduction of foreign parasites, it seemed to him that it is a field we are just entering, with the future all before us, and there would be many failures; but where such work was carried out carefully he believed it might prove successful with respect to a great many introduced species of insects. When we come to carry it out between States, how

ever, other difficulties will surround us. He went to a great deal of pains to obtain from Professor Morgan an egg parasite of Murgantia, and after getting it established, it was swept out of existence during the winter of 1898–99, and no good has come from the introduction. He was also of the opinion that a great deal could be done by an exchange of experiences with insecticides, such as had taken place in the morning session, as insecticides seldom have the same effect in different portions of the country. It had always seemed to him that the work of the economic entomologist was very largely to work out life histories, and after he had done this and had found out methods that could be used to destroy the insect his duty ends and the work of the horticulturist and agriculturist begins. He did not think it ought to be necessary for an entomologist to make of himself a mechanical, hydraulic, or civil engineer.

Prof. Fernald referred to the remark just made by Mr. Webster to the effect that no two men saw the same thing in the same light, and said that the same was often true in listening to an address, for generally no two men got the same ideas from it. For him other parts of the address than those mentioned by other speakers had presented themselves with particular force, and especially those with reference to collections in connection with the insectary or entomological work of any kind. It seemed to him that the work of a station whether connected with a college or not, is most emphatically educational, for even if it be not educational to students or visitors, it is certainly educational to the workers at the station themselves, and by continually adding to such a collection they are adding to their education as well as to the education of the residents of the region. He had thus far found a great demand for collections rather different from those ordinarily met with. The ordinary collection contains the rare insects as frequently as it does the destructive ones, and by that he meant to uphold the question that was raised in the address with reference to how many of the common insects could be found in different collections. He suggested that, so far as his own experience goes, there are too few collections in which all stages are preserved in connection with the work that insects do. A large part of the material that he receives in Massachusetts does not contain any insect whatever, but simply a sample of the work of the insect which has either escaped from the box or was never inclosed. The problem in such cases is to tell what has done the damage by the damage itself. He found that his greatest help was to preserve specimens of the insect and of the work it was doing, and he used such specimens in the identification of material sent in, perhaps fifty times as often as any other specimens. Our collections, in his opinion, should be amplified along the lines of early stages and the work done by the insects, and such collections will appeal strongly to the people. The whole address was interesting and suggestive, but it was this feature which interested him most. He had also had experience with the Murgantia parasite obtained from Louisiana by the kindness of Mr. Morgan, and while he was now fortunate in not having Murgantia to deal with, it was a great relief, while searching around, to find that there was some one who could assist him, and he thought anything in that line should be encouraged, for when a man wants a thing of that sort he wants it badly.

Mr. Johnson said there was another important suggestion implied in the address, and that was the commercial side of entomology—if the term might be permitted. We have enough systematic entomologists at the present time, and perhaps enough economic entomologists, but we do need another lot of men who will take up purely the œcological side; that is, they must study conditions in the field. The day is coming, and is not far distant, when our great commercial railroads and some of our greatest manufacturing concerns, such as canneries, will employ œcological entomologists just as they employ engineers and other skilled labor. He felt quite certain that this would come about, and that a new field would open to young men especially, who would take up this commercial side of the entomological problem. To give an illustration of what he meant, he said he would try to bring this out in a paper which he would read on the following day on the subject of the pea louse in Maryland, which has destroyed more than $4,000,000 worth of green peas along the Atlantic coast this season.

When insect injury touches the pockets of the producers to that extent they are going to look about for the men who have a knowledge of the insects. It means money to them. He had been in consultation with some of the high officials of one of our principal railroads, and felt certain that the day is not far distant when these roads will employ men to take up the entomological study and development of the territory through

which their lines run. He considered this an important point for the student of entomology to bear in mind. Of course such a man must go out and study conditions over a vast area. He must also know what our worthy chairman is doing in Colorado; what Mr. Weed is doing in New Hampshire; what Mr. Lounsbury is doing in South Africa; what Dr. Fletcher is doing in Canada—in short he must keep posted on the entomology of the whole world and be ready to meet any emergency.

Prof. Hopkins said that he found in the spruce forests of Maine that a large timber concern controlling some 300,000 acres employed a practical forester and scientific man, and paid him about $1,500 a year, to give advice on practical methods of cutting timber and making surveys. The concern mentioned sent this man with the speaker through the spruce forests of Maine to learn all he could about forest insects. This was another evidence of the fact that the practical men are beginning to realize that they can very profitably make use of the results of scientific research.

A vote of thanks to the chairman for his interesting and suggestive address was unanimously adopted.

Dr. L. O. Howard, in the first paper, detailed the operations performed in the introduction and establishment of the *Blastophaga* in the fig plantations of California, which had been carried on since the last meeting. The paper will be published in full in the Year-book of the U.S. Department of Agriculture for 1900.

Establishment of a New Beneficial Insect in California.

A second note presented by Dr. Howard also related to the introduction of a beneficial insect. He stated that it would perhaps be remembered that at the tenth annual meeting of this Association he had referred to his efforts to introduce and establish in this country, with the assistance of Prof. Antonio Berlese, of Italy, the interesting Oriental parasite known as *Scutellista cyanea*. In Italy this curious parasite occurs commonly in the wax scale (*Ceroplastes rusci*), and it was introduced into Italy in all probability from the Orient about forty years ago, although originally described by Motschulsky in 1859 from specimens reared by Nietner in Ceylon from *Lecanium coffeæ*. The living specimens were sent by Dr. Berlese and his colleague, Dr. Leonardi, and were colonized at Baton Rouge, La.; also in Washington D.C., in the insectary of the Division of Entomology upon *Ceroplastes cirripediformis*. The Washington specimens did not succeed in perpetuating the species and nothing has been found since of the Louisiana material. A year later Mr. C. P. Lounsbury, government entomologist of Cape Colony, found this species parasitic upon *Lecanium oleæ*, the common black scale, in Cape Colony, and sent specimens to the writer for identification. The past spring, Mr. Lounsbury, at the writer's request, made formally through the United States Secretary of Agriculture to the Secretary of Agriculture of Cape Colony, brought with him from Cape Town to New York two boxes of twigs covered with the black scale affected with this parasite, and expressed them to Washington, whence they were immediately forwarded to Mr. E. M. Ehrhorn, the horticultural inspector of Santa Clara County, Cal. On June 19 the writer received a letter from Mr. Ehrhorn announcing the arrival in living and healthy condition of the parasites in question. The twigs in one box were somewhat mouldy but quite a number of parasites were crawling about in the box and were found in the pupal condition in some of the scales. Mr. Ehrhorn had been warned by telegraph and had prepared twenty-five infested oleander plants by potting them and had covered each with a tight bag of the finest Swiss muslin. In these most of the parasites were liberated and a few were allowed to fly in the orchard. Specimens of a hyperparasite (*Tetrastichus* sp.) also survived the journey, but Mr. Ehrhorn was on the lookout for this parasite and isolated them as they appeared, pending instructions from Washington as to their destruction. The writer had strong hope of the successful establishment of this species at San Jose, the climate being appropriate and the supply of food unlimited, and stated further that this was another instance of international entomological work which emphasized the fact that this Association through this class of work binds together its members all over the world more than any other association.

At the opening of the discussion on the paper, Dr. Howard said that he would be glad to hear from Mr. Lounsbury on the subject of this parasite of the black scale. He

said he wished to add that Mr. Lounsbury had sent two boxes, one a deep box and the other a shallow one. The shallow box carried the more successfully; the scales had begun to rot in the deep one.

Mr. Lounsbury stated that the history of the case dated back to his first arrival in Cape Colony. Before he had been there a year he noticed that the black scale was not injurious, and upon travelling about the Colony he found the same condition true over many thousand miles of territory. Later, upon obtaining specimens of the parasite and corresponding with Mr. Howard on the subject, the latter had suggested his sending it to California. For four years he had been watching for an opportunity to get a sufficient number of parasites to send, but the scale is so well kept in check by the parasites or by other factors, that until this year he was unable to find a large quantity. Last year he mentioned the matter in his annual report; a copy of which he had sent to Mr. Ehrhorn, who at once wrote and asked him to take steps to get the parasite established in California. He replied that he would gladly do all he could, but would like Mr. Ehrhorn to make it a formal matter so that he might be able to spend the time and money necessary. This was done and Mr. Lounsbury received formal orders to go ahead. He set about it in two ways: First, he had scales collected and reared young larvæ from them, which were placed on young oleander trees now being kept in the Cape Town gardens. Primary parasites were to be admitted to the plants, but secondaries excluded. These plants in time he may be able to send to the United States in Wardian cases. Second, while waiting for these to develop he had Mr. Mally go out and search the country side, with the fortunate result that relatively large colonies of scale were found where Mr. Lounsbury had seen small colonies the year before. Mr. Mally collected for nearly a week and brought in over a bushel of twigs which were carefully sorted, cut into foot lengths, and the ends dipped into sealing wax. The twigs were then wrapped in tissue paper. The matter of the differently shaped boxes was purely accidental. He went to the grocery shop and picked out what he thought would be best suited, taking one shallow box and one deep box in order to try them. He thought that packed in the manner above described and placed in a wooden box, what moisture came would be absorbed by the wood. The boxes were packed the night preceding Mr. Lounsbury's departure, the deep box being placed on a dry shelf in the fruit room of the Cape steamer and the shallow box kept in the stateroom. In this way the insects were taken to England, which he hurried across and took the next liner. He then tried to get the box which he had kept in the fruit room also placed in a cool room on the New York steamer, but found no choice between putting it in the meat room or leaving it outside. He preferred not to freeze the insects because the parasites, not being accustomed to such temperature, might succumb, and he therefore placed the box in an empty cabin below the water line. The voyage was fortunately cool, the temperature averaging about 60°. The shallow box was kept in his stateroom, as on the Cape steamer, and immediately upon arrival in New York both boxes were shipped to Dr. Howard. They arrived in New York in 25 days from Cape Town, a quick passage which, perhaps, could not be repeated.

On being asked if the black scale in South Africa is destructive to citrus trees to the same extent as in California, Mr. Lounsbury replied that he had seen citrus trees infested in only about ten places in the last five years, and never more than a few scales at any of these places. Occasionally he had seen the scale on citrus trees from Natal or from Australia which had been imported to the Cape. One orchardist having several thousand trees, said he had seen a few on his Australian trees, but they had disappeared. He himself was unable to find any there after a year from the importation. It is not known of what country the scale is a native, but it must have been in Cape Colony for many years. It occurs most commonly on oleander, which at the Cape is an outdoor plant, and Myroporum. He had found it 150 miles inland and on numerous indigenous plants away from settlements.

Transmission of Parasites.

A conversation on the subject of the transmission of parasites from one region of country to another then followed. Mr. Johnson said that he had recently received a request from Mr. Ehrhorn of California, for parasites that prey in the East on the imported cabbage worm. It seemed to Mr. Johnson that this was a matter for co-operation,

and he merely mentioned the fact as a suggestion from Mr. Ehrhorn that it is very desirable to establish such parasites in that section. He had promised to do what he could from his end of the line, and he hoped that others who were fortunate enough to possess such parasites would also assist. He had also received a request from Professor Morgan for specimens of the parasite which he had bred and which Mr. Howard had named. Professor Morgan is anxious to colonize this parasite on *Murgantia histrionica* in Louisiana, and Mr. Johnson had promised to send him parasitized eggs of the harlequin cabbage bug at the earliest opportunity, but up to the present time had been unable to find any specimens of this destructive pest. Three years ago it was one of the most destructive insects in the Maryland and Virginia cabbage-growing sections, but since the freeze of February, 1899, he had seen very few specimens. He was unable to say whether this was due entirely to the freeze or to the parasites. The parasite is a new species (*Encyrtus Johnsoni* Howard, Can. Ent. Vol. XXX, pp. 17, 18) and there seems to be some promise of its successful introduction into the South.

Mr. Gillettte said he considered the matter of parasites one of great interest, and he hoped the subject would be further discussed. In Colorado nature often seems out of balance. There are a number of species which are not abundant in the East, but which are very injurious in Colorado, and he thought it was because the parasites have not been carried to that section of the country. In his opinion it would be of the greatest benefit to certain portions of the country to introduce insect enemies, both parasitic and predaceous.

Dr. Howard said he desired to call the attention of the members of the Association to the fact that this was the most representative meeting of the Association ever held. Not only was Mr. Woodworth, of California, present, with Mr. Fernald, of Massachusetts, Mr. Weed, of New Hampshire, and Messrs Quaintance and Scott, of the Southern States, but also "our dear old friend," Mr. Fletcher, of Canada, and Mr. Lounsbury, who had carried American economic entomology clear across the Atlantic Ocean to South Africa. Mr. Currie, the under secretary of agriculture for Cape Colony, who was recently visiting Mr. Howard in Washington, had said that he was very glad indeed that he had sent for an American entomologist to come to the Cape, and congratulated his department upon being able to secure such a man as Mr. Lounsbury.

Dr. Howard presented a third note in which he gave an account of the useful work performed by the larvæ of a little lady-bird beetle, *Hyperaspis signata*, in destroying the scales on maple trees, *Pulvinaria acericola*, and also those of *P. innumerabilis*. These larvæ very much resemble the scales on which they feed.

Mr. E. P. Felt, State Entomologist of New York, read a paper on

Some Effects of Early Spring Application of Insecticides on Fruit-trees.

He said that a series of tests had this spring been begun near Albany, N. Y., with the object of ascertaining the best method of controlling the San Jose Scale in orchards. During the progress of the work trees were treated with mechanical mixtures of water and kerosene, and of water and crude petroleum, using 20 and 25 per cent. of the oils and applying with a kero-water sprayer. A few trees were treated with undiluted kerosene and others with undiluted crude petroleum; a number of trees were also treated with caustic potash whale oil soap, at the rate of $2\frac{1}{2}$ lbs. to a gallon of water, and some with a combination of the soap and crude petroleum in the proportion of one pound of soap to four gallons of water, and one gallon of the oil to ten gallons of the soap solution. The spraying was mostly done on April 11th and the work was performed in a mixed orchard of over 100 young pear, peach, plum and cherry trees, where the San José scale had been for about eight years, and the trees, therefore, presented every degree of infestation. The undiluted kerosene and crude petroleum were applied to the worst infested trees.

The spraying with the insecticides occurred just before the buds began to open, and with the exception of the trees treated with the undiluted oils very few or no harmful effects were observed. Eight days after spraying, the trees as a rule were budding out. Those treated with kerosene gave little indication of the presence of the oil on the bark, while the dark colour of those treated with crude petroleum was very apparent, a condition which still continues at the time of writing, June 20th. The whale-oil soaps showed to a considerable extent. Photographs were exhibited showing the harmlessness of

mechanical 20 per cent. emulsions of either kerosene or crude petroleum, also of similar 25 per cent. emulsions. Other photographs showed positive injury from the use of undiluted kerosene, and most marked injury from undiluted crude petroleum; one plum tree was killed outright by the latter treatment.

Experiments undertaken in other localities also served to show that crude petroleum may seriously injure trees under certain conditions. The trees may eventually outgrow the harm, and it is possible that the injury may be no greater than the scale would have caused, if allowed to go unchecked. The mechanical dilutions of crude petroleum, at least up to 25 per cent., appear to be harmless if applied before the buds are open, and it is to be hoped that they will prove effective in controlling the scale.

A general discussion followed the reading of Mr. Felt's paper. Mr. Scott said that in Georgia undiluted crude petroleum killed peach and plum trees outright, but 50 per cent. and less strength did very little damage. The best results were obtained with 25 per cent. in mechanical mixture with water sprayed with a Gould kero water sprayer. The application was made just before the fruit buds opened in the spring; all the insects reached by the spray were killed, according to notes made up to June 12. Until that date the sprayed trees remained oily and the odor of the crude petroleum could yet be detected. It is a reasonable conclusion, then, that the scale can not live so long under such a coating of oil. He had concluded that the 25 per cent. crude petroleum in mechanical mixture was better than refined kerosene of the same strength.

Mr. Woodsworth said that when the bulletin from the New Jersey station came out it was heralded all over California, and he had to write more letters in regard to the kerosene and crude petroleum treatment than about any other insecticide. Crude petroleum in California is a very indefinite term, since there is a crude petroleum from Ventura which is as thick and black as molasses, and from that it varies to crude petroleum which is almost as thin as gasoline. Even in a single well the product varies according to depth and age, and distillations show that it varies greatly in composition. He had been assured that the Eastern product varied also, and was of opinion that before we can recommend any percentage of crude petroleum we will have to establish a criterion of excellence. The different kinds of crude petroleum he had experimented with in California produced very different results—strikingly different. There is also a very decided difference in results according to time of spraying with the same oil. Thus spraying before rain and after rain may produce entirely different results. He had sprayed with some forms of crude petroleum without injury which would have thoroughly destroyed the foliage at another time of day. The amount of water in the leaf may determine to a certain extent the damage by the oil. It seemed to him, therefore, that another thing that must be done before we can really properly understand the action of the oil will be to study the effect of the oil upon the vegetable tissue. Perhaps this had already been done, but it was still in large part a mystery to him.

Mr. Webster said he had used oil from two wells located in different parts of Ohio this year, and although the analysis ran almost exactly the same in each case the effect has been different. In the one case he had not seen the orchard for several weeks, but when he last saw it the peach trees seemed to have been in many instances killed by the use of crude petroleum. He could not say whether the oil had been applied just before or just after a rain. In the other case the trees sprayed were seedling apples on the experiment farm, the experiment being made to determine if possible the effect upon the trees and not against insects. Some of the trees leaved out at the proper time about as freely as usual, while others had no leaves at all. At the present time, however, there was no apparent difference whatever in them, all having finally leaved out precisely the same. It was evidently nothing but a temporary injury. His experiments had produced such various results that he was badly mixed up and did not favour recommending the use of kerosene of any sort. He was of the opinion that the variation would be just as great in the crude article as in the refined.

Mr. Hopkins said that in West Virginia they have a great variety of petroleum, from that as thick and black as molasses to the thin light-coloured product. The oil obtained from the Standard Oil Company is a mixture of all kinds except the heavy oil. The heavy oil is used for lubricating machinery. He had obtained some results which are quite at variance with the testimony of others and show what conflicting results can be obtained in different States. In one case he recommended crude petroleum as an experi-

ment in a large orchard which was almost dead from the scale and which the owner refused to cut down. It had been sprayed once with pure kerosene, which did some damage and killed many scales, but the owner had allowed it to go without treatment and the scales had again covered the trees. He sprayed it with crude petroleum obtained in Baltimore. When he last saw the orchard, in April, the trees were black and greasy, but underneath the bark they were as healthy as ever, the leaves were coming out in full, and the owner claimed that the crude petroleum had benefited them. He was not recommending the oil, but simply giving this as an example. His spraying was done in February and wherever the oil touched the bark it remained dark and greasy for months afterwards. A thorough examination failed to reveal any of the living scales, and he believed that the young scales could not settle and live on the oily surface. He felt very much encouraged. It is one of those problems which require co-operative work. As a result of further investigation, he thinks it may become one of the best insecticides ever discovered. He could not think of any better work than trying to find the reasons for the great difference in results in experimental work with insecticides.

Mr. Webster said he was unable to see what could be gained even if crude petroleum should be perfected. It was true that we will have to get something cheaper and more effective than whale-oil soap, which if used on peach trees except during the winter will destroy the fruit, but in view of the difficulty he had had in getting crude petroleum and the high price asked for it, how much better an insecticide than whale-oil soap would we have even if it was perfected? He thought that entomologists who cared for their reputation would experiment much and say little for publication, for the present at least. He further stated that while experimentation was always in order, it would be best to stick to the whale-oil soap until more obscurities in regard to the use of petroleum had been eliminated.

Mr. Johnston said he agreed with Mr. Webster. We have got to get something better than kerosene for both peach and plum. In one instance he had sprayed an orchard of two hundred 9-year old peach trees in February with 25 per cent. kerosene and not a tree was living on the 28th of April last. It seemed to him that atmospheric conditions were at the bottom of the difficulty, and he thought it would be necessary to go back to the old whale-oil soap remedy, which destroyed the scale more effectively and was less liable to injure the trees. It would not be wise to substitute crude petroleum for whale-oil soap. After three years experience with the soap, kerosene and gas, he was of the opinion that there are other conditions which must be studied more seriously in the future than in the past, and he heartily agreed in the opinion that co-operation is desirable. He believed it would produce better results in the future. We must not confine our labours to the territorial boundaries of a State, but go outside for information, suggestions and experiences of others.

Dr. Fletcher remarked that he was glad to hear what had been said about whale-oil soap and crude petroleum. He had never yet been able to see what object there was in trying to use petroleum. The results were far too conflicting and always unsatisfactory, and the question of cost in the ruin of apparatus was never considered. There was very slight injury to the hose in the use of potash whale-oil soaps, which could now be obtained of pretty uniform manufacture and had been giving good results. These are always to be had, and are easy to get in most places, while he had found great difficulty in getting crude petroleum. He thought there was room for experiment with much weaker mixtures of the potash soaps during the summer. His experience was in favour of these soaps in preference to either crude petroleum or kerosene mixed with water. Even with the kerosene emulsion there is sometimes unexpected injury to the trees, which was always put down to difference in the oil or in the water. He was satisfied for the present that the whale-oil soap was the safest remedy, and it was the best for those who are official entomologists; who have to recommend formulæ to people who will make a mistake if they possibly can.

Mr. Sanderson related his experience with crude petroleum, which was favourable to its use. He had sprayed a pear orchard on the Delaware river with it in the latter part of January, on a cloudy day, followed by a little hail and rain soon afterwards. Two months later he sprayed another lot of 100 trees with a 25 per cent. mixture; it was a very windy day and almost all the trees previously sprayed got a dose of the 25 per cent.

mixture on one side. Examination shows no injury on either lot. Here and there could be seen a tree not doing well, but that was owing to the spray of a year before with pure kerosene. The buds were not injured. The growers in his region never use whale-oil soap, because it destroys the buds. They have used it during midwinter and it destroyed buds, and have now given it up.

Mr. Woodworth said that he did not wish his former remarks to be construed to mean that there is no future for crude petroleum as an insecticide, but he desired to emphasize the fact that there is a great deal to learn. In some of the large orchards in California crude petroleum has been used with success, but not against the San Jose scale. He is of the opinion that there is a great future for crude petroleum, and that the time will come when it will be cheaper in the East. In California it is the cheapest insecticide that can be bought.

Three papers were read by Mr. Clarence M. Weed on "The oviposition of an egg parasite of Vanessa antiopa"; "The oviposition of Cacœcia cerasivorana," and "The relation of Pimpla conquisitor to Clisiocampa Americana." The last-named insect (*Pimpla*) is the most important parasite which attacks the pupa of the apple-tree tent-caterpillar.

Hydro-cyanic-acid gas.

The reading of a paper by Prof. Fernald on "The Marguerite Fly," which he has retained for publication elsewhere, led to a discussion regarding the use of hydro-cyanic acid gas.

Replying to a question from Mr. Johnson, as to whether hydro-cyanic acid gas had been used, Prof. Fernald stated that there was objection to the use of this substance among florists, who have an exaggerated idea of the danger involved and will not often use it. He had no doubt hydro-cyanic-acid gas would be more effective, but thought the florists would prefer to use carbon bisulphide, as this substance had proved satisfactory.

Dr. Fletcher thought that remedial work against the flies during the winter would be better than work against the larvæ after they have eaten the leaves.

Prof. Fernald replied that the problem had been thus far looked at by him entirely from the florists' standpoint, and the insect treated in the stage at which the florists would first see it and want to treat it. He was certain, however, that the fly could be handled by fumigating the greenhouses.

Mr. Johnson stated that one could not be too careful in the use of hydrocyanic-acid gas, and he wanted to caution all those who used it. In one instance, after preparing the chemicals necessary for generating the gas, he thought he would take his chances in dropping the cyanide in the jar and get out, but he felt the effects of the gas almost immediately. By the time he reached the door a haze came over his eyes, everything looked black, and a feeling similar to blind staggers overcame him. Experience has proved that it is not a trifling matter, and he would caution all who had occasion to use the gas. At the same time he felt that hydrocyanic-acid gas was the coming material for the destruction of certain insect pests in mills where stored grain and other products become infested. He had recently performed one of the largest experiments ever undertaken in the use of hydrocyanic acid gas, in a five-story brick mill in Canada. Over 150 pounds of potassium cyanide was discharged in the mill, and the results were very gratifying. It practically eliminated the flour moth from the mill.

Dr. Fletcher said he did not think enough care could be taken in giving instructions when recommending hydrocyanic-acid gas for general use, especially in this stage of introducing it, as a fatal case or two would put an end to its use entirely. Several striking instances had lately been mentioned which show the intensely poisonous nature of this gas. Much more care, instead of less, than has been exercised in the past is necessary. With regard to the use of bisulphide of carbon, he certainly was not satisfied with its use in mills and had not got the results promised for it. He was very sorry Mr. Marlatt was not present at the meeting, as his laisser-faire policy had given him a lot of trouble with the people he had to deal with, and he was of the opinion that some others of the Association might have liked to discuss that matter somewhat.

Mr. Webster stated that his fumigating houses in Ohio are covered carefully and made perfectly air tight by the use of layers of building paper, but if the ordinary nurseryman makes his own fumigating house he would not make it any more air-tight

than a hencoop. He had tried almost every way of introducing the cyanide, but the man who did the work invariably complained of severe headache, until he devised a method of combining the mixtures under the floors.

Mr. Lounsbury suggested that a simple way was to have a small lead tube leading from the outside of the house. the vessel containing the cyanide being placed under the tube, the door closed and locked, and the water and acid freshly mixed being poured in through the little funnel or tube and the aperture closed.

Mr. A. L. Quaintance of the Georgia Experimental Station, read the next paper on *Diabrotica 12-punctata* which is a serious pest to corn in the Southern States. The injury to the plant is confined almost entirely to the work of the larvæ on the underground portions of the plant, as the roots and stem below the surface of the soil. The attack is mainly in the spring while the plants are quite young. The writer gave an account of the life history of the beetle and the experiments that had been made with a view to its control. He found that if eight to ten grains of corn be planted in each hill, the plants would not all be destroyed, and the injury from this Southern corn-root worm would be practically avoided, or so distributed that the damage would be trifling.

Mr. C. P. Lounsbury gave a long and very interesting account of his observations on the habits and associations of a number of species of Ticks that cause great annoyance and much injury to live stock in South Africa.

Mr. W. M. Scott presented a paper on the Coccidæ of Georgia in which he enumerated 41 species of scale insects that he had found in the State, and gave their localities and food-plants.

On Saturday morning, June 23rd, the Association met in joint session with the Society for the Promotion of Agricultural Science, the President of which (Prof. Beal) read his annual address. Dr. L. O. Howard gave an account of the progress of Economic Entomology in the United States, which is published in the year-book of the U.S. Department of Agriculture for 1899; and Mr. C. P. Gillette read a paper entitled "Apiary Notes."

NOTES UPON THE DESTRUCTIVE GREEN PEA LOUSE FOR 1900.

(*Nectarophora Destructor*, JOHNS).

By W. G. Johnson, College Park, Md.

Perhaps no insect in recent years has attracted more attention than the destructive green pea louse. It became conspicuous, first, on account of its ravenous attacks upon the pea fields, a crop heretofore practically immune from the ravages of insects; and, secondly, from the fact that it was a species not recorded in science. What condition in nature was responsible for such a general distribution of a new species of insect the writer will not attempt to discuss in this short paper. It appeared last year, and was recorded for the first time, from Maine along the Atlantic coast southward to North Carolina, and westward to Wooster, Ohio. It was also observed in Nova Scotia and Ottawa, Canada. I had it sent to me from Massachusetts and Vermont in July and August, and complaints of its serious nature have come to me from Chillicothe, Ohio, Long Island, N.Y., portions of New Jersey, and Wisconsin (August). I first observed the pest May 18, 1899, and have had it under constant observation from that date to the present writing. I described the newcomer in the February issue of the Canadian Entomologist as *Nectarophora destructor*. A very long name, I admit, but if there is anything in a name being a burden to its possessor, we hope that this one will accomplish such a purpose.

From the first I have held that this insect is probably a clover pest. It has been observed upon both red and crimson clover, and this season hundreds of acres of red clover have been destroyed by it. In one instance, reported to me June 13, Mr. C. Silas Thomas, of Lander, Frederick County, Md., stated that the pest had almost entirely ruined 65 acres of red clover for him. Many other cases of a similar nature were reported or observed by us. The attack has been very common upon crimson clover also, but I have not heard of a field being killed by it. That clover, and perhaps the red clover, is

its original food plant seems quite conclusive from our experiments and observations. I am of the opinion that red clover is its original food, and that it is, therefore, primarily a clover pest. Without doubt it is a native American insect, and has spread its attacks to crimson clover and field peas, as these two plants have encroached upon the feeding ground of the louse. It spends the winter, at least in the South, as an adult in clover fields. It may winter in another form farther north.

It is barely possible that this insect has other food plants and lives over winter upon them, but clover is, no doubt, the main plant upon which it lives. Mr. F. H. Chittenden, of the U.S. Department of Agriculture, Division of Entomology, in Washington, observed this insect, or one very closely allied to it, feeding upon a number of species of vetches in Washington this year.

From a long series of experiments in the laboratory we have shown that there are two kinds of females known at present, the winged and wingless forms. No male has as yet been discovered, and perhaps in the South none exists, and the insect remains over winter in the adult stage, as stated above, upon some plant, and in most instances this is clover. The female produces living young which reach maturity in from ten to fifteen days, and possibly less time in hot weather. As an example, a young one born March 4 reached maturity (winged form) March 16, or 12 days from time of birth, and was producing living young on March 19. From that date to April 17 it became the mother of 111 young and then died. Her first young (wingless form), born March 19, reached maturity and was producing on March 31, or eleven days from time of birth; from that date to April 13 she gave birth to 120 young and died. We have made many other observations of a similar character, but this will suffice to show the rapid reproductive powers of this insect, and we might state that in many instances where this insect was first observed on May 1, three weeks later the fields were abandoned on account of its attacks. Calculated from the average number of insects produced per day (which is 6), in six weeks one would become the progenitor of 423, 912.

It was estimated last year that the total loss from the attacks of the creature along the Atlantic Coast States was $3,000,000, and that the crop was only one-half the usual output. From information obtained from the largest growers, the most experienced seeds men, and most extensive dealers in this line of business, "The Trade," a canned goods journal published in Baltimore, has gathered the information that the crop of peas of the Atlantic Coast this year will not exceed, on the outside, one-third of what it was last year. This is about as serious as it can be, when it is taken into account that it is mostly due to this one pest, and that it is certain to increase its destructive powers from year to year, unless some factor in nature intervenes to check and retard its further development. With this condition of affairs it is not strange that farmers have become thoroughly discouraged and make the statement that they will be more cautious about planting peas for market purposes, or for the packer, in the future.

With this year's experience, however, we have shown conclusively in our experiments and practical works in the field that this insect can be kept in control to a very great extent if taken in hand in time. In the first place, the peas must be planted in rows 24 or 30 inches apart, and not broadcast or in drills, as has been the case over a wide area throughout many of the Southern States. As an illustration of this we may cite an instance on the place of Mr. C. H. Pearson, a large packer of Baltimore. His 600 acre pea plantation was practically saved by persistent and energetic efforts on his part this season. All the methods from a practical standpoint were tried on this place, and it was found that the brush and cultivator method was the most effective. Forty men were therefore engaged to work in the field, and the 600 acres were brushed and cultivated every third day for a period of two weeks, and in this manner the entire field was saved, netting the owner from 25,000 to 30,000 cases of peas of 2 dozen each. It is a fact which is not questioned by those who are familiar with this plantation that had not this persistent and energetic fight been followed, the greater portion of the peas would have been destroyed by the insect. Last year the peas over the same area were broadcast so there was no opportunity of fighting the pest, and as a consequence 480 acres were entirely ruined by it. This year, by changing the method, and by a new system of fighting the pest, the peas have been saved. Many other illustrations of a similar nature could be given where we have been following this method persistently in this State.

The brush and cultivator method is a simple one; a good pine switch is used to

brush the vines backward and forward ahead of the Iron Age cultivator, drawn by one horse, and in this manner the insects are covered and a very large proportion of them destroyed. The cultivation should not be repeated until the third day, as it requires usually something over forty-eight hours for the destruction of the adult insects when covered with earth. On this plantation we also sprayed a large acreage to show the practical side of this work. Suffice it is to say that we have found that no spray can be used which can destroy a percentage of insects large enough to warrant the expense of the operation. In this instance we sprayed 100 acres in two days, and thoroughly tested the method from every standpoint, using various materials. We abandoned the spraying apparatus, and began the brush and cultivator method, which was followed up persistently, with the results already noted. We have also used the "brush and pan," in which a bushel of lice were caught to each row of 125 rods long.

Many natural enemies, such as parasitic and predaceous insects, have been found feeding upon this pest in the fields, and in this manner, no doubt, the number has been somewhat reduced The most important factor, however, we have observed in the destruction of this pest has been the fungous disease, *Empusa aphidis*, which was common during the early part of the season upon this insect, in both clover and pea fields. It is a contagious disease and destroys the pest in very large numbers, under certain conditions. In one instance we found 58 dead lice upon the undersurface of a single lobe of a clover leaf, and it was not an uncommon thing in June to find 15 or 20 dead lice upon the under surface of a pea leaf. With the rains which prevailed throughout this section of country during June, which fostered the developement of the disease, it spread rapidly throughout the infested fields, and as a consequence it was very difficult to find the pea-louse upon late peas. A careful examination of peas where the insects were abundant in June showed that they were practically free from them. We feel, therefore, that the climax, as far as the development of the insect this season, has been reached, and that these silent factors in nature are now actually reducing the pest to such a point that it may possibly be several years before it will be such a destructive pest in this section as it has been for the past two seasons. At any rate, the conditions are such that the farmer and canner have new hope, and we trust the future will bring fewer lice and more peas.

In discussing the paper, Prof. Hopkins enquired whether the insect were possibly an introduced species, and if there were any records of its previous occurrence in large numbers.

Mr. Johnson replied that, in his opinion, it was not an introduced pest, but an indigenous insect, which had multiplied enormously from the change of conditions. The only record he had regarding it was one made ten or twelve years ago by Mr. Beckwith at the Delaware station, and another of its occurrence along the Potomac River in 1887. In neither case, however, was it certain that it was the same insect, as no specimens had been preserved. The pea-growers state that the insect has been known to them for many years.

Prof Hopkins said that this case is such a complete parallel to the invasion of the pine-bark beetle, the trouble from which is now over, that it occurred to him that in this case, within the next few years, this insect will probably disappear or become exceedingly rare. He had taken the trouble, in connection with the investigation of the pine insect, to look up the history of invasions by indigenous insects, and found that they multiply rapidly for several years, become enormously destructive, and a few years later disappear. They are destroyed by parasites or by climatic conditions and soon become rare species. This happened in the case of the pine insect, which was scarcely heard of before, and was one of the rarest insects in collections until it suddenly occurred in 1891 in such enormous numbers as to destroy millions of dollars worth of timber, but now it is practically extinct. Not a single living specimen has been found since the fall of 1892. Prof. Johnson's paper shows the great importance of the work he has undertaken, and his experience will be of inestimable value in dealing with future outbreaks of the pea louse. He thought the farmers of Maryland would make a great mistake by changing their locations for growing peas until perhaps a year had elapsed, because if the rule follows in regard to sudden invasions by indigenous insects they will soon disappear or become rare.

Mr. Johnson said he was greatly obliged to Mr. Hopkins for his opinion, but there is so much money at stake that the growers could not let the matter rest awaiting nature's

relief. He believed fungous diseases, especially *Empusa aphidis*, are one of the factors which will bring about the temporary disappearance of the pest.

Mr. Galloway said the point in regard to the appearance and disappearance of forms holds good in fungous attacks also, the most striking example being the potato blight. The same holds good in the passing of the Russian thistle. These things come and go and come again, and the principle holds good with fungous diseases as well as with insects.

Papers were read by Mr. B. T. Galloway on "Progress in the Treatment of Plant Diseases in the United States," and by Prof. Webster on "Meteorological Influences on the Hessian Fly." These were retained for publication elsewhere. The meeting then adjourned to the Central Park to inspect Mr. Southwick's spraying outfit.

On reassembling in the afternoon an elaborate and valuable paper was presented by Messrs. E. D. Sanderson and C. L. Penny, of the Delaware Experiment Station, on "Hydrocyanic Acid Gas as an Insecticide on Low Growing Plants." The results of their experiments proved that this method of treatment is practicable, but, owing to its cost, only for plants of some considerable value and for relatively small areas. Under many circumstances it could be used to much better advantage than any other means of combating a pest, and often might be found effectual where no other method of extermination were possible.

Mr. Sanderson then presented a paper, "Notes from Delaware," in which he reported upon the most noticeable attacks of the year in that State, and dwelt particularly upon the destructive green-pea louse, which had already been under discussion. After giving an account of the various parasites which preyed upon the insect, he said:

"The enemies of the lice appear too late to prevent the bulk of the injury, and as the same was true last year, it seems impossible to place any dependence upon them. It seems evident, however, that the lice are attacked by a parasite while still in crimson clover (parasitized lice were also common on red clover), but are not parasitized until they have been on peas for some time. Is it not possible the sudden appearance of the lice last year may have been due to the severe winter, which killed off the parasites and other enemies which usually hold the lice in check on the clover and so reduce their numbers that but few of them spread to peas?"

"The very sudden appearance of this new species last year was a unique entomological surprise. Where it came from was a question. It would seem to me that the original food plant of the pest was clover and probably crimson clover. It is true that crimson clover is not grown in the North where the louse was found destructive last year, but it is entirely possible that it may have spread from sections in which crimson clover is grown to red clover in these localities, but have been held in check by its parasites, and remained unnoticed. Furthermore, the insect enemies of red clover have at various times received study without this species having been previously noted. On the other hand, there seems to be good evidence that the louse has been on crimson clover for several years. One of our best farmers, Mr. Frank Bancroft, of Camden, Del., tells me that he has seen what he judges to be the same louse on crimson clover for at least six or seven years. In 1890 crimson clover grown upon an experimental plot at the Delaware Station became so badly infested with a plant louse that it was feared it would be killed. Professor Beckwith's notes state (May 11, 1890) that these were exterminated by a fungous disease, and the clover was not seriously injured. Upon looking over the station collection I found specimens of *N. destructor* which unfortunately were without any label, but were among material which was unquestionably collected prior to 1896. Upon corresponding with Professor Beckwith he informed me that he distinctly remembered preserving specimens of the aphis in question. As his accession catalogue shows no such specimens to have been numbered, though by no means conclusive, the evidence is at least strongly circumstantial that *Nectarophora destructor* occurred in injurious numbers on crimson clover as early as 1890."

"As regards remedies, I have practically nothing new to offer. It evidently is important to plant crimson clover as far from peas as possible, and to turn it under as early as practicable."

APHELINUS FUSCIPENNIS AN IMPORTANT PARASITE UPON THE SAN JOSE SCALE IN EASTERN UNITED STATES.

By W. G. Johnson, College Park, Md.

For the past eight years the writer has been paying particular atttention to the parasites attacking scale insects. During this period many species have been bred, but not many specimens from any particular scale. The instance cited below is, perhaps, the most important from the economic standpoint yet discovered in these observations.

Since we assumed charge of the State work in Maryland we have collected the San Jose scale on various food plants, and inclosed infested twigs, about 4 inches in length, in glass cylinder tubes open at both ends. The ends were closed with cotton, and if any parasites existed upon the scales they were easily detected and mounted for study. Only upon rare occasions have we taken more than a half dozen specimens from a single tube. This experience has been repeated year after year until the fall of 1899.

Of the four species of true parasites known to feed upon the San Jose scale, three of them have been bred in Maryland. So far as I know *Anaphes gracilis* How., bred by Dr. L. O. Howard from scales from Charles County, Md., has not been reared from this scale from any other State. *Aspidiophagus citrinus* Craw. has been reared only in California from this pest. *Aphelinus mytilaspidis* Le B. and *Aphelinus fuscipennis* How. have been reared from scales taken at the following places in this State: Riverside, Annapolis Junction, Araby, and Mitchellville. Last fall, however, I discovered a new locality for *A. fuscipennis* near Easton, Talbot County, in an infected orchard along the Miles River. The orchard contained a miscellaneous variety of fruits, and all the trees were quite seriously infested with the San Jose scale. Instructions had been given the owner to cut them down as soon as possible and burn them. A quantity of small branches incrusted with scale were brought to the laboratory and inclosed in breeding tubes. Much to my surprise these tubes were swarming with parasites a few days later From one tube 1,114 specimens of *Aphelinus fuscipennis* were taken; while a second tube gave 432, a third 1,478, and a fourth more than 1,000, but owing to an accident the count in the case last mentioned was not exact. The writer was greatly elated over the discovery, and immediately sent out the following statement to the State press:

I am advising my correspondents not to burn twigs and branches cut from trees infected with the San Jose scale. If the tree is so seriously infested it can not be saved, it should be dug up by the roots, trimmed, and the brush and wood piled in the orchard, where they should be left until about the 1st of June or longer. If the trees are to be sprayed with either a 25 per cent solution of kerosene and water, whale-oil soap (2 pounds in a gallon of water), or crude petroleum, the pruning should be done first and the cut branches gathered up and piled where the spray cannot reach them.

This is done to preserve the little friends nature has supplied to help keep the scale in check. If the twigs and branches are burned or sprayed the parasites would be destroyed, as they feed upon the scale insects and are now wintering under the shell-like cover protecting them. These parasites are very small, being scarcely visible to the naked eye, yet they play an important part in the economy of nature. They are wasp-like in general appearance and quite active. It would be very difficult to estimate the actual number of parasites present upon a 5 or 6 year old peach or plum tree, but it is safe to say that they would run into the millions if the parasitism was at same rate as upon the twigs in the tubes.

If I had burned these twigs I should have destroyed all the parasites. On the other hand, if I had left them on the ground in the orchard the little friends would have escaped and concentrated their attacks upon other trees where the scale had been missed by the sprays. It is clear, then, that by using a little judgment in these matters we can assist nature in restoring the balance she desires. Do not sit down and fold your arms thinking nature is going to restore this equilibrium at once; you must do your part faithfully and well. Prune your orchard as soon as possible and save every twig that contains a scale; then spray with a 25 per cent. solution of kerosene and water, using any first-class spray pump, or with whale-oil soap (2 pounds to a gallon of water), before the buds open.

There is no possibility of the scale spreading until some time after the 1st of June. The young begin to appear in the vicinity of Washington, D.C., June 10 to 15 [in 1900 young were seen by the writer crawling June 3 near Washington], and the insect continues to breed until very cold weather. We have seen young, just born, on trees as late as December 19. When a twig is cut off between, say, December 20 and May 15, there is no possible danger of the scale spreading from it. It is not possible to transfer one of these insects from one twig to another after it is "set" and formed a scale over its back, and all of them die as soon as the sap is dried out of a cut twig or branch. Badly infested trees of no commercial value should be cut down as soon as possible, before the buds open, and the brush piled. Do not leave the stump standing, as it may prove a veritable breeding place during the summer. If you are so unfortunate as to have this scale, remember that eternal vigilance must be the order of the day, and you will find before you are through with it that it is no trifling matter.

The orchard in question was not destroyed by burning, as first suggested, but the trees were pruned and the cuttings saved. In May, 1900, the writer had a large quantity of the branches from this orchard carefully packed and sent to Mr. W. W. Cobey, Grayson, Charles County; to Capt. R. S. Emory, Chestertown, Kent County, and to Hon. Charles G. Biggs, Sharpsburg, Washington County. Instructions were sent to place the infested branches in grape baskets and hang them about the orchard where the scale was most abundant In this manner we will establish *Aphelinus fuscipennis* in the various counties and under different conditions. We have every reason to believe that the experiment will prove successful.

In this case the study of parasitism has given us a valuable suggestion for the treatment of scale infested orchards, namely, never burn a twig or tree cut late in the fall, winter, or early spring. A positive remedy one day may be wrong the next day, just as we are able to unravel nature's secrets and interpret them for own good.

Since the above was read the writer has tested a lot of twigs from the Charles County orchard and has bred numerous specimens of *A. fuscipennis*, thus proving that a parasite is thoroughly established there.

Mr. A. H. Kirkland read a paper on "the Brown-tail Moth in Massachusetts," in which he gave an account of the natural spread of this injurious insect throughout the State. The infested area in 1896 was only 29 square miles; in 1899 this had increased to 928 square miles.

The next paper was by Mr. C. P. Gillette, who gave a series of interesting notes on some of the most important insects of Colorado. Mr. Johnson followed with "Notes on insects of economic importance in Maryland during 1900," and Prof. Webster with an account of the "Insects of the year in Ohio." Foremost among these he placed the Hessian fly, regarding which he said: "In point of destruction the Hessian fly outranks every other insect, when considered in connection with the wheat crop of 1900. It is doubtful if there will be over 20 per cent of an average crop in Ohio; the remaining 80 per cent may be largely charged up to the ravages of this pest. As an average crop in Ohio amounts to, approximately, 40,000,000 bushels, the loss may be computed at 32,000,000 bushels, which at the ruling market price would mean a loss of $22,400,000, at least three-fourths of which, or $16,800,000 can be justly charged up to the ravages of the Hessian fly. More extended studies of this outbreak and some of the meteorological phenomena connected therewith are given in another paper. The unprecedented abundance of the pest this year may be attributed largely to the almost total lack of parasites, the retardation of the fall brood over the northern half of the State, and the extremely favorable weather during the autumn of 1899, which enabled all but the very latest deposited eggs to hatch and the larvæ develop to the "flaxseeds" and thereby defy the adverse influences of winter. In many localities the later sown wheat escaped fall attack and up to May 1, 1900, was uninjured, but the flies developing in the earlier sown fields seemed to have migrated *en masse* and settled down on those sown later, and the result is that in many cases the destruction is as complete in the one as in the other."

Mr. Woodworth gave a short account of the Entomological situation in the State of California, referring especially to Scale insects, the Codling moth, peach and grape insects. The last paper read was by Dr. Fletcher of Ottawa, who gave an account of the most noticeable insect attacks of the year in Canada, mentioning those affecting fruit trees, roots and vegetables, cereals, fodder-plants, and trees and shrubs.

Before the meeting closed, an interesting discussion took place on the matter of common names for insects, in which a number of the members took part. A committee was appointed to deal with the common names of such injurious insects as may be discovered in the future and to remove ungainly and inappropriate names.

The following officers were appointed for the ensuing year: President—C. P. Gillette, Fort Collins, Col.; First Vice-President—A. D. Hopkins, Morgantown, West Va; Second Vice-President—E. P. Felt, Albany, N. Y.; Secretary-Treasurer—A. L. Quaintance, Experiment, Ga.

The next meeting will be held at Denver, Col. on the 22nd and 23rd of August, 1901.

REGULATIONS RE SAN JOSE SCALE

Extract from The Canada Gazette of Saturday, January 12, 1901.

ORDER IN COUNCIL.

His Excellency, in virtue of the provisions of section 5, chapter 23, 61 Victoria, intituled "An Act to protect Canada from the Insect Pest known as the San Jose Scale," and of 63-64 Victoria, chap. 31, "An Act to amend the San Jose Scale Act," and by and with the advice of the Queen's Privy Council for Canada, is pleased to order that exemption from the operations of the above mentioned Act shall be and is hereby authorized of any trees, shrubs, plants, vines, grafts, cuttings or buds, commonly called Nursery Stock from any country or state to which "The San Jose Scale Act" applies; and that all importations thereof shall be and are hereby permitted to be entered at the Customs Ports only of St John, N B., St. John's, Que, Niagara Falls and Windsor, Ont., and Winnipeg, Manitoba, between the following dates in each year: 15th March to 15th May in the spring, and 7th October to 7th December, in the autumn; and at Vancouver, British Columbia, during the winter months only from 15th October to 15th March, at which ports they will be thoroughly fumigated with hydrocyanic acid gas by a competent Government official in accordance with the most approved methods.

All shipments made in accordance with the above will be entirely at the risk of the shippers or consignees, the Government assuming no risk whatever.

Packages must be addressed so as to enter Canada at one of the above named ports of entry, and the route by which they will be shipped must be clearly stated upon each package.

As it is well known that well matured and thoroughly dormant nursery stock may be safely treated, but that there is danger of serious injury to the trees if fumigated in the autumn before the buds are thoroughly dormant, or in the spring after the buds have begun to unfold, all stock which when received is immature or too far advanced for safe treatment will be refused entry and held at the risk of the shipper.

His Excellency, in virtue of the provisions of section 7 of the Act first above mentioned, is pleased to direct that the authority herein granted be published in the *Canada Gazette*.

JOHN J. McGEE,

OTTAWA. Clerk of the Privy Council.

OBITUARY.

Mr. JOSEPH EVELEIGH TREFFRY died at Quebec, of spinal meningitis on the 27th day of April last—his second wife had died but a few months before. Mr. Treffry belonged to a Cornish family. He came to Canada about thirty years ago, and at first lived in Montreal. After a while he moved to Quebec, and for ten years was reporter and proof-reader on the staff of the *Morning Chronicle*. He left newspaper employment to accept the Government position of English translator in which he continued till his death. He had been a member of the Quebec Branch of the Entomological Society of Ontario from its formation; and his ready pen and ability as a journalist had often been exercised in its favour. Before his bereavement his wit and good humour had added greatly to the interest of the meetings of the branch. He was buried in Mount Hermon Cemetery. T. W. F.

THE NORTH-WEST (CANADA) ENTOMOLOGICAL SOCIETY.

The second Annual Meeting of the North-West (Canada) Entomological Society was held at Lacombe, Alberta, on 16th January, 1901. It was a meeting essentially in the interests of farmers. At the request of the President, the chair was taken by Mr. F. H. Wolley-Dod, of Calgary, who was supported by the vice-President, Rev. M. White, and several well-known farmers of the district. A number of letters in support of the objects of the Society were read, including letters from Mr. C. W. Peterson, Deputy Commissioner of Agriculture, N.W.T.; Prof. C. C. James, Deputy Minister of Agriculture, Ontario; Dr. James Fletcher, Dominion Entomologist, and the Right Reverend the Bishop of Calgary and Saskatchewan.

The President of the Society, Percy B. Gregson, on being called upon (after the opening remarks by the Chairman) explained that the object of the Society was to instruct and interest the farmers of the North-West regarding the insects that affect them,—to bring home to them individually the principles which underlie the treatment of insect and weed pests, so that they can deal with them in time, without waiting, as so many do, till their crops are destroyed before applying for advice. Mr. Gregson stated that farmers were beginning to appreciate the value of the study of insects, and this was evidenced by the fact that a number of Agricultural Societies had during 1900 become active supporting members of the North-West Entomological Society. Mr. Gregson impressed on farmers the importance of careful observance of the habits of the insects that came under their notice, such as their time of appearance, their method of feeding, the nature of their food, etc. Some insects, such as beetles and caterpillars, feed by nibbling their food, and poison should therefore be placed on their food, so that the insects when consuming the leaf will also consume the poison with it. Other insects such as lice, pierce through the outside of the leaf with their trunk-like beaks, and poison, therefore will not reach them. As however, insects breathe through little openings in their sides they can be suffocated by anything which clogs up their breathing valves, such as coal oil emulsion, or the fumes of tobacco.

The list of injurious insects in the North-West is already a long one, and as insects always follow cultivation, we must, as the country gets cultivated, expect arrivals of fresh insects. There are very many ways by which insects are always liable to be imported into a new country. They may come in clothes, lumber, domestic animals, packing substances (such as hay, straw or grass). It was probably in packing substances that all the grass stem maggots, common to Europe and America, have reached us, including the Hessian fly, the wheat stem midge, and wheat stem saw-fly.

In applying remedies there is a reason for each different remedy recommended, and in the list of insects presently given the reason for each remedy can readily be seen.

The Principal Injurious Insects of the North-west for 1900.

The Red Turnip-beetle (*Entomoscelis adonidis*). In many places from south of Calgary to north of Edmonton, and in Saskatchewan and several districts in Assiniboia this beetle has been more or less abundant—in some instances devastating entire fields. Around Beulah, in Manitoba, it has also been somewhat abundant, but chiefly confined to mustards. Remedy: Spray the plants with Paris Green solution (1 lb. to 160 gallons of water) and stir in also 1 lb. of quick-lime, or if in small quantity, ½ oz. of Paris Green, ½ oz. of quicklime, and a pail-full of water. In mixing Paris Green Dr. Fletcher recommends that it should first be made into a paste with a small quantity of warm water, and the paste afterwards mixed with the larger amount of water required. If it does not adhere readily to the leaf, a little soap added to the water will overcome the difficulty.

The Turnip flea Beetle (*Phyllotreta vittata*) has been very general throughout the North-west Territories, but the damage done was not great, owing to a counter-attraction in the shape of mustards. Remedy: Dust the young turnips with dry Paris Green and land plaster, or dry Paris Green and sifted ashes when the dew is on the young turnips. This little beetle hatches in May—about the third week—and by deferring sowing the turnips until June the beetle will have hatched and disappeared to native cruciferous plants before the young turnips are up.

The Diamond Back Moth (*Plutella cruciferarum*) in June and early July was extremely abundant throughout the Territories and in many parts of Manitoba, practically the whole of the cultivated area of Alberta, Assiniboia and Saskatchewan was visited by this pest, and many fields of cabbages, cauliflowers and turnips were completely destroyed. The larvæ of this moth also attacked lettuces. radishes, rape, etc. A field of turnips badly infested with this pest presents a weird and ghastly appearance. The riddled leaves are bleached and white like skeletons. Parasites have destroyed immense numbers of the larvæ. Remedy, as to turnips, young cabbages, etc., except lettuces: Paris Green solution as recommended for the Red Turnip-beetle. The chief difficulty is in getting at the underside of the leaf, as the larvæ principally attack from underneath, In the case of lettuces, hellebore should be used. Scatter on the leaves—as much underneath as possible—when the dew is on, a mixture of 1 lb. of hellebore to 2 lbs. of sifted ashes.

The Colorado Beetle (or Potato-bug) has again made its appearance in Central Alberta, though not in large numbers. On 28th June both larvæ and mature insects were seen in several potato fields, but no great damage done. As this is the second year of appearance of this insect in Alberta it is possible these are an advance guard, and it is well to look out for them. Remedy, the same as for the Red Turnip-beetle. Do not kill the lady-birds. This bright scarlet little beetle and its larvæ greedily devour the young larvæ of the Colorado beetle.

The Three-lined potato-beetle has been more troublesome than the Colorado beetle. In some localities in the south of Central Alberta it has seriously damaged potato crops, but its presence elsewhere has not been reported. This beetle was the chief insect pest of potatoes in Ontario until the arrival of the Colorado beetle, which it seems to have heralded. Remedy, the same as for the Red Turnip-beetle.

The Rocky Mountain Locust has been very bad in parts of Manitoba, north of Douglas, and around Aweme. This pest is dealt with in the May, June and July numbers of the leading agricultural journals, issued from Winnipeg, so fully and clearly that its characteristics and remedies need not be repeated at length. In the Nor'-West Farmer, for instance, of 21st May, 1900, is a very good account of them. The insect lays its eggs in the soil among the stubble in the early fall (August and September) and they hatch in the following spring. If, therefore, the soil be deeply fall plowed the eggs will be buried so deep that the young when they hatch cannot get to the surface.

Cutworms,—(in Alberta and Assiniboia principally the garden ones such as *Agrotis clandestina*, *Plusia brassicæ*, and *Carneades ochrogaster*) have caused the usual amount of loss and replanting in several districts among cabbage and cauliflower growers. It is difficult to understand why there need be any loss from this pest when the remedy is so easy. Remedy: Take say 50 lbs. of bran and very slightly moisten it with water, and sweeten with a little sugar. Then mix well with it enough Paris Green to just color the bran (e.g. about a lb. of Paris green). The cutworms will eat this bran in preference to the cabbages. The common cutworm is not a climber, so wrapping a piece of smooth paper about 3 inches in breadth around the stem of the young cabbage when planting out is a good preventive remedy. The paper should be $\frac{1}{2}$ an inch below the surface of the soil and $2\frac{1}{2}$ inches above. Keep the garden clear of weeds and rubbish, old cabbages or cabbage stalks in the fall, so that the cutworm moth will have no attraction for laying its eggs. A more serious trouble, however, has been caused by another kind of cutworm in Manitoba. This is the glassy cutworm (*Hadena devastatrix*), and it, in the spring, committed very serious injury to wheat crops north of Stonewall. This pest was present in some fields in thousands, and marched in a phalanx devouring as they travelled. The remedy for the glassy cutworm is not easy. The grub burrows into the earth in the daytime, and comes to the surface to feed at night. It eats the whole plant, beginning just below the surface. Thoroughly spraying the grain along the front of their attack for a space of ten feet with a solution of Paris Green has been found successful. If however the crop has been ruined, turn chickens or turkeys into the field for a day or two, and then sowing oats for green feed might be tried.

Wireworms. These are the larvæ of the "click beetles." This is a pest very difficult to get at. There are several species of wireworm. They pass the winter in cells in the soil, so that for some species a plowing in August, and for others a plowing late in

the fall, will disturb these cells and kill the inmates by exposure. Seeding down only encourages the wireworm, but barley and rye seem distasteful to this pest, and fair crops of these can be grown even if the field be badly infested with it; and possibly the field itself be ultimately cleared of the pest.

Among pests of foliage has been the pallid aspen beetle. The loathsome larvæ of this beetle were very destructive to the early leaves of aspen poplars throughout Alberta and the Territories, and considerably marred their beauty. Remedy: Poison their food by spraying with Paris Green solution.

The striped cottonwood beetle was also very abundant on willows. The fetid larvæ emit, when disturbed, a milk-like fluid from tubercles along their back, and trail a sticky fluid wherever they crawl upon the leaf. This is a very troublesome pest in the East, in districts where osiers are cultivated. The larvæ as well as the beetle cause the osier canes to branch by injuring the tips. Should osiers be cultivated in the Northwest this pest will be on hand. Remedy: Paris green or green arsenite solution sprayed on the food.

Lice on poplars and plants have been common in many parts of Alberta. *Remedy:* Suffocation by coal oil emulsion, or fumes of tobacco. The Western Blister Beetle was reported like "swarms of bees" on beans at Lethbridge in Southern Alberta about 25th June. Other blister beetles were abundant on vetches in Central and Northern Alberta.

Fleas. Towards the end of summer this pest became an intolerable nuisance throughout the Northwest. Hay mattresses swarmed with them. A slight odor of carbolic acid will prevent them from coming into a room so scented; but if introduced with hay or otherwise, then burning pyrethrum powder is a good remedy for driving them out.

Warbles in cattle appear to be on the increase. Cattle farmers are very well acquainted with this fly, but it is a trouble that is too apt to be treated as of not a very serious nature, and as not preventable. This, however, is a great mistake. In the first place the bot maggot, or warble, so damages the hides that grubby hides sell for one-third less than sound ones. But the beef itself is rendered so inferior that buyers of the highest class of meat, who supply hotels, &c., will not on any account buy carcasses showing traces of warble attack Such beef has therefore to be sold at a lessened price below that obtainable for good beef, the reduction sometimes amounting to $5 per carcass. In view of the large and increasing exports of beef (cold stored) to England, it becomes important to see that the reputation of the Northwest is sustained by keeping stock free from this pest. In dairies, too, the loss sustained through the attacks of warbles is just as serious. There is the loss in quantity of flow of milk as well as deterioration in quality, resulting from the annoyance of the animals by the flies when depositing their eggs, and later by the grubs The shrinkage in the milk is estimated at 10 per cent. and the deterioration in quality at the same rate, making a total of 20 per cent. By the time the warbles are discovered in the spring the mischief is done. Certain localities are more particularly infested than others, and a dry season seems more encouraging to the warble fly than a wet season, and where there is danger of the warble the animals should be protected during the summer months by spraying them occasionally with strong smelling oils, such as fish oil, train oil, kerosene emulsion, &c.

To make kerosene or coal oil emulsion add to 1 gal. of kerosene hot soap suds made of $\frac{1}{2}$ gal. of water (rain water preferred) and $\frac{1}{4}$ lb. soap. Then churn all thoroughly together till it will adhere to the surface of glass without oiliness. When required for use, dilute the emulsion by adding from 9 to 15 times its measure of warm water.

After the close of the discussion consequent on the President's address, the officers of the Society for the year 1901 were elected. The officers for 1900 were re-elected in the capacities respectively held by them with the exception of A. D. Gregson, who retired from the curatorship, the same being accepted by Percy B. Gregson, the collections having been safely removed to his house.

Mr. F. H. Wolley-Dod most generously presented to the Society a large number of Lepidoptera, the bulk of which were new to the collection.

Mr. O. C. Poling, of Quincy, also presented to the Society several exceedingly rare specimens including Neophasia Terlootii and Erebia Magdalena. Some of these specimens are represented in but one or two other collections in the world.

After a vote of thanks to the Chairman, the proceedings terminated.

Report of the Council.

On behalf of the Council of the North West (Canada) Entomological Society, the President begs respectfully to submit the following report:

Several fresh works have been added to the library of the Society during 1900, among them being a complete set of "Insect Life," (partly the gift of Dr. L. O. Howard and partly by purchase). The impossibility in this distant country of access to an outside Library of any kind has been and is an obstacle which the Society hopes gradually to surmount by accumulating serviceable works of its own.

It is encouraging to note that the farmers are taking a marked and growing interest in economic entomology,—the President having during the past year given by request addresses or papers on twelve occasions and at various places in Alberta and Saskatchewan. Various agricultural societies have become active supporting members of the North-West Entomological Society.

A field class of young folk has been started in Lacombe, and operations (all being well) will be commenced in the ensuing spring.

A most welcome assistance has been received from the Territorial Government in the form of an annual grant of $25 towards furthering the objects of the society.

Acting on the advice of the original supporters of the Society, it was decided to defer attempting the issue of a magazine for a year, and in the meantime the president has, without cost to the society, circulated a large number of agricultural papers among farmers whenever such papers published matters of interest in economic entomology.

Percy B. Gregson,

1st January, 1901. *President.*

Auditors' Report.

Receipts and expenditure of the North-west (Canada) Entomological Society:

Receipts.		*Expenditure.*	
Members' Fees	$26 00	Library	$26 00
Territorial Government Grant	25 00	Stationery	7 00
Deficit (met by President)	38 50	Meetings (Farmers' etc.)	23 00
		Printing account	6 50
		Cork, pins, etc.	5 00
		Store books, glass, etc. and other apparatus	8 00
		Expense account (postage, etc)	7 00
		Subscriptions to periodicals	7 00
	$89 50		$89 50

I hereby certify that I have examined the books and vouchers of the Treasurer of the North-West (Canada) Entomological Society and find them correct, and the above is a true statement of the accounts of the Society.

J. L. Tipping,

Waghorn, 1st. January, 1901. *Auditor.*

INDEX.