ANNUAL REPORTS

OF THE

FRUIT GROWERS' ASSOCIATION,
FRUIT EXPERIMENT STATIONS

AND

ENTOMOLOGICAL SOCIETY OF ONTARIO.

1897.

TWENTY-NINTH ANNUAL REPORT

OF THE

FRUIT-GROWERS' ASSOCIATION

OF

ONTARIO.

1897.

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CONTENTS.

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To the Honorable John Dryden, Minister of Agriculture:

SIR,—I have the honor to present the Twenty-ninth Annual Report of the Fruit Growers' Association of Ontario, containing papers and discussions on subjects of vital interest to the fruit-growing community. Among other questions you will note that we have given much consideration to the benefits of spraying, the prevention of the spread of the San Jose scale, the possibility of exporting our tender fruits in cold storage, and other important themes, all of which will be of great interest to the farmers and fruit growers of Ontario.

I have the honor to be, Sir,

Your obedient servant,

L. WOOLVERTON,

Secretary.

GRIMSBY, December, 1897.

FRUIT GROWERS' ASSOCIATION OF ONTARIO.

OFFICERS FOR 1898.

President.—W. E. WELLINGTON, Toronto.
Vice-President.—W. M. ORR, Fruitland.
Secretary-Treasurer and Editor.—L. WOOLVERTON, Grimsby.

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Division No.	1	W. A. WHITNEY, Iroquois.
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"	3	GEORGE NICOL, Cataraqui.
"	4	W. BOULTER, Picton.
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"	10	J. A. MORTON, Wingham.
"	11	T. H. RACE, Mitchell.
"	12	ALEX. MCNEILL, Windsor.
"	13	G. C. CASTON, Craighurst.

Auditors.—A. H. PETTIT, Grimsby, and GEORGE E. FISHER, Freeman.

FRUIT GROWERS' ASSOCIATION OF ONTARIO.

ANNUAL MEETING.

Town Hall, Waterloo. Wednesday, Dec. 15, 1897.

The President, W. E. Wellington, took the chair and called the meeting to order about 10.30, after which the following committees were duly appointed :

Fruit Exhibit : Messrs. M. Pettit, G. E. Fisher and T. H. Race.

Resolutions : Messrs. Thomas Beall, W. M. Orr, Alexander McNeill.

Nominations : Messrs. A. M. Smith and A. H. Pettit (by the President) and Messrs. M. Pettit, W. H. Dempsey and T. H. Race (by the meeting).

New Fruits : Professor H. L. Hutt, the Secretary and the President.

Constitution and by-laws : Messrs. M. Pettit, Thos. Beall, George E. Fisher, Alexander McNeill and T. H. Race.

All these committees were to report at this meeting except the Committee on new fruits.

PRESIDENT'S ANNUAL ADDRESS.

By W. E. Wellington, Toronto.

It is with a feeling of pleasure, that at this critical period in the history of fruit growing in Canada, I am able to meet the Fruit Growers' Association, with a feeling of hopefulness for the future of this great industry.

For some years past there has been a feeling of great anxiety amongst fruit growers, and with some cause. The difficulties of raising fruit, through the attacks of insects and fungi, were very alarming, but when to this was added the great difficulty of selling the fruit at a profitable rate, in the markets of Canada, it became a subject for very serious contemplation. The cost of raising the fruit was much greater than in the past, and the prices obtained, especially in years when we had full crops, were so much less, that many felt there was little or no money in the industry, and that something must be done, or fruit growing would have to largely be given up in this fertile Province, which is so finely adapted for producing the choicest fruits that are grown.

Thoughtful men, however, have been trying to solve the question, and, it seems to me, with every prospect of success, and I think that many will agree with me, when I say that there is even a greater success in the future then there has been in the past, if fruit growing is carried on in a business-like way, and advantage taken of the new openings which we have found in the markets of England for our surplus fruit.

I believe there is a great market also in the North-West, but, as I suggested last year, on taking my seat as President of this Association, the difficulty to overcome was mainly that of transportation. It will only be a few years, in all probability, before the great North-West is pretty well settled, and there will be a large population who will require our products, and will be dependent upon us for furnishing them fruit, which is such a necessary and beneficial article of diet.

As you all know, experiments have been carried on this season by the Federal Government, aided by leading fruit growers of this Association, in trying to solve the problem of landing our fruit in the English market in perfect condition. I believe that this problem has been pretty well solved, inasmuch as we know the requirements that are necessary to place our fruit in the English market and bring handsome returns.

It resolves itself into this—that only the best fruit must be sent, put up in small packages, carefully and well packed, and that our cold storage system must be so perfected that we can keep the temperature of the fruit, until it is landed in the market, not over thirty-four degrees.

Without going into detail, as our secretary has a full report, and will give you the results of the shipments, I may say this, that where the fruit has been kept properly cool, and put up in proper packages, the returns have been most satisfactory.

This matter is one that should receive the serious consideration of the fruit growers assembled, and I strongly favor committees being appointed to aid the Government in still further carrying out the experiments which have been inaugurated the past season. I am satisfied that success is before us, and that we may with confidence look forward to the future of fruit growing in Canada.

This matter of shipping properly cannot, however, be carried on in an erratic manner. There must be systematic organization, and supervision by competent officials, who will see that packages are properly put up, and that no inferior fruit is slipped into these packages. I am satisfied that one of the great causes of the poor returns which are obtained for fruit, is the fact that there is so much poor fruit thrown upon the market by people who would not take pains to cull the fruit, and who in their anxiety to sell everything they grew, whether first-class or otherwise, have not been careful in putting up their packages in an honest manner. Buying as I do, a large amount of fruit for my own use, in the market in Toronto, and being interested in fruit, examining packages as they are displayed in our fruit stores, I am satisfied that there is room for great improvement in this respect, and that while there are many honest dealers who put good fruit on the market, their honesty is discounted by the many who place inferior fruits and dishonest packages before the public. The suspicion with which people regard the packages, has a tendency to lower the prices, and I thoroughly believe that if we could have legislation in this respect, it would be of the greatest benefit to the fruit growers of this Province.

I leave this matter, however, to the consideration of the society, and I have no doubt it will receive the thought and attention which this subject demands.

Our fruit growers will watch with great interest the result of recent shipments to the West Indies. The enterprise of the shippers is greatly to be commended, and while there will be difficulties that are unexpected to be overcome, and no doubt losses to face in making experimental shipments, it is only by such pluck and enterprise that we can learn the requirements necessary to complete success.

The advantages and necessity of thorough spraying has been fully demonstrated the past season, as set forth in Mr. Orr's report, and it is therefore unnecessary for me to enlarge on the subject. That it pays has been shown ; that it must be done if it pays is self-evident.

During the past year a new pest has invaded our country which is more dreaded than all others combined. It has been distributed throughout the Province of Ontario by trees imported from American nurseries, and fruit-growers have every reason to dread this terrible pest, and we must act in an energetic and thorough manner to rid ourselves of it. It cannot be accomplished, however, without aid from our Governments, which we have every reason to believe will be accorded us. The Ontario Government has acted in a very prompt manner, and in a way that I am sure will commend itself to the fruit-growers of the Province, and I believe, as far as it lies in its power, will do everything they can to stamp out this pest.

We must, however, have legislation at Ottawa to prevent the further importation of infected trees, and I would strongly impress upon this Association the necessity of organized action to bring before the Honorable Minister of Agriculture and members of

the Federal Government the necessity for prompt action to either prevent the importation of American trees or have them so thoroughly inspected at certain ports of entry (all shipments being confined to these ports) that infected trees cannot further be distributed throughout the Province. All efforts within will be of little avail if the infected trees are allowed to be imported in the future.

Already many States in the Union are taking action, one against the other, and inaugurating laws to stamp out the dread pest, and we, whose interests are so largely bound up in the industry of fruit-growing, must ask our Government to take effective measures to prevent a further spread of the scale.

The Executive of the Ontario Fruit Growers' Association took it upon themselves to call a meeting of the fruit growers to take measures for the destruction of this pest, and Prof. James Fletcher, of Ottawa, and Prof. J. H. Panton, of Guelph, were sent to the meeting, which was held at an orchard in Niagara which was supposed to be infested with the scale. There we found that all reports were true, and discovered that the orchard was seriously affected.

Representations were made to the Department of Agriculture for Ontario, and in response to our request Mr. Orr was appointed Inspector, and he has been busily engaged during the season in locating infected orchards.

Later we found that the pest has been more generally distributed than at first supposed, and in Essex, where so many American trees have been planted, the pest has greater foothold even than in the Niagara district.

I believe that the Hon. Mr. Dryden is at present preparing a bill to come before the Legislature from which we hope much, and it is for the Ontario Fruit Growers' Association to consider what further steps shall be taken to save our orchards.

You will remember that the Executive decided at the beginning of the year to as largely improve our monthly journal as the state of our finances would admit. It was decided to discard the colored plates that had formerly been used and substitute in their stead photogravure illustrations. The result has been that we have been able to use a larger number of illustrations than ever before, and at a much less expense than it would cost for colored plates each issue.

The increased size of the page, and the increase in number of pages, from forty to forty-eight, is worthy of note. In some issues the number of pages has grown to fifty-six, and if the patronage continues to grow, as we have every reason to believe it will, the size of the journal will still further be increased.

The improvement, not only in the cover, but in the matter of the journal, has, I believe, been very generally appreciated. The most flattering notices been received by myself and our secretary through private letters, and the press of the country and also of the United States have in many instances given us very flattering notices, showing that the step which the Executive have taken has earned the appreciation of the public and the results have justified the expenditure.

This is a move in the right direction, and I have hopes that still greater perfection will be reached, and that our journal will take a still higher place amongt the horticultural productions of the Province, in the near future.

I wish also to congratulate the directors and members of this Association upon the fact that we have now reached a greater number of subscribers than ever before in our history In 1887 the membership was 1,600. We have gradually increased since that date up to the last year, when the paid membership was over 2,500. Now, the number of paid members is about 3,500. Besides this, there are upon our list about 250 unpaid members, not counted in the above number, who will no doubt renew.

True, there was one year in our history when the membership ran up to 2,800, but this was under extraordinary pressure. The premiums given away to obtain this result were pianos, sewing machines, and other articles of considerable value. We have not resorted to any such unhealthy means of securing subscriptions, but our members are people interested in our work, and are likely to continue with us as permanent subscribers,

The premiums offered by the Association have given good satisfaction, are of good value, and of use to people interested in fruit growing. We have endeavored to send out the very best of stock, and something that was new and desirable to test. As a result, we have had no complaints from our large membership, which is well worth noting.

The expenditure during the year, for the distribution of plants, amounted to $344 08, and the following is the list of plants distributed :—

422 new Japanese Lilacs.
1,100 bulbs (Speciosum Rubrum.).
1,468 plants, Conrath Raspberry (two plants in each package).
791 Dempsey Pear Trees.

Usually, the premiums to be given the following spring have been decided upon so late in the winter as to serve little purpose in securing new subscribers. Your Executive, therefore, have made up the list of premiums for the coming season at a much earlier date, and we believe the result will be to materially increase our subscription list.

Our list for 1898, decided upon, is as follows: (*a*) Improved Pæony. (*b*) Crimson Rambler Rose. (*c*) Gault Raspberry. (*d*) New Victoria Black Currant. (*e*) Wickson Plum.

A circular has been issued containing this list, with description of the different varieties, in order that the work in obtaining subscriptions may go forward in advance for the coming year.

One of the most important features of the work of our Association during the the last year or two has been the encouragement of the formation of affiliated horticultural societies. These societies are formed under the Agriculture and Arts Act in incorporated towns and villages, and where they have a membership of fifty or over, receive a grant from the Department of Agriculture. They are allowed to spend their money in securing lecturers on horticultural topics, in distributing floral treasures among their members, and also in distributing horticultural literature. Under the latter head they are able to give each of their members the *Canadian Horticulturist*. Our association undertakes to send a lecturer to each society at some time during the year.

There are now twenty-seven of these societies, and several more are being formed, which are likely to unite with us during the coming year. A great increase in our subscription list may confidently be looked forward to, in this direction.

It is very gratifying to myself and your directors to find, at the end of this year, that we have a surplus in hand. It means, with the large expenditure and improvement in our journal, that it has all been done judiciously, and after careful thought, and without any extravagance. It means that we shall be able to prosecute our work without borrowing as much money from the bank as we have found it necessary to do during the last few years, and it shows an onward movement, as era of prosperity in the history of our Association which means a largely increased benefit to every member.

I believe that the Society in its present prosperous condition is one of the strongest factors for the benefit and good of the fruit grower in the land, and that worked on the lines at present adopted it will still further advance the interests of the fruit grower.

The small grant by the Legislature, I believe, is one of the best, and productive of as great good, as any expenditure which the Legislature may make.

In conclusion, I would urge upon the members of the Association, united action in the development of outside markets, united action working towards the reduction of the cost in transportation; united action to be taken to regulate the packing of fruit, the packages in which it is packed, and the appointing reliable and intelligent agents to sell the fruit, so that the fruit grower may get the full benefit of his labor, and lastly, *imme-*

diate action to bring before the Federal Government the necessity of drastic measures being put in force, before the spring shipments of infected trees are made, to prevent the further spread of the San José scale.

I have to thank the directors and the members of the Association for the consideration they have shown me, and have no doubt that my successor will receive a continuation of the same.

TREASURER'S REPORT FOR THE YEAR 1896-7.

Secretary Woolverton then read the Treasurer's Report and also the report of the Auditors and Finance Committee thereon, which, upon motion, was adopted.

Receipts.

Membership fees	$3,325 17
Government grant	1,800 00
Advertisements	538 71
Back numbers and samples	48 92
Binding and bound volumes	29 95
	$5,742 75

Expenditures.

Amount due Treasurer, December 1, 1896.	$ 41 25
Canadian Horticulturist	1,798 49
Salary—Editor, Secretary and Assistant.	1,200 00
Commissions	551 82
Premiums	344 08
Illustrations	294 92
Affiliated societies	287 05
Printing and stationery	261 30
Directors' expenses	257 50
Postage and telegrams	140 00
Reporting	105 00
Express and duty	54 39
Collection and discount	31 38
Auditing	30 00
Committees	29 30
Bookbinding	23 45
Advertising	22 80
Care of rooms	3 00
Exchanges	1 00
Balance in hand December 1, 1897	266 02
	$5,742 75

We have examined the books and vouchers of the Secretary-Treasurer and find that they agree and are correct.

A. H. PETTIT, } Auditors.
G. E. FISHER, }

GRIMSBY, 9th December, 1897.

REPORT OF THE FINANCE COMMITTEE.

To the Board of Directors:

We, the undersigned, your Finance Committee, have to report that we have carefully examined all accounts and payments made by our Secretary-Treasurer, and have initialed them to show that we approve of them; and we believe the expenditures have all been made in the best interests of our Association. We note with satisfaction the large increase in membership and also the increased receipts from advertising, both being larger than in any other year of our history. We also wish to note the careful, neat and systematic manner in which all books and accounts are kept.

(Signed) A. M. SMITH,
W. M. ORR,
M. PETTIT.

THE KIEFFER PEAR.

The SECRETARY asked the opinion of the delegates in regard to the Kieffer pear. At Grimsby it is an immense bearer—excels any other variety we have in the orchard. The quality is debatable, but when kept for a little while it yellows up and looks marvellously pretty. A few have been exported to the Old Country. It carries perfectly, and sells equal to any pear that we have shipped. Whether it is desirable to recommend it for cultivation, or whether the growers here think it is worth growing to a large extent, is the question.

Mr. JONES (Cataraqui): I had a sample in the Kingston market this fall, grown in the eastern part of the Province, between Napanee and Belleville, and the man who had it on the market reported it was an immense bearer, and it was certainly selling on the market. Although the quality was not what you call first-class, it was not bad, and where tender varieties might be grown I think it would be a valuable pear.

R. L. HUGGARD (Whitby): I have had a good dead of experience with the Kieffer pear. Out of some thirty-four or thirty-five kinds I have had fruiting for some years, the Kieffer has out-balanced all of them as far as finances are concerned. We have never had a blight with it since I started planting it. It is not number one in quality, but for its season it fills the bill, as there is no other pear on the market. I shipped my last barrel of Kieffers only a week ago, and I expect to get $5 for it. I have been selling them in the fall all along for $3.50 to $4.50. Of course we ship them north. I have no hesitation in recommending a planter to set out quite a number of Kieffer pears, inasmuch as they are hardy, early to bear, and immense bearers. I have grown Kieffers since the Philadelphia Exposition.

Mr. ALEX. MCNEILL (Windsor): There is no doubt about the quality of the Kieffer pear when it is canned. We have used it for a number of years. I have some growing it, and I am perfectly satisfied with its quality when canned, and also with the quality of it and its salability, and I believe there is something in it. Those growers who are growing for quality simply perhaps had better not plant too many Kieffers to eat out of hand; but when properly canned, and where they are thinned and do not generate that peculiar grain in them that you find in a pear that has been grown on a tree that is overloaded, which is very disagreeable in a canned fruit, the quality is there. If you are in fruit growing for the money that is in it as well as the love of it, the Kieffer pear will yield you excellent returns. Certainly it is one that can be recommended for a commercial fruit grower.

Mr. W. BOULTER (Picton): I would like to ask the speaker if he has any secrets about the canning process?

Mr. MCNEILL: None that are not already known to Mr. Boulter, but perhaps for the uninitiated we have a few. My wife does the canning.

Mr. BOULTER: I don't want any misunderstanding. You might possibly draw an inference from Mr. McNeill that anything would do to can that would not do to eat.

Mr. MCNEILL: No, I don't mean that.

Mr. BOULTER: Don't run away with the idea that you can put anything up in cans. Any article you put under an hermetically sealed case, if properly put up, will have the flavor when you open the can that it had when it was put in. All the boiling and cooking cannot change the nature of that Kieffer pear or any other article of fruit that you put up; so don't run away with the idea that you are going to improve it by canning. Of course you can make it a little sweeter or a little more tart, or something of that kind. We put up very few of the Kieffers, and my experience is it has not been the very best.

Mr. GEORGE FISHER (Burlington): There are quite a good many Kieffer pears planted in the Burlington district, and those who have them planted always seem to like them, and those who have not them are not quite so sure. I have fifty trees, and while in Montreal last month I made careful enquiries as to the value of the Kieffer pear on that market, and was told that they had always been able to sell them, but generally it was

necessary to find somebody that never had had any. (Laughter.) That is my idea of the Kieffer pear—you have got to have somebody that has not had them.

Mr. BOULTER: I bought a dozen trees, and I took all the scions off and grafted, and I have not a Kieffer pear left, and I am very thankful. I gave the President an order for a lot of pear trees the other day, and I didn't put one Kieffer in.

Prof. L. R. TAFT (Agricultural College, Michigan): In Michigan we find that the Kieffer does fairly well where we have a warm rich soil in the southern counties. There they get a good size and are comparatively free from this granular nature. As we get north or on the colder soils they do not get to a large size, and as a result the texture is not anything like first-class. We don't regard the flavor as first class, but we think it is a fair pear for canning where well grown. I am surprised to hear of its not blighting in Canada, for with us, although perhaps not exactly one of the worst, it is as bad as the ordinary varieties in blight. I think I have had more complaints from that this year than from any other variety.

Dr. WM SAUNDERS (Ottawa Experimental Farm): We find the Kieffer in British Columbia does remarkably well. You know at Ottawa we are not able to grow any pears except the hardy Russian sorts, so that our experience is not very much in regard to this particular subject; but there we find the trees bear well and they are healthy, and I think we have had finer crops of fruit as far as the quantity is concerned from Kieffer than from any other variety we grow.

The PRESIDENT: That is the experimental farm at Agassiz?

Dr SAUNDERS: Yes; the quality is pretty much the same there as it is in the east—it is granular. The quality is decidedly inferior, and while it is said to be a good canning pear, yet I hold the same opinion as my wife—that the best pears are none too good for canning. At the same time, where the Kieffer can be grown to advantage, and other varieties cannot be grown to the same advantage, it may be proper to grow them for that purpose.

Mr. MCNEILL: I think there is a misconception here with regard to this canned fruit. I had no idea whatever of hinting that the best were any too good for canning purposes, but I think it is the experience of everyone here that many fruits that are good out of hand are not good to can, and many fruits that are good canned are not good out of hand. It may be true to a certain extent that canning fruit does not change its nature, but it is not altogether true. Even the very best fruit that you get in the cans are not the same as fresh fruit; it never is the same. Take strawberries as an illustration. Nothing is more delicious than fresh strawberries, but who would care for canned strawberries? I never tasted canned strawberries that approached my idea as to what canned strawberries should be. There are different varieties of apples, such as the Minerva, that are scarcely fit to eat out of hand, but when canned it is delicious.

Mr. W. M. ORR (Fruitland): I have grown the Kieffer; I have about 500 trees out, which shows I have some faith in it. I think among pears it is about what the Baldwin and the Ben Davis are among apples. It is a beautiful tree, vigorous grower and abundant bearer. There is a difficulty about its bearing—it overbears—and then the quality of the fruit is not nearly so good as when it is thin and the fruit fully matured. We put the fruit away, and when it becomes fully matured it has a beautiful color and is a very fair eating pear, and for canning purposes reasonably good.

Mr. BOULTER: I can understand why Mr. McNeill has never eaten any good canned strawberries—he lives too close to the United States, where they never put up any in proper shape; but I will take pains to send him up some good canned strawberries. It is simply folly to say that you cannot preserve them, and in the general interests of the fruit-grower canning should not be condemned but rather encouraged, because it creates a market that otherwise would not exist, and uses up surplus stock that would simply be flooding the market. I believe, after the thousands of dollars and the long experience spent in canning, that canners are now able to retain the flavor of the fruits put up.

NEW FRUITS.

The PRESIDENT: I would like to hear what new fruits are valuable; perhaps some new ones have been tested at Ottawa.

Dr. SAUNDERS: I would rather wait awhile. There is a box or two to come from Ottawa with some of the newer varieties of fruit, and especially a good many of the Russian fruits, which do not improve on acquaintance. I don't know whether they are good enough for canning; most of them are not good enough for eating.

Mr. HUGGARD: We have had considerable discussion over the Japan plums through the columns of the *Horticulturist*, and I was very much pleased indeed to read them. My experience with three or four kinds is that they superseded almost all the varieties that I have planted previously, with the exception perhaps of four or five. They bear abundantly; they are beautiful looking; they are large, which is a great point in the market, and necessary to obtain a large price. I am not speaking of canning, but for selling them by the basket it is necessary to have a well-colored and large plum to get a good price; and I find that Japan plums so far keep up equal with the very best of our common kinds.

Mr. R. B. WHYTE (Ottawa): Have any members of this part of the country tried the Mayberry—the strawberry-raspberry?

Mr. A. E. SHERRINGTON (Walkerton): The strawberry-raspberry is perfectly hardy with me.

Mr. WHYTE: What about fruit—is it any good?

Mr. SHERRINGTON: Plenty of fruit; it fruited right on till frost, and is fruiting still. The fruit was perfect in shape. I noticed in the *Horticulturist* that at Geneva it does not set fruit except a few odd ones, but with me the fruit is perfect in every way. It ripens up, but it has its drawbacks, and great ones at that. It is no use to eat from the hand—it is like a piece of leather; there is no juice, it is dry. We had enough this year to can a jar, and they were delicious canned—(laughter)—very rich; but in my experience it will never be profitable, for the simple reason there is never enough, unless you have a very large plantation, to pick any quantity at a time. They are out in bloom and ripened fruit and green fruit coming on all the time. You cannot get sufficient to make any pickings that would be any good in the market. You might have a bed for home use if they were thought sufficiently worthy for that, but I could not recommend them for planting for marketing purposes. The plant dies down in the fall completely out of sight, and they come up in great trees in the spring. I sent a sample to our Secretary, and a very correct photograph of it appeared in the *Horticulturist*, but of course it does not show the color. It is very fine in appearance. I would not advise anyone to plant it for commercial purposes.

Mr. D. J. MCKINNON (Grimsby): What about plums?

Mr. SHERRINGTON: I have the Abundance. With me the tree is just as hardy as any other. They blossom at the same season as our other varieties. One bore two samples. Fruit matured very fine in appearance, skin thin and tough, and I consider they were a fair quality, of a peculiar flavor which I think most anyone would like. So far they seem perfectly hardy. The first year I planted the lowest thermometer record was thirty degrees below zero, yet they were not the least injured with frost. I have other varieties, but they have not wintered with me; they were only put in last spring. The Wickson has made over three feet of good growth this season; it was planted last spring. Another peculiarity I notice now is their wintering; they grow late in the fall, but this fall those that were out two years cast their foliage just as early as all other kinds, but those that were planted this spring carried their foliage up till late in the spring.

Mr. ORR: How old are the oldest trees you have planted?

Mr. SHERRINGTON: They have been out two years.

Prof. TAFT: From our experience with the Wickson it is a promising plum especially in the milder section of Michgan. It is the largest plum I have ever fruited, weighing three or four ounces on young grafts, and they bear with us a year after grafting; grafted in the summer they bear a good crop the following season, and gave a shoot a foot in length; cut back to that length we allowed three or four shoots to remain, and there the average was three or four ounces. It is a little better quality than Pond's Seedling—a little more rounded, and to my taste, it is better in quality. Of the other Japan plums I believe there are at least a dozen on the market that are really worthy of cultivation. The Red June, and it seems to me the different variety of Red Nugget—some call it the same, but with us there is a difference of probably ten days in the season—and while I have not tried the Hale I think it will be perfectly hardy. The Burbank is a promising plum where you can grow any kind of plum. The great trouble with this plum is that it blossoms a few days earlier than the hardy varieties, and at the same time is a little more tender in the flower, but fully as hardy where they ripen. I was afraid of the Wickson as far as hardiness was concerned. It is a seedling of the Kelsey, but with us it has proved perfectly hardy, and seems to me one of the best of Japan plums. The Grand Duke has been a very promising plum. We have fruited it now for five years, and that, with the Black Diamond, Monarch and Kingston are all valuable late plums. It seems to me with you and with us in Michigan it is a late plum we need to grow for profit.

The PRESIDENT: Confirming what Prof. Taft has said, I may say concerning the Wickson that we have grown a great many trees and they have stood twelve to fifteen degrees below zero without injuring the top bud, and I think so much of the plum that I have put out an entire orchard of the Wickson—I am so convinced of its great value for commercial purposes. Other Japanese plums we have found are just as hardy as the ordinary varieties. The only cases in which they were injured at all is the first year, where they make sometimes a very heavy growth, and then the top buds would perhaps be killed back; but after that we had no trouble with that at all. They are just as hardy as the ordinary varieties, and the fruit, in abundance, is certainly good. It comes out of the can in excellent shape and has a peculiar flavor that I think is very attractive. The same may be said of Burbank, which probably is an improvement on the Abundance.

A DELEGATE: What about the Satsuma?

The PREISDENT: I have never fruited that, but in our section it is perfectly hardy; we don't have any trouble with it killing back.

Prof. TAFT: That is a very productive variety with us, and as most of you know it has a very deep red flesh. The juice is red, and when canned, unless thoroughly sweetened, it has to me a pleasant acid flavour, but it would not eat at all from hand. That is the least liable to be killed in the flower. It blossoms ahead of any of the others that I have tried.

Mr. BURRELL (St. Catharines): My own experience has been this year that the Abundance has been of better quality than the Burbank. I don't know whether there is any difference in the season. We thought the Abundance was a more sprightly, pleasant flavor in every way than the Burbank, which seemed heavy and soggy. I would like to ask Prof. Taft if they have experience in picking plums and keeping them to ripen for some time.

Prof. TAFT: I never picked them before the time of ripening. I pick them just when you would call them ripe. They softened and had a sweeter, pleasanter taste than those freshly picked.

The PRESIDENT: You consider them good for shipping?

Prof. TAFT: I think so. We have not raised enough to ship them any distance, but we have received them from quite long distances in good shape.

Mr. HUGGARD: My experience with the Abundance and Burbank is a little different from the expressions here. We picked some as soon as they would be useful, really before they matured—and we used some of those and found them not very agreeable. About a week later on we picked some more that were more ripe, and some more left on

the tree for two weeks longer, that would be four weeks from the time of picking the first ones, and the last were decidedly the best in flavor, and they kept firm right to the end, and they didn't rot on the tree. We hadn't one rotten plum, although they were as thick as they could possibly grow on the branches in knots.

Mr. BURRELL: Those that you picked very early you didn't keep as long?

Mr. HUGGARD: No, we just picked them to taste.

Prof. TAFT: A question was asked about the Ogon. I don't think it is a very valuable plum. It is productive and of fair quality, but only medium sized, and has a very dirty, unattractive color—a dull greenish yellow; and we have the other kinds—Willard and Burbank and others—coming on at the same time, and I don't believe it would be of any great value for market.

The PRESIDENT: Will some one suggest any other fruit?

Prof. TAFT: There was a question asked about this Logan berry and Mayberry, and answered also in regard to the strawberry-raspberry. I want to advise against even testing them if you care anything about the results. To my mind that strawberry-raspberry is a regular pest. It is worse than what we pride ourselves on calling the Canada thistle. (Laughter.) It will sucker and spread. I put out six plants and the next spring they covered a space that was a rod wide and the full length of the rod, and although we had fruit it was of no value whatever. You can put your thumb up inside the berry and have a thimble, and that mass is most all seeds. That is worthless. With us the Logan Berry is of no value. We have a few fruits occasionally. It is somewhat tender, won't stand even zero temperature, and I don't know one of that class of fruits that is of any value even for amateur purposes.

Mr. WHYTE: Have you had any experience with the Wine berry?

Prof. TAFT: I thought that was out of the question entirely. It is rather an attractive plant, and the berry is covered over with a husk that closes over the berry till it is two-thirds grown, but that will not stand without protection anything like zero. It grows to the ground even with us at Lansing, and only by protection do we get any fruit at all. The fruit is acid and of no value.

ELECTION OF OFFICERS.

Mr. RACE read the report of the nominating committee, which was adopted. The list of officers appears on page 2.

EXPERIMENTAL SPRAYING OF FRUIT TREES.

By W. M. ORR, FRUITLAND.

During 1897 the experimental spraying of apple trees, carried on by the Department of Agriculture of the Province of Ontario, was conducted in twenty-nine orchards, situated in twenty three counties, covering the Province from Sarnia to Lancaster. The original plan was for six sprayings at each point. This would have finished the work early in July. About this time, however, scab was making such headway that it was decided to make another application. Accordingly the men were sent out again and the work was completed by July 18th.

Only one solution was used—Bordeaux mixture—according to the following formula:

Copper sulphate ..... 4 lbs.
Fresh lime ..... 4 lbs.
Water ..... 40 gallons.

To this, in every case, was added four ounces of Paris Green.

On account of the law, which forbids the spraying of fruit trees while in full bloom, and on account of rain, many applications were omitted, and numbers of applications were discounted or lost by being closely preceded or followed by rain. However, the results were highly satisfactory, in some cases the full 100% of clean fruit being obtained. These trees and their fruit were absolutely perfect.

A great deal of interest was taken in the work and the gentlemen in whose orchards we sprayed, did all in their power to assist us. The attendance during the season reached almost to the 3,000 mark. In one case I know of a man coming forty-three miles to see the work done and obtain information. Thirty thousand sixteen-page bulletins, entitled "Instructions in spraying," containing also a short paragraph on each of the more common insect enemies and fungi, with illustrations, were issued by the department and distributed gratis; many applications were made for these by mail. Numbers of requests were received to have the work done at points we were unable to serve. In one instance a town clerk wrote that he was instructed to inquire upon what terms the spraying could be secured for that locality. The people are gradually waking to the fact that spraying is indispensable to the up-to-date orchardist, and every year the experimental, or more properly now, the instructional spraying of fruit trees is attracting more and more attention. The attendance this year was 60% greater than last year, and inquiry by mail was ten times as great.

In a recent report by the entomologist of the State of New York, three hundred and fifty-six species of insects which commit depredations on the apple are catalogued, and each is known at times to feed upon the apple from choice. Many others will feed upon it when other plant food is lacking, and he adds: "The least harmful among them may at any time, through such sudden and inexplicable multiplication as is often witnessed in the insect world, become a serious pest." Add to these the injurious fungi, and you will have some idea of the phalanx of enemies the apple grower has to face. I believe the most effective artillery we have is the spray pump, but to be effective the proper ammunition must be used at the right moment. With every insect there is a time when it is most vulnerable with same treatment, which can only be successfully applied for a few days in the season. For this reason some have objected to the loss of the time during which the trees are in bloom, claiming that to be handicapped at that season is unjust. Professor Lintner has prepared a list of seventeen common insects which feed upon the apple while in bloom, for which arsenites are the proper treatment; and our agents who did the spraying found the following insects at work while the blossoms prevented spraying: Curculio, bud-worms, leaf crumples, cankerworm, tent-caterpillars, leaf-roller, eye-spotted bud-moth, and case-bearer. However, we found no difficulty arising from the regulations, and were able to observe the law to the letter and successfully deal with these insects by spraying before and after blooming.

In the report of a series of careful experiments, covering several years and published last year, Professor Webster, of Wooster, Ohio, demonstrates conclusively that spraying with Paris Green while tree are in bloom is fatal to bees. He has found arsenic in the abdomens of the dead bees and in the larvæ of a colony which died suddenly without apparent cause. The interests of the horticulturist and the apiarist are allied, and it would be a mistake to destroy bees as they perform so important a part in the fertilization of our fruits.

I want to give you a few of the actual results obtained in our work this year. In calculating the percentage of perfect fruit the following plan was adopted. A part of

the tree was stripped of every apple. These were carefully examined and any specimen which had a worm or a spot, no matter how small, was rejected.

In Mr. Warner's Orchard at Trenton.

	Experimental spraying.	Unsprayed.
Spy	76 per cent. clean.	8 per cent. clean.
Snow	75 " "	No clean fruit.
Wealthy	90 " "	20 per cent. clean.
Summer Pearmain	75 " "	5 " "
Baldwin	90 " "	10 " "
Bottle Greening	76 " "	5 " "

The packers said it was the best fruit they had packed this year, and Mr. Warner says the increased value of the crop on the twenty-five sprayed trees was $100.00.

In George Adams' orchard, Smithville, Swaar experimental spraying 80% clean and held its fruit. Swaar unsprayed, dropped 75% of its crop and not a clean specimen. Roxbury Russet, experimental spraying, 90% clean and held its crop. Roxbury Russet, unsprayed, dropped most of its crop and what remains is worthless. Canada Red, experimental spraying, 90% clean. Canada Red, unsprayed, worthless. Snows, experimental spraying, 80% clean. Newton's Pippin, experimental spraying, 90% clean. Spy, experimental spraying, 90 p. c. clean, and well loaded. Spy, unsprayed, well loaded but under size and not a clean specimen to be found. There are ninety trees in this orchard; we sprayed twelve. Apart from these, Mr. Adams says he did not have more than two barrels of clean fruit.

Mr. Bradt, of Port Rowan, who spent several weeks buying apples between Port Rowan and Smithville, says he has not found an unsprayed orchard that will give more than 7% of clean fruit, with the exception of one which he thinks will give 15%. He says there is five times as much clean fruit on the twenty sprayed trees in Mr Adams' orchard at Smithville, as there is in any other entire orchard he has seen. He reports a fair crop in many orchards, and spoke of one in which there will be three hundred barrels, but said there would not be more than ten barrels of clean fruit and not more than seventy barrels that will be worth packing. The fruit on some orchards is so badly scabbed that Mr. Bradt says he will not handle any of it.

In Mr. J. P. Thorn's Orchard, Picton.

	Experimental spraying.	Unsprayed.
Spy	90 per cent. clean.	10 per cent. clean.
Colvert	90 " "	
St. Lawrence	75 " "	10 " "
Snow	75 " "	25 " "
Golden Russet	90 " "	25 " "
Bellefleur	75 " "	10 " "
Swaar	75 " "	10 " "
Red Astrachan	80 " "	15 " "

Mr. Thorn says that the spraying of the twenty-nine trees we worked on was worth $75.00 to him. He further says that while unsprayed Spys were worth $2.00 per barrel he was getting $3 50 per barrel for sprayed fruit.

In J. J. Moffat's Orchard, Wingham.

Blenheim Pippin, experimental spraying	95	per cent.	clean.
Greening experimental spraying	95	"	and good crop.
" unsprayed	30	"	clean.
Crop light, most of fruit having dropped.			
Spy, experimental spraying	80	"	"
" unsprayed, well loaded with undersized fruit and not a single clean specimen to be found.			
Duchess experimental spraying	100	"	"
" unsprayed	50	"	"
Maiden's Blush, experimental spraying	95	"	"
" unsprayed	50	"	"
Tallman's Sweet, experimental spraying	95	"	"
" unsprayed	2	"	"
Snows, experimental spraying	100	"	"
" unsprayed	5	"	"
Trees loaded, but fruit almost worthless.			
Colvert, experimental spraying	90	"	"
" unsprayed	40	"	"

In Mr. Cameron's Orchard, South Lancaster.

St. Lawrence, experimental spraying	90	per cent.	clean.
" unsprayed	10	"	"
Maiden's Blush, experimental spraying	100	"	"
" unsprayed	no clean fruit.		
Snow, experimental spraying	100	per cent.	clean.
" unsprayed	no clean fruit.		
Alexander, experimental spraying	100	per cent.	clean.
" unsprayed	10	"	"
Baxter, experimental spraying	90	"	"
" unsprayed	10	"	"
Hash, experimental spraying	100	"	"
" unsprayed	20	"	"

Sprayed Maiden's Blush sold at $4 per barrel; Unsprayed Maiden's Blush at seventy-five cents per barrel. This orchard is just on the bank of the St. Lawrence and is remarkably free from insect enemies.

Many other instances might be cited, but the above are sufficient to show how effective spraying is when properly done. It also shows what an enormous loss is annually sustained by the fruit growers of Ontario, through neglect of their orchards. Spraying not only increases the percentage of clean fruit, but the specimens are larger, brighter, better flavoured, and possess superior keeping qualities. Because the foliage is protected from injury by insects and fungi, and, being healthy, performs its important function properly.

One gentlemen, in whose orchard we sprayed this year with splendid success, said that he had sprayed for four years with very unsatisfactory results. The trouble was that instead of breaking up the spray, as should be done, until it looks like a vapor and settles on every part of the tree and fruit like a fog, he had used a coarse spray with which it is impossible to touch every part. In this way the scab had an excellent chance to thrive, and much of the foliage was not poisonous to insects feeding upon it. When a coarse spray is used the work is only half done, and there is a great waste of material, for every drop which falls to the ground is lost.

When the nozzle is working properly, and the sun is shining, you will often notice a miniature rain-bow on the spray. Do not drench the trees but spray them. As to the cost of spraying we find that in an average apple orchard about two cents per tree per application covers the cost of material and labor.

With apples at from $2.50 to $4.00 per barrel at home and from $6.00 to $7.00 in Britain, many an orchardist to-day is regretting that he did not spray.

Dr. Fletcher, (Central Experimental Farm, Ottawa): The report is an exceedingly valuable one as giving definite results. The only trouble is, I am afraid the fruit growers will listen and say, "What a nice report!" and do nothing. That has been the

work of the last fifteen years, since spraying was introduced. I should like to draw attention to one or two points in the report. One was the list of insects which Prof. Lintner, gave as insects which attack fruit trees at the time they are in blossom. I don't think it was a particularly wise thing for Prof. Lintner to have ever published that list, because there is no insect that need be treated at that time. It is an injurious practice that there is no good in, and on the other hand a great deal of harm. I don't know of any insect that the trees need be sprayed while in bloom to destroy. There is no necessity for spraying fruit trees while they are in bloom, and it is better not to do it, because there are better times. Another point was with regard to the general principle of spraying. Why is not spraying adopted all through Canada to-day? There is nothing new about that report. Those figures can be found for years from good men, and now you have got it in your own report; you have it printed; but I know from experience you are not going to adopt it; you are not going to do your spraying. Some of you may —the more progressive men—but the frut growers of Canada will not spray; and one of the reasons I find they will not spray is that the buyers of fruit say they will not buy fruit that has been sprayed. Only last week a man in my orchard said, "I dare not spray, or people will say, 'You spray your fruit,' then my people won't buy." This is founded on ignorance. There is no man yet, able to get arsenic or arsenical mixtures on the fruit without destroying the bushes. If the life can absorb arsenic, it in itself is destroyed. Long before the fruit can be rendered poisonous it is rendered unsuitable and unmarketable; therefore the contention that there is any danger in spraying fruits is foolish, and has been shown so over and over again. Why people don't spray is simply because it involves a little trouble and a little more expense, and we are loath to take trouble if it is not necessary to do it. Every man who has sprayed systematically and properly has always reaped those percentages Mr. Orr has shown us. I hope the fruit growers will adopt that method of spraying. Over and over again a few orchards have been picked and treated, and on the other side of the road orchards have been left alone, and every time the beneficial results have been attained. About ninety per cent. of the spraying is not spraying at all. You take a man and duck him under water, and that is not spraying. That is about the meaning of the word spraying by ninety per cent. of the people, with cheap spraying pumps and cheap nozzles. You turn a fire hose on a tree, and that is not spraying. I think this is a most valuable report, and if the gentlemen will follow it out they will get the results mentioned in this report. How is it that entomologists for the last fifteen years have always got those results, and men who are practical fruit growers do not get them? Simply because entomologists take care to do it properly, because that was their chief business, while to the fruit grower it was secondary. That spraying is just as important as any other operation that you put in practice on your farms, and I think the gradual acceptance of that is getting wider-spread through the country, and the only difficulty that seems to me to arise is, that buyers are supposing that if it is known the trees are sprayed, there is still that old idea that the fruit can be poisoned. Well, you can challenge it and get a chemist to prove it for you, or you can even prove it with a microscope, because the particles of Paris Green are so large that they are easily detected by a microscope on the outside, and if the arsenic is dissolved you can detect it by the injury to the bushes. I say there is no danger at all. I have examined the matter very carefully so as to be able to protect myself in making statements as positively as I do now.

Mr. McNeill: It is over ten years since I bought my first spraying pump. After listening to the various speakers wondering why the fruit growers did not spray more, I came to the conclusion that one of the great causes was the imperfect machines that we have been using. I first used an old-fashioned pump that cost me $10, but it was the dearest $10, in one sense of the word, that I ever invested, because I would work with it a while and then go and hunt for the hired man to help; and the hired man would play out in two or three hours and want a new job. The second season it would hardly do anything; the third season, I think, we threw it in the fence corner. For two or three years I did not spray at all. Since I have bought a modern pump the difficulty of spraying is nothing. My neighbors who do not own a pump but who rely on me for the use

of mine are doing spraying that they never would have done if I had that old pump. Spraying with an modern pump is just as simple an operation as watering a lawn. Get people to use a good tool and they will spray every time, and they will never go back on it. An essential point is to get a good pump and a good nozzle.

Mr. McKinnon : I would like to hear the views of some members as to spraying in winter, when there is perhaps a little more time than in summer. I would also like to know if anyone has had experience of working the spraying pump by gas machine or small steam engine. I am told that on the other side these are somewhat extensively used and do the work very satisfactorily.

Mr. Huggard : I have had a little experience of spraying in winter. Two years ago we sprayed some snow apple trees in November or December, and on those trees that were not sprayed in winter we had considerable more No. 2, or spotted, apples than on those that were sprayed. This year I am trying it more extensively and with several varieties. About two weeks ago we spent an hour or so spraying certain trees which we have marked so as to test their results for next season. I am satisfied the trees should be sprayed before the buds come out, and if they are sprayed twice so much the better. Another feature in spraying is that it is quicker to apply. Lye made out of wood ashes applied at that time will do more good than two sprayings after the buds are out. The leaves come out very vigorously, and the blossoms, and so on. This spring it is very noticeable. One row the entire length of the orchard we sprayed with the lye and the other not, and it was noticeable the entire season The branches are smoother and there seem to be less lice and bark insects than when we sprayed later on, so that an early application, to my mind, is the thing ; and from my experience I am satisfied an application late in the fall, after the leaves have dropped, is just as good as in the spring.

Mr. Burrell : How strong a solution of lye ?

Mr. Huggard : We get a forty gallon barrel about half full, or with about two bushels of ashes, and fill it up with water and leave it there two or three days and it becomes quite gritty between your fingers, like rubbing a piece of glass, and if I find it is not so I add a little lime when using it so as to strengthen it up. I think, however, lime is a little too heating on the surface and has a tendency to make the young bark crack, which I do not like to see. We like our trees as smooth as we can get them, and the more ashes I have used on trees in that way, the smoother the trees are and the freer from insects.

Mr. McKinnon : Would concentrated potash be better than lye ?

Mr. Huggard : I presume it would be equally as good, but I can get ashes cheaper.

Mr. McKinnon : It would be less liable to clog the nozzle.

Mr. Tweedle (Stony Creek) : I have noticed that the apple scab only propagates in continuous wet weather, and we need only to spray at such times for that purpose. I noticed that this year we had considerable rain four or five days running just along before the apple blossoms opened, as the peach bloom commenced to open, sometime in May, and by spraying a couple of times then we seemed to control it quite well until the wet weather that struck us in the latter part of haying, in wheat harvest. I think that rain was pretty general ; then we got considerable more scab, and I believe had we followed up with another application of Bordeaux mixture at that time, we might have controlled the scab on the apple crop pretty thoroughly. The pumps we have nowadays work so easily that there is no need for any more application of machinery to drive them. The best pumps now made can be handled by a boy twelve or fourteen years of age and work all day, or by a man with one hand without tiring I have handled it myself and followed the pumps all day and not been tired.

Mr. Orr : I was just going to ask Mr. Tweedle to read this report. We have been doing a little experimenting this winter, and I think it would be interesting for the gentlemen to hear it.

Mr. Tweedle then read report of spraying experiments with a view to ascertain the effects of cold rains at the time of blooming.

REPORT ON SPRAYING WITH ICE WATER WHILE IN BLOOM.

Following is a report of experiments in spraying fruit trees with ice water while in bloom, to ascertain the effect of cold rains on the fertilization of blossoms and the setting of fruit ; also to ascertain if heavy bloom could be partly sterilized in this way, thus saving the labor of thinning fruit :

The work was done by Jos. Tweedle at Fruitland, Ontario, and was in connection with the experimental spraying of fruit trees carried on by the Department of Agriculture for Ontario.

Three trees of Langhurst peaches, three trees of Shipper's Pride plums ; three trees of Kiefler pears, and one side of an Astrachan apple tree were selected for the work. The peach, plum and pear were in full bloom at the time of commencing work, and the apple bloom was just opening.

For spraying, a barrel of water was cooled to the lowest temperature possible with broken ice. The tripple nozzle was used. One tree each of the peach, plum and pear was drenched for seven minutes; one each for three and one-half minutes, and one of each had one side drenched for seven minutes, the other half remaining unsprayed.

One side of the apple tree was drenched for seven minutes.

This work was performed on May 13th, 14th and 15th on all the trees, and on the 17th and 18 on all except the peach, from which the bloom was falling.

On the 18th the plum and pear bloom began to drop. The weather was fine and warm, excepting a shower on the afternoon of the 15th. Results were carefully watched, and no difference could be noticed in the crop set on sprayed and unsprayed trees of the same variety, nearly 100 per cent. of the blossoms setting in each case.

It would appear from the results of the above experiment that a cold rain during the blooming period does not injure the blossom unless so prolonged as to interfere with the fertilization of the blossoms

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Dr. FLETCHER : The question was asked whether there was any advantage in spraying in winter. It is just as well to discuss why we spray at any time. Spraying will not destroy everything and kill every fungous disease. The question whether it is advisable to spray in the winter must be answered decidedly "yes." Why do we spray in winter? We spray to kill, chiefly, the fungous diseases—the black spot of the apple ; and it is wise to do that because that fungus passes its life largely on the trees in the winter time, and you must not spray with Paris green or kerosene emulsion ; you must spray with a fungicide, and the cheapest and best at that time of year is sulphate of copper, one pound to five gallons of water, and if you spray with that solution you will destroy all the fungus you reach with it. It passes the winter on the fallen leaves, so you must spray again in the summer. Then there will be a large quantity of spores left on the fallen fruits and leaves, from which infection will come again ; therefore it is necessary to spray during the summer again, but it certainly is wise to spray in the winter. That may be done at any time after the leaves have fallen or before the spring opens, and perhaps the best time is as near as possible to the time when the vitality of the whole tree revives, because the fungus is then more susceptible to injury probably than in the autumn ; but if it is more convenient to spray in the autumn, from time or any other reason, certainly spray in the autumn, but you can spray during the winter with any spray to destroy fungicide diseases. You must decide what insect you want to fight against, and you cannot make one application that will destroy everything. That is one of the mistakes that is made. Paris green does not by any means destroy everything, although that is the general conception of it throughout the country. It is only by bringing it up in meetings like this, time and time again, that men gradually learn. Men are interested in it to-day that thought nothing of it two years ago. Certainly in regard to fungus and black spot it does pay to spray in the winter time.

Mr. McKINNON: How would it be to gather the leaves that fall and burn them?

Dr. FLETCHER: If your orchard were very much sheltered it might be important to burn the leaves, but I think in general practice it would be impracticable. You might destroy a great many spores undoubtedly.

Mr. T. H. RACE (Mitchell): Would Dr. Fletcher recommend spraying in winter for gooseberry mildew?

Dr. FLETCHER: I have had no experience; I think the usual practice is to spray during the summer.

Mr. RACE: I am strongly convinced that Bordeaux mixture has no virtue at all with gooseberry mildew. I think I have given it a thorough test the last two years, and my experience is it is absolutely harmless so far as mildew on the gooseberry is concerned.

Mr. McKINNON: What is the best thing for grape mildew? Is Bordeaux mixture good for that?

Dr. FLETCHER: Yes, undoubtedly it is the best remedy.

Mr. ORR: Is not sulphur thoroughly effectual for that?

Dr. FLETCHER: No, not thoroughly.

Mr. ORR: We have found no difficulty whatever with it in the last ten or twelve years. We have found sulphur controlled it thoroughly.

Dr. FLETCHER: There are two mildews to the grape.

Mr. RACE: Would Dr. Fletcher or Dr. Saunders let us know whether either ever tried Bordeaux mixture on gooseberries that had been mildewed before? There are a great many things that are recommended for gooseberry mildew that have been tried on gardens and gooseberry orchards that never had mildew; but in an orchard or garden where the mildew has been in one year, has any man found that the Bordeaux mixture has prevented it the following year? I used to hold to the theory that a sufficient application of hardwood ashes beneath the bushes, and thinning the bushes so as to let in plenty of sunlight and air, was all that was needed to prevent mildew. I stuck to that theory for several years, but I found that mildew got into my garden by getting bushes from other quarters that had mildew, and after it once got in there all the hardwood ashes that I could pour into the garden had not the slightest effect, so I had to resort to spraying, and I have been trying spraying with Bordeaux mixture for two years. I know I have done it as thoroughly as can be done, and it has not had any effect at all on the mildew.

Dr. FLETCHER: When did you begin to spray?

Mr. RACE: I began just as the buds were forming and gave the first spray. Then after the blossom was just about open—before it had opened—I gave the second spraying. After the blossom had dropped and the berry was fairly formed I gave the third spraying. Then I didn't do anything further than that, because I found in a very few days after I had finished the third spraying the mildew appeared.

Dr. SAUNDERS: I don't know that I can fully answer Mr. Race's question, but I can say this much, that there was mildew among those gooseberries on those experiments with the Bordeaux mixture that were tried by the Horticulturist at Ottawa. I was not present at every trial, but I saw enough to prove that it had a marked effect in lessening or preventing the mildew on the English gooseberries, which, with us, are very liable to mildew, and some of them were badly withered and worthless. Others again are much less liable to mildew. It is a subject that will bear a great deal of further experimentation. Mr. Race's experience will certainly be a stimulus to others to try still more perseveringly to see whether the mildew cannot be controlled entirely by that means. I don't mean to say that we have been without mildew, but the opinion of the Horticulturist was that the spraying with the Bordeaux mixture had been decidedly beneficial for that purpose.

Mr. RACE: I was so determined to give the Bordeaux mixture a thorough test this year that in the third application I took an open dish with the mixture in and bent the

bushes down into it and held it there so that every berry that was then formed was thoroughly covered, and I noticed berries afterwards with a coating of the mixture on the outside, and actually the mildew developed right there almost underneath that coating, so I was satisfied then that there was something very wrong with either myself or the mixture, because it didn't have any effect.

Mr. BURRELL: I don't think Mr. Race's experience is exceptional, because Mr. Morton, of Wingham, told me last winter that he had given it a very thorough trial on gooseberries with the same negative results that Mr. Race found, and another very careful experimenter, Mr. Pafford, of Niagara, had found it not so successful. In my experience I cannot say I have found Bordeaux mixture absolutely successful for mildew on the gooseberry.

Mr. A. H. PETTIT: Does Dr. Fletcher class the black rot as mildew? The sulphur remedy spoken of by Mr. Orr we find very well in regard to one kind of mildew, but there is another kind of mildew that Grimsby has not been attacked with at all.

Prof. FLETCHER: To state the matter shortly, there are two mildews of the grape—the downy mildew and the powder mildew. These two names are so close alike that they are somewhat confusing. The powdery mildew, which is prevalent in the Niagara district, is the one which is treated with sulphur with considerable success. The downy mildew, however, is a much more serious disease, and one which is not prevalent in the grape-growing district of Niagara, but is very prevalent in some other parts of Canada. For the powdery mildew the sulphur is the remedy, and can be used in a paying manner, but for the other it is no use at all, and you must use the Bordeaux mixture, and that is the only remedy that I believe can be used effectively. It is the most serious disease that is at Ottawa, and it is not an unusual thing to see a grape vine drop the whole of its crop after spraying. These matters have been treated at great length in the reports of the Society, and it is unwise for anybody to take a verbal statement such as this is. There are endless printed accounts of these different diseases. We have them in the *Horticulturist* and in agricultural reports; you can get these from Guelph and Ottawa, and it is wise to get these printed reports and follow them—not make them as most women make a pudding, have the recipe before them and never follow them. Most people think that, when spraying, if a pound of an ingredient is good two pounds would be better; but get those rules and follow them accurately and you will get results. I am surprised at Mr. Race taking all the trouble he did with the Bordeaux mixture, and not using first of all the sulphate of copper spray, which is very much more effective. Of course I don't say any of these remedies are going to be perfectly effective every time; in fact I will tell you before you begin that they are will not, but the spraying experiments conducted from year to year show it is a paying operation, and a man who says he has not time to try them is the man who says he has not time to make money, and if a man has not time to save 75 per cent. of his fruit crop he has not time to save 75 per cent. of every dollar he makes.

Mr. MCKINNON: I have had no mildew on any of my grape vines since five years ago till this year. Tnis year I sprayed more faithfully than ever before, and nearly all the Rogers vines were affected, and some of them seriously affected, with mildew. I found that especially the case where they grew most rankly on the richest soil. The Niagara were slightly affected, but a great many Rogers vines were absolutely worthless, although they were faithfully sprayed, even more carefully than in former years.

The PRESIDENT asked Dr. Taft to give his views.

Dr. TAFT. We have been doing a good deal of spraying on all these lines, and as the gooseberry was mentioned I would say that I have gone a little further than anyone yet, from the fact that I used three different materials for spraying. The first is this copper of sulphate solution that Dr. Fletcher advises, applied in the spring before growth starts. Then both against mildew and currant worm I used Bordeaux mixture with Paris green about the time the leaves are half open. Before they blossom, and as soon as the fruit is set, I spray again with Bordeaux mixture and generally add Paris green; and after that, for the mildew, I have relied on the liver of sulphur and find it is very effective and does not spoil the fruit; it is nearly harmless in avery way except against

the mildew, and is easier to procure and no more expensive than the Bordeaux mixture. Regarding the other application, I would say that I have generally made use of an early spring application of the sulphate of copper, the same as for the powdery mildew on the gooseberry, and after that relied entirely on the Bordeaux mixture. A gentleman said something about the rot on the grape ; and where you may perhaps have a rot due to the downey mildew it is my impression that you have the same rot that is troublesome a little further south that is known as the black rot, which is often very destructive, ruining the grapes entirely, and for that same disease I would use the Bordeaux mixture, after having sprayed very thoroughly with the copper sulphate solution in the spring. To have that first spraying effectual, you should thoroughly reach every part of the plant, and in doing so don't omit to spray the trellis and everything of that kind to destroy the spores that may be about at the time.

THE EXPORT OF TENDER FRUITS IN 1897.

A Report of Progress by L Woolverton.

At the annual meeting of the Ontario Fruit Growers' Association at Kingston in December, 1896, the advisability of making some experimental shipments to Great Britain of tender fruits, such as peaches, tomatoes pears, grapes and summer apples, was fully discussed. An address was given by the Hon. Sidney Fisher, Minister of Agriculture for the Dominion, to the effect that the Department of Agriculture was desirious of assisting Canadian fruit growers in this enterprise, and would like to know just what provision would be needed

A committee, consisting of L. Woolverton, W. M. Orr, G. E. Fisher, A. H. Pettit and E. D. Smith, was appointed to reply to his enquiries. This committee met and recommended that shipments go forward during the months of August, September, October or later, of at least one carload per week, and of three or four carloads per week during the month of September ; that cold storage would be needed at the point of shipment, as well as on the railway cars ; that the varieties of fruit be as many as possible, and packed in the very best manner ; that only the best stock be allowed to go forward ; that an agent be sent to Great Britain to look after the interests of the fruit grower ; that cold storage warehouses be erected at such points as can be agreed upon, where growers will furnish the amount of fruit required, and agree to buy over the warehouses at the end of three years provided the experiment proves a success.

At a meeting of representative fruit growers from Grimsby, Winona and Burlington, held at Grimsby on the 26th of January, 1897, two resolutions were passed, one asking for three warehouses, one at Winona, one at Burlington and one at Grimsby, each place to provide one-third of a carload per week ; and another resolution, which, while approving of the former, recommended as a preferable scheme, the erection of one warehouse by the Department, and the guarantee to the shippers of a fair market price for the goods. The Department approved of the latter scheme, and decided to place one warehouse at Grimsby, provided growers there would agree to provide the necessary fruit to make up one carload a week and buy over the warehouse, provided the experiment proved a success. Nine prominent growers of peaches, pears, grapes, tomatoes, etc., agreed to the scheme, and on the 7th of September the first shipment was made, consisting of Bartlett pears, Crawford peaches and grapes for Covent Garden, London, England. In all seventeen carloads of our choice varieties were sent forward, the last car leaving on the 12th of October, loaded mostly with grapes. The two markets chosen were London and Glasgow.

The result of the season's experiment has been of great value, although not without considerable loss on the first shipments. It has been proved that our Canadian Crawfords and Bartlett pears are just what the trade wants in England, the latter variety being identical with the favorite English pear "Williams," known in France as "Bonchre-

tien." Some half cases, containing about six dozen each, of this pear sent over on the steamer "Georgia," arrived in excellent condition, and sold about October 1st for $2.30 per half case, or the equivalent of about $15 per bbl. This is sufficient to prove the market for such goods, especially for well grown samples; while, on the other hand, it has been proved that a second grade cannot be exported without loss. The first shipments arrived in an over-ripe condition. This was not the fault of the packing, for the fruits were gathered very green, carefully wrapped with paper and packed closely and firmly in shallow trays. In this way each fruit was separate, so that rot could not spread from one to another, and there was no chance for heating from bulk. Eight of these trays were put in a bushel case. The only fault in the package was that this bushel case was at first tightly covered at the top, which prevented a free circulation of the cold air, a fault that was remedied in the later shipments.

One cause of the failure of the first shipments was the temperature both in the cold storage warehouse at Grimsby and in transport, which was from 40° to 48°, with a still higher temperature, of course, inside the cases. This is altogether too high a temperature for the carrying of such tender fruits, without change of condition, and for this reason chiefly, added to the lack of free ventilation in the packages, the Crawford peaches and Bartlett pears arrived in the English market in an over-ripe and unsalable condition.

The first packages used were too large for peaches and pears, and too expensive, being bushel cases, each containing eight wooden trays, but towards the latter part of the season, a half case, holding about six dozen pears, was adopted, which proved much more satisfactory, for, while a case of Bartlett pears sold for 15s., a half case of the same, at the same sale, brought 9s. 7d. The temperature of the later shipments was held somewhat lower, averaging about 38°. If this can be still further reduced, perfect success must result.

The following are some extracts from the account of sales:

Fruit, ex.S.S. "Merrimac," sold in London, October 21st, 1897. 885 cases—loss £64.7.9.

Bartlett pears	30c.	to	72c.	per bushel	case.
Clapp's Favorite pears	Nil	to	$2.07	"	"
Tomatoes	78c.	to	1.08	"	"
Crawford peaches	Nil	to	1.22	"	"

The peaches and pears all arrived too ripe, and in a very wasty condition. Mr. Orandall expressed the opinion, when he saw it, that the fruit appeared to have been carried at too high a temperature. It was thought that the packers had put the fruit up too ripe, but this is not the case, for, on the other hand, it was shipped so green that many feared it would not ripen. The cause of the failure of this lot, therefore, was, in my opinion, entirely due to the high temperature at which it was carried.

Fruit, ex.S.S. "Sardinian," sold in Glasgow, 27th Sept., 1897. 542 cases.
Net returns, £16.0.1.

Crawford peaches	41c.	to	54c.	per bushel	case.
Bartlett pears	30	"	$1.22	"	"
Moore's Early grapes	2	"	30	"	"
Tomatoes	26	"	1.34	"	"

Temperature 48° F. for most of the voyage.

Carried at such a temperature, nothing but failure could be expected, but the fault was with the engineer of the "Sardinian," who was instructed to keep the temperature at 38° F. His excuse was that there were eggs in the same compartment, which he was instructed to keep at 35.° As a matter of fact, the temperature in some parts of the hold must have been about 56.°

Fruit, ex.S.S. "Iona," sold at London, October 7, 1897. 194 cases—net returns, £1.6.8.

Bartlett pears	Nil	to	$1.03	per bushel case.	
Tomatoes	24c.	"	30c	"	"
Plums	Nil.				

Fruit, ex.S.S. "Vancouver," sold in London, October 10, 1897. 694 cases. Loss £37.12.6.

Bartlett pears	30c.	to	$1.11	per bushel case.	
Plums	Nil	"			
Peaches	12c.	"	1.09	"	"
Tomatoes	24c.	"	91	"	"

Mr. Crandall writes: "While these two shipments were some improvement on the fruit shipped by the "Merrimac," they are far from being satisfactory. The peaches are practically worthless, most of them decayed and rotten. All the pears are over-ripe, and in some of the cases decayed and rotten." He then proceeds to blame the package and the ripeness of the fruit when packed, instead of the temperature of the cold storage, which, I believe, is in fault in each case.

Fruit, ex S.S. "Kastalia," sold in Glasgow, October 15, 1897. 752 cases. Net returns £21.0.3.

Grapes	4c.	to	30c.	per bushel case.	
Tomatoes	4	"	$1.23	"	"
Tomatoes, half cases			75	per half case.	
Duchess pears			1.64	per bushel case.	
Bartlett pears	30	"	1.22	"	"
Anjou pears			2.07	"	"
Ribston apples	1.77	"	2.58	"	"
Flemish Beauty pears			2.01	"	"
Crawford peaches	2	"	97	"	"

Fruit ex S.S. "Numidian," sold in Glasgow, October 15, 1897.—336 cases.—Net returns, £43.16.5.

Crawford peaches	Nil to $3.66 per bush case.				
" " on lot of 87 cases made net returns of $92.02.					
Grapes	48c	"	2.68	"	"
Tomatoes			1.44	"	"
Bartlett pears			2.00	"	"

Fruit, ex. S.S. "Hurona," sold in London, October 21, 1897—786 cases.—Net returns, £39.19.10.

Bartlett pears	73 c.	to	$2 92	per bushel case.	
Duchess pears	$1.64	"	2 19	"	
Anjou pears			1 34	"	
Louise pears	$3.41	to	3.90	"	
Howell pears			2 07	"	
White Doyenne			3.01	"	
Peaches	73 c.	to	2.44	"	
Grapes	24 c.	"	1.36	"	
Tomatoes	$1.22	"	1.71	"	
Tomatoes			61	half	

Messrs. Garcia & Jacobs, the salesmen, write: "There is no doubt that the fruit will suit the London trade, the eating quality being exceptionally good. The general appearance is about equal to that grown here and in France, but not equal to that in California. . . . There is no reason to doubt that if the fruit can be made to stand the journey, when once the difficulties of packages and temperature are overcome, the results should be satisfactory."

Fruit, ex. S. S. "Labrador," sold in Liverpool, October 29, 1897.—388 cases.—Net returns, £36.3.2.

Grapes	40 c.	to	$2.40 per bushel case.
Tomatoes	64	"	2.04 "
Peaches	$1.44	"	2.40 "
Pears	1.46	"	2.92 "

Fruit, ex. S.S. "Gerona," sold in London, November 4, 1897.—597 cases.—Net returns, £7.10.8.

Grapes	30 c.	to	55 c. per case of 20 lbs.
Duchess pears			$2.92 per bushel case.
Anjou pears			3.00 "
Louise pears			3.53 "
Tomatoes	48 c.	to	80 "

Mr. Crandall wrote concerning this shipment: "The tomatoes were in fine shape, and the size selected are more in favor than the large tomato, a medium size being preferred. Buyers object to mixed varieties of grapes in the same box, and would prefer each variety packed by itself. I regret to find a prejudice here against the flavor of the Canadian grape. This must be overcome before they sell readily and realize their value."

The consignee wrote: "We beg to advise you of the arrival of the "Gerona." Everything did well, with the exception of the grapes, of which the peculiar flavor is not appreciated in London. Grapes from Spain and Portugal are being brought to our market in large quantities, in big bunches, and being sold at 2½d. to 3d. per pound. The pears did splendidly, and, as the season advances, the results are sure to be satisfactory for good apples."

Fruit, ex. S. S. "Sardinian," sold at Glasgow, November 2, 1897.—1,029 cases (mostly grapes).—Loss, £31.16.5.

Grapes	16 c.	to	90 c. per case of 45 lbs.
Peaches			$1.22 per bushel case.
Kieffer pears			2.68 "
Duchess pears	$1.95	to	2.80 "
Anjou pears			2.19 "
Sheldon pears	$1.95	to	2.19 "
Tomatoes	30 c.	to	85 c. per half case.

It is worth noting that about the twenty-first of October California pears and peaches cease to arrive in Great Britain, thus leaving Canada a special opportunity to capture the market for these fruits from the middle of October onward. It will, therefore, be worth our consideration whether we can hold back our Bartlett pears and Crawford peaches in cold storage in Montreal until about the 10th or 15th of October, before forwarding them. Also, whether we can grow such desirable late varieties of pears and peaches as will suit the British market at the time above mentioned. The Louise pear, for example, succeeds beautifully in Southern Ontario, especially when grown as a dwarf, and the same may be said of the Duchess and the Anjou. Another magnificent late pear is the Clairgeau, which would be one of the finest for the export trade. Even the much abused Kieffer would export in fine condition.

Tomatoes have succeeded as well, or better than any other fruit, so far as condition is concerned, and prices have been good, considering that the variety Ignotum was too large to suit the English taste. Some smaller, round, smooth variety will give excellent results.

Grapes have been a complete failure, the fruit having been about given away, the very best not bringing more than one cent a pound, the cost of transportation. The salesmen write :—"The grapes are of no use here, the peculiar flavor not being very palatable ; and in quality they are in every respect inferior to those grown in Spain and

Portugal—thin skinned, white, sweet grapes, which are brought here and sold from four to six cents. a pound." A consignee in Liverpool, however, writes more favorably, and we hope yet to create a demand for our grapes that will ensure a profitable trade.

PEACHES. In the export of this fruit there appear to be great possibilities, both of loss and of profit. For example, one shipment of one hundred and thirty cases of beautiful Crawfords reached Glasgow in such bad condition as to bring the shipper in debt $73, besides the loss of his fruit, valued at $325, or a total loss of $398; and another shipment of forty cases returned a net profit of $77.01, an average of $3 66 per case.

EARLY APPLES were so great a failure in crop this season that it was impossible to make up any cases of them for export. Next year, should the crops be first-class, some experimental shipments will be made, beginning with Red Astracan and Duchess in August, Gravenstein, Ribston and Blenheim Orange in September, and Fameuse, Wealthy, King and Cranberry Pippin in October. These are all excellent varieties, of beautiful color, which are bound to bring the top prices in any market.

Altogether we can report encouragement, although the season's shipments on the whole have been a serious loss. We have learned (1) to use smaller packages with better ventilation, (2) the importance of lower temperature in transportation, and (3) that fruit should be placed in a cool room as soon as gathered, and cooled even before it is packed, in order to attain the best results.

With these conditions observed, we expect to report success next year, such as will lead to private enterprise in the export of our tender fruits.

The temperature at which fruit should be stored for transportation long distances is one of the most important points to be determined. We all know that a ripe Crawford peach will soften on a hot day in twenty-four hours, so that it cannot be shipped even to a near market, and that the greenest Bartlett will yellow up and become mushy in a few days if shut up close in a tight package and kept at a high temperature. Evidently, therefore, a low temperature is necessary to keep such fruit for two or three weeks' transportation to a distant market. Evidently, also, this temperature must be kept up from the hour the fruit is packed until the time it is opened for sale.

At the great cold storage warehouses at Chicago, where our Canadian fruit was kept for one year for the World's Fair and placed under care of the writer, who was Dominion Superintendent of Horticulture, the best results were obtained where the temperature was held at about 33° F. Fruit so held came out in perfect condition.

The Genesee Fruit Company, Rochester, N. Y., aiming at the best results, engages to hold certain products in cold storage at the following temperatures; Apples, 30-33°; grapes, 36°; pears, 35°; peaches or plums, 35°; quinces, 35°.

Now, if it is possible to have our fruit carried at an average temperature of 35° F., I believe we are sure of success, and I would not be afraid to venture to ship freely.

Regarding our packing, we can never expect uniformity under the present method of each shipper packing his own fruit. Some will do the thing well, and possibly get a reputation for their brands, but the multitude will do it carelessly and get a bad name for Canadian fruit.

If it were possible to encourage the establishment of packing companies, managed by experts, to do the packing for export, the difficulty would be overcome. Such companies would build cold storage warehouses at central points, and adjoining packing sheds, and agree with certain shippers to receive a certain quantity of fruit per day, and pack the same in the best manner for a certain sum per case, loading the same in refrigerator cars from day to day. Each case would be stamped with the trade mark of the shipping company, and also with the owner's mark, so that the returns would be made direct to him from time to time.

THE PRESIDENT: This is a very important paper, and I think you will want to discuss it pretty thoroughly. Probably before going into the discussion we had better hear from Mr. Fisher on the same subject.

Mr. GEORGE E FISHER: The operations at Burlington we conducted so irregularly that I have not any formal report to make. In the first place, we were disappointed in our calculations on the cold storage warehouse, and had to try it without that advantage. We held a little meeting and decided we should be doing something, and if we ever did anything that we would have to make up our mind to go it alone. We therefore decided upon shipping a few Bartlett pears as soon as they were ready, and also a few boxes of plums; we had some apples and tomatoes, and I think that these constituted our shipments I am altogether without account sales, for the reason that when we decided to ship we felt that we were without any business connections in this matter, and it would be necessary for us to make use of our friends to get to our destination. I addressed a letter to Messrs. Hart & Tuckwell, of Montreal, with whom I have been doing business for a great many years, and asked them to act the part of forwarders and to get our shipment on board the ship with as little delay as possible and in the best possible cold storage. This they undertook very readily to do. They took a great interest in our undertaking, for they said we deserved encouragement; so we put up a little shipment and sent it down there in a refrigerator car. When it got to Montreal, much to our disappointment, we were refused admittance to the ship. There was a vessel there going to Liverpool. Our shipment got there at 5 o'clock in the morning. It laid in Montreal that whole day till midnight in the heated city before they would allow it to go on board the vessel, and this merely because a shipment of butter that was expected had not arrived. We were at a great disadvantage in this way. It appears that the Government have subsidized the vessels, and one of the conditions of the subsidy is that butter and eggs shall have a preference in cold storage. We were the more disappointed because of this delay as we had been given to understand by the Minister of Agriculture that if we undertook any work on our own account we should have the privilege of cold storage; that was promised us in the winter. Well, our first shipment got away with this much delay. It reached Liverpool, the report said, in good condition. The pears sold at 17s. a case. This is the Burlington cold storage case. (Sample shown.) It is four-fifths of two cubic feet in size. Here is the old apple case that we used, which is exactly two cubic feet. (Sample shown.) The apple case is one-quarter larger than the other. Our pears sold at 17s. a case, and the Montreal house shipped goods in connection with ours, and they got account sales showing the sales of their goods and ours too. They sent me this account sales to look over, with the request that they would be returned to them; therefore the account sales in connection with our portion are on file in the office of the Montreal house, and I have not seen them since shortly after I got them, for I returned them without delay, so I am quoting entirely from memory, and it is a good while ago now.

Mr. MCKINNON: Was the average price 17s.?

Mr. FISHER: They sold them at the uniform price of 17s.; that was the price that they all sold for—those that we shipped on that occasion; it was not a large quantity.

THE SECRETARY: You don't remember the number of boxes?

Mr. FISHER: No, I don't remember the exact number of boxes; there was not a great number of boxes—in the neighborhood of ten. Then our tomatoes we shipped green. We didn't know in what condition of ripeness to ship them, and when they got there they were still green, and of course they were not decayed and rotten, and they sold them for a trifle more than enough to cover expenses; but we learned that we needed to know what condition of ripeness tomatoes should be sent in. We received our cable returns for the sale of the first shipment of pears just a day or two before the Government shipment started, so that we were in the field early. As soon as we got this word we found it was necessary for us to know something more of the condition in which tomatoes should be sent, and the next shipment we put them in four conditions of ripeness—one quarter ripe, half ripe, three quarters and fully ripe—and the returns showed that those that were shipped in a half ripe condition reached there in perfect order, and sold at a fairly good price, but the average for these different conditions of ripeness was not large, although those that arrived in good condition was all right.

Mr. BURRELL: What do you mean by calling them half ripe—just colored up a little?

Mr. FISHER: One half colored. We sent the tomatoes quarter colored, half colored, three-quarters colored and fully colored. Now in this second shipment we had some more Bartlett pears, which I got from a neighbor. They were entirely ripe, and those of you that have seen the letter that was published as coming from the Liverpool firm will know in what condition those pears arrived in Liverpool—in splendid condition, just as good as if they had been opened up in Montreal. Now during these shipments we had the advantage of cold storage at Montreal. It was during the season of small fruit shipment, and plums were going still, and we put our cases of fruit in the car with those other fruits to Montreal; but a little later in the season these cold storage cars stopped and we were without even that accommodation, and we had only the alternative of shipping by express at a high charge—about forty cents for one of those cases to Montreal—or shipping by boat at eight cents per case, which we preferred to pay, and we put up quite a large shipment of mostly pears; there were some grapes, I cannot tell just what was in those shipments, but in all there were 398 cases. We put them on the old propellor "Ocean" down at the Burlington Beach canal, and they were two or three days getting to Montreal, and after that they went into cold storage on the vessel. They went to Bristol, and that shipment of 398 cases sold at prices that netted us at home $570—in the neighborhood of $1 50 a case net. We afterwards sent another shipment of 169 cases by steamer "Ocean," and this shipment realized $340 odd, or a little over $2 a case clear.

Mr. BURRELL: How much would that case hold?

Mr. FISHER: Four of those cases will just a little more than fill a barrel. We got 10s. for Kieffer pears in Bristol. In Liverpool the Duchess pears sold for about 12s., against 7s. for Kieffer. Now, in our experience not only in these cold storage shipments but in all shipments, I take it as a very important consideration, to have the fruit thoroughly cooled before it is put into the case. I put great value on that. It is difficult for us to do it at all times, because we sometimes have only a little time to do in. For instance, the Bristol ship leaves on Thursday. In order to reach Montreal by cold storage car we have to ship on Mondy night. Monday night and Tuesday night are occupied in reaching Montreal. We leave one day for them to get the shipment on the vessel. The vessel is supposed to leave at daylight, and if the weather should be warm on Monday—if there should be a hot sun or a hot wind—it is almost impossible to get this fruit picked and cooled to go in the car. You can do it nicely for the Liverpool shipment when the vessel leaves on Saturday, for in that case we have a day or two to get ready. So you see that it is not always practicable to have the fruit cool when we have not the advantage of a cold storage building, and in every case where we shipped pears put into the packages hot we found that the prices realized were from one to two shillings below those realized for pears that we put up cold. In one shipment I put about eighty cases of my own, and about one-third of those had been put cooled and two-thirds put in warm. I think I received 9s. a case for those that were warm and 11s. for those that were picked cold. In shipping to Montreal I think that it is just as much of a consideration to have the fruit thoroughly cooled before it goes into the case for the Old Country. Now with regard to shipping into cold storage in Montreal and then from there at a later date, unless there is greater pains taken to keep the fruit right in the cold storage I have very little confidence in it. My instructions have been to keep my fruit at 35°, and I contend if they do not do that they are liable to damage. (Hear, hear). I have been very much inclined to enter an action against them for the way they have treated me in this regard. I shipped fifty cases of Bartlett pears out of cold storage in Montreal. These had been shipped to Montreal some time previous, and had been stored there. They were not wrapped, because we expected to send them on, and hadn't taken such pains in the selection of the fruit as we do in what we send direct from Burlington to the Old Country market. These pears arrived in Liverpool out of condition. They seemed to be all right when they left Montreal, but that shipment was a failure, and that is the only loss we have had in our shipments. In the first shipment we made by the steamer "Ocean" we had a few cases

of grapes. They went to Montreal on the boat and from there in cold storage. They arrived out of condition, and sold at less than cost of transportation ; and I believe those few cases of grapes, less than a dozen, were the only packages that didn't pay their way. With the exception of these grapes the packages were all fairly remunerative, and on the whole the Burlington people have made money by shipping to the Old Country. I have done considerably better than we could have done in Montreal with our pears. The worst we have done is about $6 a barrel, and the best would be $15 to $16 a barrel. We have made a good average and feel that we have made lots of money by shipping to the Old Country.

Mr. BURRELL : You are speaking of net prices now ?

Mr. FISHER : No ; the $16 a barrel would not be net, but the other prices I have quoted would be net.

Mr. BURREL : Six dollars a barrel would be net ?

Mr. FISHER : Yes, and $8 a barrel. We got $8 a barrel net for a good deal of the pears that went by the "Ocean." Now, as regards cold storage against ventilated chamber, I have a friend in Toronto who has been shipping some this year in the ventilated chamber. He packs his tomatoes and pears in peat moss and they do not go into cold storage at all, but they go into a well ventilated part of the vessel, and those packages have arrived in Bristol in first-class order, just as good as those that went in cold storage. Now, if we can ship in a ventilated chamber in safety it will be much more profitable to the shipper, because the cost of transportation was so much less. Between Montreal and Bristol the charge per ton, that is forty cubic feet of space in the vessel, is 17s. 6d., and the additional charge for cold storage is 7s 6d., making a total of 25s. Now this larger case here containing two cubic feet go twenty cases to the ton, so that twenty of these cases shipped to Bristol would cost 25s. The small case, being four-fifths the size of the other, would go twenty-five to the ton, so that the cold storage to Bristol would cost us exactly one shilling a case.

A DELEGATE : What do you mean when you speak of cooling the fruit ?

Mr. FISHER : The only way we cool the fruit is to pick it and pack it in the forenoon up to the time that it gets warm from the heat of the day—the sun and the warm wind. Then I don't want any more fruit packed that day. We pick it and leave it on the table and leave it to cool, let it lie over night and let it cool off all that day. My packing house has sliding windows ; it is on the upper floor, and we leave these windows open and the wind plays through them, and this fruit gets pretty well cooled off by next morning, and we let our pickers go on and pick all the fruit they can on the following morning while it is cool, but just as soon as the fruit gets warm we don't want any more of it mixed with that cool fruit ; we put it by itself, and then there are girls that wrap these pears in paper, and we go on with our packing, and in the field they are picking and putting in another part of the building.

A DELEGATE : Suppose you have a very hot night ?

Mr. FISHER : It will cool off. They will cool off very much more in the night in any kind of room. I think this is a necessary process because of the process of the cold storage people. They have a room called the tempering room, and if fruit goes into their warehouse hot, they don't put it into the cold storage at once ; they put it into the tempering room. Within a month I visited a cold storage building in Toronto where they had a large number of baskets that were put in during the Bartlett pear season, and the pears were still in splendid condition, having been kept at a temperature of thirty-eight degrees. They had been sold to the Queen's Hotel, and one of the conditions of the sale was that they should be ripened for immediate use before being delivered to the hotel, and when I called there were a number of baskets sitting about the stove on the floor being ripened for delivery to the hotel. They had been there three days when I saw them, and they were still hard after being kept for several months.

Prof. TAFT : How ripe did you ever put pears in cold storage and keep like that ?

Mr. FISHER: I never put it that way, but these pears that went to the Old Country were just as ripe as they could be, but they were not soft, and I was very much surprised myself at the report which came from Liverpool regarding those pears; and there were a number of pears just ripe enough to get soft, but they were not soft. The Burlington people in their operations this year have been trying all such features of the work, and endeavoring to get all the information they can. We have not aimed at making money, but what we were after was to get the fruit there in good shape and find out what we could do.

The SECRETARY: Do you think your case is sufficiently ventilated? The case we are proposing to use is much more ventilated than that.

Mr. FISHER: We have not used any other case, and I have given you the results of using this case. It may be that a more ventilated case would be better, but we think that that case is sufficiently ventilated. When we fill our case the fruit stands about three-quarters of an inch above the edge. We have a frame in which we place an ordinary screw press. When the box is full we just shove it into this frame; we place the cover on it just as you see it here, and then we have a little frame made of pieces of wood that sits across the top, and two slats, and these right across the cover; then we bring down the screw and press this home, which opens up the spaces at the sides more than you see them open now, and they remain so. It is ventilated at the top, bottom and side. The Toronto people say they do not want a ventilated case, they would just as soon have a tight barrel as an open barrel; they say they have just as good results. They say the Chicago people have taught them that. I don't know from experience which is best.

Prof. ROBERTSON: Do you use the same case for tomatoes?

Mr. FISHER: For shipping tomatoes we get some little baskets made like they use in the twenty-four quart berry case, only they are as long as the box is wide, and so wide that three of them would reach the length of the box. We put these in, fill them with tomatoes, and then put a slat on the top. They were as deep as one-half of the box, and then we put a row of these baskets on the the top and put on the covers. Now about the one-piece sides. A great many cases they made for me were two-piece sides, although the contract was for one. When they come to make them up they said they hadn't the material, and we allowed them the privilege of using two-piece sides, which we consider was not at all to our advantage, on the consideration that they would use this iron (showing two narrow strips of hoop iron about nine inches long and one inch wide). Now this is an idea of my own which the Coleman Lumber Co. give me great credit for. They say they intend to use it on their boxes right along. In shipping the old apple box to the Old Country, a number of my friends at Burlington said they could not sleep after a shipment went away unless the boxes were banded · they were afraid they would go to pieces in handling, and consequently a good many of them were banded; and when they got to the Old Country the consignees in Glasgow complained fearfully of the bands—they said they could not sell them because they went right into private families, and the people cou d not get the boxes open. (Laughter.) They said the ordinary family had no better kit of tools than a poker and a pair of tongs, and they could not do anything with the boxes. (Laughter.) In order to do that we set ourselves to strengthen the boxes without putting the band on the outside, and when we consented to take the two piece sides, the maker of these boxes consented to put that piece of steel across the end before they nailed the sides on. It goes inside the covers. The nails go through it, and these two pieces of steel will carry pretty nearly a ton. The box is practically indestructible with that band in there.

A DELEGATE: You say you prefer a four-fifths box to a bushel box at the same price. Why do you prefer that size to a bushel?

Mr. FISHER: I don't know that I do. When we shipped that box to the Old Country first, they sent us a message from Liverpool on no account to change that box—that we were shipping the finest package that came to Liverpool. You can stow that box on the top or sides or endways, or any way you like, and it will fit. The vessel people

like it, and they like it in the warehouses, it was just what suited them, and they wanted nothing else; but it was only because this Burlington people had the boxes made up and the material all cut that we were using this box. However, for our cold storage purposes it is certainly a very fine box. We find it a useful package. I don't know whether it is too close or not.

Mr. WESLEY SMITH (Winona): There is an idea that they want the air to circulate free. If packed so solid will fruit carry as well? Should they be separated?

Mr. FISHER: I don't want to appear as an expert. I really don't know anything about this business except what we have learned from the little experience we have had this year.

Mr. BOULTER: You are satisfied that the lumber should be thoroughly seasoned? It would affect the fruit to put it into new made boxes?

Mr. FISHER: We found that by experience in former years. It is our practice to get a number of boxes made up early in the season. Last year I shipped 5,000, and we didn't have enough ready, and we had to go back to the factory for more, and word came from the Old Country that the fruit tasted of the wood.

Mr. BOULTER: I have just got a letter from Mr. Larke, our Canadian Commissioner at Sidney, Australia. I sent him some goods, and amongst others evaporated apples, and the complaint is that they taste of the pine. They were put in new-made boxes.

Mr. FISHER: That was another reason why I think these basswood boxes would suit us better. There is no doubt basswood is better than pine to ship fruit in, but these boxes were sold for fifteen cents when they were made up, and they say they could not afford to make them at the price they sold them to me at, but they had them there, and in order to get rid of them they were willing to supply them at the same price at which I could buy pine boxes. The printing of course was a disadvantage, as we had to do it with a stencil and shoe brush and ink, and it is a slow process, and we cannot do as neat a job as they can with the machine. My idea in bringing this box here was to learn all I could from criticism. This strip of steel saves the boxes from destruction in handling.

The PRESIDENT: I would call on Prof. Robertson for his address in connection with this subject.

CANADIAN FRUITS FOR THE BRITISH MARKET AND COLD STORAGE.

Prof. ROBERTSON, who was received with applause, said: I have no verbally prepared report for this afternoon, but I am very glad to be here. I came a good deal more to learn how our Department could serve the Fruit Growers than to try to offer you very much of advice and suggestions. At the same time, having learned a good many things during the last summer about cold storage and transportation, I brought with me, in addition to what I carry in my head, as full reports as I could collect of all that the English people said about our fruit and our packages, and the advice they give us as to how we could best meet their wants. The fruit men of England are like the other importers of England—they insist on having things done their way, even if that be not in our judgment quite as good a way as the way we suggest; and so we have been trying, so far as we could during the progress of the season, to send over, in the shipments that we sent under the supervision of the Department of Agriculture, fruit packed in just the kind of way they said they wanted it. But before I speak of that I would like to make a very few observations on the two addresses we have just heard, to make quite clear one or two matters that didn't seem to me quite clear in regard to what they had presented. Now, it is known without explanation from me that the Government did provide cold storage on steamships for the carriage of perishable products. That was begun first to carry butter—that being the only product that then sought that accommodation—consequently all the agreements were drawn up with the steamship companies saying that fresh made creamery butter should always have the

preference. But if more accommodation is wanted for fruit, then extra accommodation can be provided. It would not be fair to restrict the butter accommodation in favor of anything else. This limitation was put in there, and I would like to make this explanation on behalf of the Minister: That while butter has the preference, on every steamship there is space for two carloads reserved for such as the Department may indicate to be trial shipments of any kind; and if Mr. Fisher or his friends had intimated to the Department at all at any time that they wanted some space fer trial shipments, they could have had a share, at least, of the two carload space, and then there would be no shutting out of any trial shipments for want of accommodation. I want to say that, lest it might seem that there was no accommodatien for trial shipments; and the steamships are not bound to reserve space for any shipments unless space is engaged four days before. The steamship people would not be able otherwise to fill the holds. Then I am very much pleased with the report that has been made on the shipments from Burlington. I had a pretty good eye on some of those shipments in Montreal quite often, and could see the progress of the work, and was very much satisfied with the way some of it was being done. I was specially well pleased with the extra good quality of the fruit offered this year—the evident care in selecting large sized, uniform-sized and well-shaped specimens. I am no authority on fruit culture, but I do know the size and shapes good fruit should have, and I pay them this well-deserved compliment, that it was the best I saw go from Montreal. Then the one matter that perhaps I misunderstood Mr. Fisher in stating, and with regard to which I took the opportunity to interrupt him, was this: That while the whole cost of carrying a package in cold storage from Montreal to the vessel might be a shilling per case, I thought the point he was discussing was the extra cost of cold storage and therefore the gain to the community of shipping in ventilated chambers where extra cost would not be imposed. The extra cost for the cold storage service would be about 8c. per case that size (sample shown). Now, rather than run any risk at all, 8c. is a very safe investment to ensure safe carriage in any kind of perishable fruit or other products. Then in regard to the report that Mr. Woolverton made in behalf of the shippers of Grimsby I would like to make this observation: That the shipments while under Government auspices were not under the direction of the Government in that full sense. The Government, through myself in charge of that branch, made recommendations in regard to the packages of fruit, but took no control beyond the recommendations, which the shippers, I think, did their best to carry out with the exception of the first packages, which were procured before the Department's judgment was taken, and these, I think, were too large and had one very serious fault which I shall point out when I speak of tomatoes. The Department was merely seeking to provide accommodation for the safe carriage of fruit such as the shippers themselves would pack and put on the railway cars for us. Then the other matter that was not perhaps quite clear, at least to my mind, was that the failure of the first shipments of fruit to carry safely was owing to the fact that these shipments were carried at too high a temperature. Now, that is quite in accordance with my own knowledge of the facts of the case, but that was not because the temperature in the hold of the ship was not cold enough. You may have fruit in a package which, because of the generation of heat in the package, will keep the fruit much higher than the registered temperature of the hold of the ship. The temperature in the hold of the ship was kept at the point we requested in each case except the one mentioned by Mr. Woolverton, and while the fruit was carried in too high a temperature it was not because of the lack of facilities for cold storage, but it was because the fruit was so insulated in the package that the cold storage would not cool the fruit in the packages. With these explanations from my knowledge of the matter this year I would like to lay before you the report, and then get what I can from you of information as to how this business can be carried on most successfully. Allow me in a few moments of introduction to assure you that the Department regards this work as being so very important to the whole fruit-growing industry of Canada, that the Minister authorized me to say that no pains and no reasonable expense that is necessary will be spared to get the Canadian tender fruits on the British market in the best kind of packages and packed in the best way and delivered in the best condition. (Applause). If shippers themselves

desire to make experimental shipments and will get carload lots, the Department will provide the cold storage expense, railway cars from the starting point to Montreal, will keep a man there as we did last year who will see that the fruit if not put immediately on board the ship is cooled or put in cold storage, and will ensure such space on the steamships thoroughly cooled as the fruit-growers will notify us beforehand they want. Of course you cannot put space in a ship in a week, but any authoritative information in regard to the amount of space wanted in time to provide that, the Minister says will be provided this year for trial shipments of fruit of the tender kinds. Now it is very well to discuss varieties and methods of growing fruit, but unless the fruit can be marketed at a profitable price of course the whole business must fail—(hear, hear)—because a large orchard with a small demand for its fruit is only a source of expense to the man who owns it. Now, how can the demand be made steady, and be made as far as possible at profitable prices? Well, first of all by taking away as far as practicable the risk of loss to the fruit merchants, the men who now in Canada handle the fruit. During the summer I have taken a great many opportunities of going into the fruit shops, both retail and wholesale, and talking to those people. One thing that keeps a man from paying even a fair price is the risk he runs of having the fruit somehow go bad on his hands. Now, I think that main risk is caused because of the fruit leaving the fruit-grower's hands in a warm condition. That applies to nearly all kinds of fruit that I have seen this year. If the fruit could somehow be cooled before it leaves the place where it is grown its natural term of life would be nearly quadrupled, and then that risk would be very much lessened. There is a tremendous loss in Toronto this last year from peaches going there and going bad on the streets, in the shops, even with cold storage there, because they get very warm, and men had to get rid of them right off before they got worse. If they had been cooled before they started, or held back a few days, it would be a great protection to the whole fruit-growing interest It would pay the fruit grower to put up a small cold storage building in his own place at a cost perhaps of $250 complete, enough to hold five or six tons of fruit. I only suggest that, now, as being a most desirable means whereby the fruit-grower can protect himself from great loss and ensure that the merchants who get fruit from him will have more confidence in the future trade with him. Then the next matter that will affect the demand for fruit is to make it possible for the consumer to get the best quality of fruit in the best condition. It is not easy in Canada in many markets to be quite sure you can get a perfect package of fruit in good condition. If you buy California fruit you can get a package with every single specimen of fruit like every other one; but if you buy a basket of Canadian grapes or pears or peaches you will find some very good fruit and some rather poor fruit; not the good always on top. I am not speaking at all of any tricks of the trade. I am speaking now of the need of catering for the best class of customers by a uniformly fine article which they can rely upon being the same all through. Now, a cool place to handle fruit will give every grower a chance to send that kind of fruit to market, and that will mean that every family both here and in England, and in England particularly, would eat twice as much and three times as much and by-and-bye, six times as much Canadian fruit as they now consume. I have been enquiring of the householders in Ottawa this season why they don't eat more fruit, They get home one basket, and one part of the fruit is good and two-thirds bad, and they don't buy more. That applies to all perishable products, so it is most essential whatever the Government may do in cold storage, either at warehouses or at steamships, that every fruit grower should provide himself for some convenience for protecting the fruit as well as he can protect it, so that both he and the merchant will have more confidence that they are not likely to lose what they buy. Now, the home market is the best market for everything we grow in Canada. I say that without any qualification at all—that out of every $10 worth grown in Canada $9 worth is eaten at home. But if you have a dollar's worth at home that the people do not want, then the other $9 worth is not worth so much; so that while the home market is the market to cater for, the home market price may be determined by what you can get in the foreign market, as the rate per basket of many kinds of fruit in a few years will be determined by the rate per basket or case you can get in Liverpool or Glasgow or London. That brings me to speak of this next, that the price of Canadian

fruits, at any rate in Great Britain, in the meantime—when I speak of the meantime, during the last two years—is determined by the condition, as far as I have been able to observe, with the single exception of apples—having found no uniform range of prices arising from the variety of fruit. Now, in listening to the discussion about pears this morning I found that the pears that are spoken of as not being so good sold just as high as others in the shipment we sent forward if they landed in good condition. The first requisite in shipping fruit to England is to get fruit there in good condition, and not to have it get there in what they call a sleeping condition, that is, a condition where the fruit is firm but just ready to be wakened up into decay by the least little bit of heat. That means that the retail men will buy it only if they get it at about 25 per cent. of its value. I do not know that it is right that that should be so, but the fact is that it is so, and the wholesale men say that they cannot get the retail men to buy fruit that is sleepy—that is too ripe when it started from the other side. Then the next thing that gives fruit value in Britain in regard to condition is that the fruit shall be seen to, that it will have reasonable keeping qualities there—and the longer the life period of the fruit there the higher the price you can get for it. Pears that land in England to be eaten within three days necessarily will fetch one-third the price of pears that land there in such a condition as to be kept for eight days—about that difference in regard to comparative value. That is gathered from correspondence as well as the results we have had from our own trial shipments. Then a minor matter, which has been counted a major matter, is the quality of the fruit in regard to its appearance and flavor. In a few years, when they get to know our fruit as being reliable in condition, they will discriminate as to flavors; but just yet, except in apples, they don't discriminate as to varieties—they merely want the thing sound. So if you can send a high-flavored fruit also sound, so much the better; but I do not think for one or two years you will get any more money per case for them than for the commoner fruit which will have a good color and be in a sound condition. Then, that I might glean from you some information as to what we should do during this coming year, let me instance what seemed to me the great difficulties of getting our fruit in England in the best way. Everybody knows there are difficulties in general. I want to indicate some of them in particular, so that you will put your best thought at work and be able to suggest the best means of meeting some of these difficulties that have not occurred to us. The main difficulty is that of climate here; that is most capricious, especially at the time that the fruit ripens. When we sent the two largest lots of peaches from Grimsby the temperature was recorded as being over 90° in the shade. Now, temperature like that, you see, does not give you any chance to cool fruit by ordinary ventilation, except the least little bit through the evaporation of the fruit itself. That accounts a good deal for the very over-ripe condition in which the first peaches landed, because they were picked at a temperature of 90° and there was no way of cooling them thoroughly in the length of time available between the time they were packed and when they went on the car. That makes me think again that some simple cooling convenience should exist on every fruit farm where a man expects to handle his fruit in the best way. Then we have distances from market, which is a very serious thing, but it is not such a great thing if you can get the fruit to carry there safely and at not too great a cost. Now the actual cost of shipments from Grimsby to London was as follows:

Freight to Montreal, counting those large sized cases	19½c.
Wharfage and marine insurance, and those incidental expenses	2½c.
Ocean freight (including cold storage charge)	31½c.
Consignees' charges on the other side, such as delivery charges, fire insurance and hauling, and all those things	17c.

Making a total of 70c. a case into Convent Garden, England, from Grimsby, with additional charge of 5 per cent. commission for the sale and guarantee. That would vary more as the fruit sold high or low. Now the cost to Glasgow is 64c. per case, the Glasgow delivery being rather cheaper than the London delivery. The cost to Liverpool would be a little less still than the Glasgow case—being 60c. per case to Liverpool. Perhaps I might interject here a statement of what the fruit would realize as sold in these markets. I take first the fruit as sold in Glasgow, which did not give as good returns as

London for, perhaps, two reasons: the Glasgow market, so far, has received no California fruit, as far as I can learn, and therefore the people are not prepared to buy imported fruit, as they are in Convent Garden; and then, besides, the first shipment that went to Glasgow was the one that was carried at a temperature of 48° by the ship's instructions to keep the hold at that temperature to save some eggs that had been put in. Of course there was a clear case against the ship if one should wish to push it, but in the experimental work we did not want to lay the blame on anybody. But that was one reason why Glasgow shipments did not realize as much at any time as the shipments to London. Take the peaches first. They landed in very poor condition, and I give you about the best price of those that went to Glasgow. There were some fancy dessert peaches by L. L. Hagar sold at only 4s a case, that netted 29c. at Grimsby. Then others at that rate. Then grapes we practically gave away, and I do not think because they were given away that therefore we should not make any more shipments of grapes. Where the grapes were put on the hotel table the guests would pick them off and spit them off on their plates. A big hotel dining-room was watched, where the Canadian grapes were put on in the best condition, and that was the result. They were put on every day for a week, and by the end of the week they were eating the grapes off the plates. (Laughter.) One sees the same thing by any Englishman and Scotchman and Irishman coming to this country. They don't like Canadian grapes, but in a while they devour as many of them as any of the rest of us.

Mr. BURRELL: More.

Prof. ROBERTSON: Yes, I dare say they are energetic and of good capacity. So I don't think because the grapes were given away, and that was the cause of a great deal of our loss—because there was a larger quantity of grapes sent than anything else, and the expense was piled up in carrying the grapes—that was a bad investment; and from my standpoint I am prepared to say this, that it would be a good investment to send as many as ten carloads of grapes next year over the country as a whole even if they did'nt much more than meet expenses—(Hear, hear)—for we are growing so many grapes that we must find an outlet for our surplus, and, perhaps, if you can educate the English people to eat grapes they will take kindly to our grapes as they did to our tomatoes, which are now eaten in enormous volume from the Canary Islands and the Channel Islands and England itself. The pears sold from 15s. a case downwards. Those sold at 15s. a case realized at Grimsby $2 78, that is counting every expense. Those that realized 8s. 3d. a case netted $1.24. Then tomatoes realized all the way from 5s. 2d. —57c. at Grimsby—down to 31c. at Grimsby. Then there were a few lots which were practically given away altogether. Then of the shipments that went to London—and these I quote from are the very highest prices that were realized—peaches were sold at 15s. 4d. a case, realizing at Grimsby $2.84 a case after all expenses were off. Peaches were sold at 12s., realizing $2.04 at Grimsby, and these were not landed in the very best condition—that is, in as good condition as I am quite confident we could land them in with the experience that we gained in regard to a lot of little things which I will refer to when I speak of packages. Pears were sold at 16s., realizing $2 95; at 14s., realizing $2.49; and 12s., realizing $2.04. The highest price realized for Bartletts was 12s., and for the Louise Bonne 16s. and 14s.—higher than the Bartletts. I find also that the Kieffer pears in one case were sold for 11s, and the Beurre d'Anjou for 15s. in Glasgow —both prices being higher than the Bartletts, I think the main reason of that being that they landed in better condition—perhaps a kind of pear that would not injure so quickly. Tomatoes realized 9s. 4d., realizing $1.43 at Grimsby. Let me interject an explanation there, that these were small sized tomatoes. Now, that was the kind of tomato that was advised to be sent from all over Canada. The horticulturist at the Experimental Farm had issued a bulletin a year before advising medium and small-sized fruit to be sent, and in the same lot we sent some large-sized fruit.

Mr. BOULTER: What particular variety?

The SECRETARY: We shipped the Ignotum.

PROF. ROBERTSON: Large size fruit sold for 6s. 8d. netting 62c. against $1 43 at Grimsby, and that occurred twice over, with the statement back from the consignees each

time, "Large sized tomatoes don't sell well in our market even in the best condition." Then grapes sold in London at 4s., netting 22c. down to 10c. and down to less than nothing, but the last shipment bringing back a better report from the retailers who got the grapes. We didn't send many plums altogether, but they sold at 15s. 6d, realizing $2.83 at Grimsby. The apples we sold at 8s. 3d., realizing $1.18. These are among the best prices that we got for the fruit that landed in reasonably good condition, but I am confident, from what I saw of the work this year on the steamships and at the warehouses in Montreal, and on the railway cars and back to the starting point, that the fruit this year didn't land in England in as good a condition as the same fruit can be sent next year, if we merely just carry out with fair judgment what we have learned this past year. Now, the next thing I find on my notes to bring before the convention is the matter of package itself. What is the best package in which to send Canadian fruit to Great Britain? Now, there is no best package that is equally suitable for all kinds of things, and no package will suit all markets equally well. There is a market preference as well as a fruit need in regard to the package that will be selected. First of all we want a package that will provide for the safe carriage, and in all the tender fruits the safety should be against attack from the inside rather than from bruising or from injury from the outside. The first shipments were conducted in a very unsatisfactory way in that sense. They were thoroughly protected against any possible injury from the outside, and that protected them from being cooled by the cold storage current to the extent that they decayed from the inside. I would like to make that clear so it will help you in any package you want to use, that the safe carriage is one protected from danger from the interior and not from the exterior of the package. Then the package must be cheap and suitable for any kind of handling, and. for such things as tomatoes and peaches and grapes, the smaller the package the better, consistent at all with strength and safe stowage. Half cases sold every time for a good deal more than half the price of whole cases, because they gave much better satisfaction—a reasonably small case rather than a large case, such as one of these bushel ones, for everything except apples and the more hardy and firmer variety of pears. I think a package as small as the Burlington package or this other package is quite small enough for firm apples or pears, but for peaches and tomatoes, and grapes and plums these packages are abundantly large to enable one to get the best results. Then retailers don't care to buy a large package in many cases from the wholesale men in Covent Garden. I would rather, after saying one thing more in general terms, discuss the particular kind of package you want in each case by itself. Nobody would think of packing apples in the same kind of package that you would pack strawberries in. One thing more: The package in which tender fruits are packed must be provided with thorough ventilation. There is no possibility of carrying fruit safe to England, in large quantities, unless each package is provided with thorough ventilation. If you have a few packages—a dozen or twenty packages—perhaps you would carry those packages quite safely without each package being ventilated, because you would only have a certain little generation of heat which would be taken by the atmosphere; but if you have a great mass of packages, each one generates some little heat until you raise the heat of the whole mass 5, 10, 15 degrees, and then there will be rapid decay; so that there must not only be ventilitation for each package, but a large amount of room for circulation around the packages on the ship. Take this as an instance: Lunnage, this last year, one of the firms in Covent Garden, who have not much experence in importing tender fruit, bought 5,000 packages of California pears in New York, in cold storage, said to be in the best of condition, and they packed the ship with that fruit quite full, and they had the misfortune of having to sell the fruit for a mere song, it being found in a rotten condition; whereas another more experienced shipper put in about 4,500 packages in a 6,000 package apartment and left a space around every package for the circulation of air, and he landed his fruit in splendid condition and made a very handsome profit. Now our first mistake on the ship was that we left only slats between the boxes, and the slat between the boxes, with the boxes at all filled with even moderately warm fruit, does not allow enough air to carry of the heat; and in our late shipments we left space between the boxes and the heat was cooled going on the voyage. The essential difficulty of a package like this (sample produced) in packing fruit as in

packing butter was in using a pine package, which is the most objectionable kind you can use as to material; it imparts a very offensive odor, and while the odor of pine is exceedingly agreeable in itself, when the odor of pine is mixed with the odor of any food product it becomes exceedingly offensive. Now a package that is built like this (McKinnon package) with a cover close on top and left that way will in half an hour become full of heat, say all around as low as that piece (half way down the side). The hot air won't go down and run up that way, and if you have cold air all around that, it will take a very long while for the cold air to be diffused through this warm air. If there be an opening at the top to enable it to rise it will cool the package very quickly. But the safety of that package, I should judge, is that you have just enough of a spread there at the top to let the warm air out, whereas in this package each specimen of fruit becomes a small slow-drawing stove, the fruit being the fuel and the generation of heat going on; so that you may have a thermometer outside the package down to 38° —where it is held down at ship—and the thermometer inside the box is 68°.

Mr. McKinnon: May I ask if the fruit in the upper part of the cases was found to be more decayed than the fruit in the lower half of the cases?

Prof. Robertson: In those I examined in Montreal, yes. From England I have no report, but some packages that landed in Montreal in a very warm condition we kept there and sold there. I had these opened, and counted the peaches out myself. I had these cases at one time in Montreal kept in a large cold storage room where the thermometer was 36° all the time, and with a 600 h.p. plant there was no trouble in having that cooling power, and after the fruit being there for forty-eight hours the fruit inside here I should say was something over 65°, whereas the ventilated package that would allow an escape of the air like that would get cooled down in less than twelve hours. We have so much of fragmentary information on this part of it that this I may say to you: not grudging the cost the department was at last year in this matter, we are going to have a cold storage building in Ottawa this summer just to find out these things, and we will know exactly, having it under our eye all the time so as to learn precisely how long it takes to cool certain packages, and the temperature at which the different kinds of fruit can be kept in the very best way. There is no way of knowing except doing it ourselves that way, and we are doing it in that way so that the public at large can profit from it. Meantime make sure of ventilation near the top where there is none, and let the hot air escape. What I have to say next in the way of suggestion, and also perhaps a text for somebody's remarks afterwards, is not on the package but on the packing. Now there is a wide difference between the two. You may have an excellent package and so pack fruit as to make the fruit spoil quickly. The packing includes first the handling. Now while I do, I know very little about the handling of tender fruits—at least I have this knowledge from my general knowledge of the causes of decaying substances, that it is far better to handle the tender fruit like the peach once than six times in packing, and it is much safer to handle the fruit when in cold condition than in a warm condition, even the one time, when you can manage it. So if in the handling of peaches they could be picked from the trees and then put in a cool place at once in baskets before any attempt was made to sort or pack them they would not suffer, whereas I could see marks of fingers showing where they were pulled or handled over, causing them to spoil at this place first. I think that is a matter that should be looked into as to whether it would not be better to have a place to put the fruit directly from the orchard, and leave it there for say twelve hours before any sorting or wrapping was done at all, and then it would be wrapped when cooled, and the fruit would be protected. Then in packing a good deal of care must be taken as to the temperature when the fruit is packed so as to keep the outside temperature from touching it. I say this by way of explanation and also by way of getting as much information as possible. If I put fruit in a case like this—thoroughly close and padded all round with excelsior or with peat moss, and each separate fruit wrapped in paper—and then put a tight cover on and have a tight box, if each separate fruit was quite cold when put in the ice, I could send that quite safely to England without cold storage at all; the cold fruit being insulated by the thickness of this box and the half-inch of excelsior lining of paper would keep the moisture from getting at the fruit. Now, if I pack that fruit in a box warm I do precisely the

opposite. I keep the fruit from being warmed up in one case, and in the other case I keep the fruit from being cooled down. That brings me to say this next, that the packing should be so as to hold the fruit firm with as little packing material as can be used, and with an entire absence of all covering paper except the wrapper that goes around each single fruit. Every extra layer of paper you put around any kind of fruit keeps the cold air from getting at the case, and so far is a disadvantage. If any of you from what I have said will feel disposed to put up a cold storage building, I have brought a lot of very simple plans for building in the very best way and at the least possible cost, and a cold storage building can be erected at about this rate. If you will count the whole of the inside contents of the ice-house and cold storage room it would cost about ten cents a cubic foot for the full cost of material and insultation. If you want a big one it will cost you so much more.

The SECRETARY : This is for the whole space ?

Prof. ROBERTSON : That is where you cool by leaving the ice in position. If the room be cooled by taking the ice out and putting in galvanized iron cylinders, your ice house would cost you very much less. That brings me to say a few things about the general plan of cold storage and how it can be applied this year to keep very many other Canadian fruits along those lines I have spoken of Its main use is by preserving the fruit. I repeat that,—to preserve the fruit, and not to give a man a chance to speculate in fruit. There is a great danger that the cold storage service of the Government may be diverted from its proper and intended use, so that people will buy all kinds of products of a perishable kind and put them in cold storage and hold them until they are out of their season. Now, I think only disaster can follow a course like that ; that every kind of product will do its best when marketed in its season. There may be a little amount of exception here and there, but every kind of product will do better in its own season, and make room for what is to follow after that. Then it gives a rather long marketing period ; you can spread the period out perhaps two weeks longer in the case of each fruit ; and then it gives a man a little better chance to choose his time of selling within those limits ; and then most of all it should be used to protect fruit while waiting shipment and on the way to the steamer. The latter is the main thing. Now, of all the different agents used for preservation let me mention just two things to make this cold storage matter perhaps clearer than it otherwise would be. In preserving anything like fruit there are two causes of decay. One of these is the attack on the outside of the fruit by all kinds of fermenting germs, and the other is the change in fruit itself—the change in its vitality. Instead of trying to reason at any length with you at all, we will be glad to send enough printed matter to make clear to any one who wants to read it, the theory and the principles of cold storage ; and let me make these two things clear—that in every change that occurs one has to take notice of two things : One is the agent and the other are the conditions. For want of clearness in these two things, cold storage methods are found defective. You have an agent that is active toward decay, and you have the conditions under which that agent will work well or will work badly. Now, you have, first of all in the agents that destroy fruit, the life of the fruit itself—the life in the cells of the fruit—bringing about changes that mean decay from the inside. Then you have changes from all kinds of molds and germs of these things that attack the fruit trees, often only in a very minute form. Now, packing in paper will protect from attacks from the outside, but wrapping in paper will never prevent the attacks that start from the inside. Therefore fruit needs protection by paper wrapping to protect it from one of these, and needs a cold condition to prevent other agents from doing their rapid work. Then I might note that one condition that makes for the rapid decay of all kinds of perishable products is the condition where the product is very wet, because all kinds of changes and fermentation go on more rapidly in a very moist product than a dry one. That is why grapes, when put in the form of raisins, will keep indefinitely. You dry the water off and they remain unchanged. Canadian fruits, such as pears and peaches, seem to be specially liable to decay because they are full of juice, more so than other fruits. It is needful that the temperature should be still lower for them than for other fruits of the same name. California fruit goes to England at a temperature of 40° to 48°, and this temperature they recommend for all fruits that go from California to Covent Garden. I think our Canadian peaches and

pears will stand probably two degrees lower with advantage, just because they are more liable to decay. I will not say what I thought once of saying on the matter of cold storage principles, but pass on to say a few words about the package itself for the cold storage building. There is no use of sending to Britain any small peaches, any small pears, or any small apples, and there is no use sending to Britain any large tomatoes. If you will bear this in mind in regard to these three things, you will get twice the price you would if you send the wrong thing large. Then, every packer should so pack his fruit that whatever the size will be or whatever the selection will be, it will be always the same. For, in Glasgow, and Liverpool and London, you will see men waiting around there in the auction room and holding their bids till the fruit of the packer they like goes up; and when that brand that three or four men all like goes up, the price goes up at the same time. If every packer could spend a week over there looking at the difference in price, there would not be a single packer that would not strive to have his packing of the best, and uniformly the best. It will pay every packer to put nearly one-third of his fruit, if need be, out into his——.

MR. BURRELL: Pig pen?

PROF. ROBERTSON: Yes; pig pen or worse—put it wherever he can so that it will not go to anybody's table. If fruit had a higher fertilizing value than it has I would say it would be a valuable thing to make a compost of it; and that is not saying anything against the fruit growers, because any man who uses his eyes knows that you cannot have any large quantity of good things without a large quantity of poor things. Now it would be a good deal better to use them in any kind of way than to put them on the consumers' tables, and especially to use it in any kind of way that would not let them go to the consumers, especially in the same case with the best fruit. This year in apples one man's brand was wanted very actively at 30 and 35s. a barrel, while another man's brand was not wanted at 18s. a barrel. It is telling every year more and more, that the man who packs uniformly well, and has uniformly fine fruit, will have his brand set off and bid for until he gets a bigger price. That brings me to say a few words on the packing of soft apples in connection with this fruit. In all the soft and tender varieties of apples if they are packed warm and the barrels are closed up at once, and they are sent over to England in the usual way on the railway and on the ship, the experience has been about sixty per cent. returned back "wet and slack," and the feeling here has been rather of suspecting the Englishmen of fraud. Now if a soft kind of apple be packed in a barrel while it is warm and the barrel be closed up, the barrel will generate more heat, and the heat will cause the apples to occupy more space, and they will shrink and be wet. I am not going to argue that beyond telling you that this season 267 barrels of early apples were sent in cold storage in one of the best ships for cooling things down after they are put in the ship, and in the same week a shipment was made of the same stock of 325 barrels without cold storage and not being cooled down. The first parcel netted back in Western Ontario $2.45 a barrel, and the other parcel averaged 75 cents a barrel—the same stock. The proportion of wets and slacks returned in the one case I think was about 200 barrels out of 325, and there was not a single barrel returned for wet or slack out of the 267 barrels that went to cold storage. Thereby hangs a very, very valuable piece of admonition in regard to the shipment of early apples—that if the apples are packed on a hot day then they should be put in the cellar for a day before the heads are put on, and then the heads or staves of the barrels should have holes that the heat may get out, and they ought to go in cold storage, and you would not get back more than three per cent. of slacks as against sixty per cent. of slacks that have been reported in past years. We have also learned a good deal about apple shipments; and before shipping the things at all I wrote every steamship company which was to carry apples a special letter urging them to have put in their ships for even fall and winter apples not a cold storage but an electric fan that would suck the warm air out and let the cool air down to the bottom of the apple hole. Two of them that have done that said they never had as much satisfaction in carrying apples before. (Hear, hear.) I believe with little things like that you could have the late fall and winter apples landed in England at bigger prices, and cause consumers to want three, four, and five times as many Canadian apples. I have sent some odd barrels myself to

friends whom I have over there. The people all want Canadian apples when they get them fine, and when they get poor apples they simply give the country a bad name. Now the slacks that have come back reported in such large quantities have not been due to the packer's dishonesty, as the Englishman says, and they have not been due to the Englishman's trickery, as the packer says, but have been due to the conditions between these two men having been wrong and apples getting spoiled on the way. (Hear, hear.) I want to say also in regard to the sending of even later variety of apples in cold storage as against those that were sent in the ordinary holds of the ship. From one of those lots I have not yet the report, but from one lot that was sent from Grimbsy we have a report to this extent, that all the apples in cold storage were sound and firm, and most of the apples not in cold storage, while sound, on careful examination showed the beginnings of decay and of the spots in under the skin. While they sold well, a careful examination by an expert showed the beginnings of decay there, while the others were found sound and solid throughout. That means that we must have the cold storage for the early apples and ventilated chambers for all the rest of the apples. Then our apple trade will be on a good basis ; but the shippers must ventilate the barrels and allow the warm air that generates in the barrel itself to escape both in the hold and before they go there. I have only a few things to say about pears in regard to packages. I think a package about this size (showing sample) is best for pears, and they should not be put in trays, but should be packed solid in the case wrapped in paper. The Californians use a case something like this, and then they put a cover on to keep the fruit solid and firm when moving, and then all the cases are packed on their edge in the ship, so that there is no possibility of squeezing the fruit by the pressure coming and crushing the sides, and then there are cleats nailed between each row, so that there is a circulation all around each row and between each layer. That means that it takes just about 5,000 cases to fill a 6,000 space in the hold, filled with the spaces all round, and by that means they could land the fruit in the best condition. I think a small package like this for Bartletts would be the best for us, with a centre piece, and then have the fruit packed in that way—(on the edge)—and have this side put on with a cleat. This small case is better for perishable fruit like Crawfords. The reason I advocate packing from the sides is because it is much easier to pack solid in a narrow space than you can pack in a large space. That will give you a better carrying package, and the same for nearly every kind of peach excepting the Crawford, and I think even the Crawford peach put in solid and cooled would carry best like that, with no trays at all between 2 and 2½ layers of peaches. The Glasgow people complain of those peaches being in layers—that the see-saw motion of the ship had bruised the surface of the peaches a little bit even when they were covered with paper ; so I think we should try as far as possible to get small packages that would carry the fruit safely without any drawers or trays in between ; and where one does use trays for such things as grapes, and perhaps even for tomatoes, those cheaper packages, let the trays be all wood and not of pasteboard. The last report I got two days ago complained that even in the cold weather the pasteboard trays, when the weather was quite cold, landed with the pears slightly molded from the paper becoming moldy in the damp ; and every report I have says, " Do not send any more pasteboard trays " Judging from every report I have had from England and Scotland this would be an eminently suitable package to carry the firmer kinds of peaches and tomatoes, and then that larger package for carrying apples and the firmer sorts of pears. These packages will cost very much less per case than ones that are filled with trays inside. In regard to pears, it is very important that the pears should be of a uniformly large size—a few small pears lessen the value very much ; and then that the pears should be of uniform regular shape. Incorrect or misshaped fruit less ns the value very much. I have nothing more to say about peaches, and I would rather say what I have to say about tomatoes in any discussion that may take place ; and I have only to apologize for the unconscionably long time taken in saying what I had to say ; and if after I am through speaking any of you would like more direct definite information in regard to any part, I have got nearly all these letters by memory, and as well as I can I will give you the exact facts in regard to the Englishman's opinion of the fruits we have sent. Before I do that let me repeat what the Minister authorized me to say on his behalf here and on behalf of the Department

and Government: "That having gone as far as he has gone this year at the request of the Fruit Growers' Association and others to try and open up a trade in Great Britain for Canadian fine and tender fruits, that any further information that is needed in regard to packages and methods of packing and methods of transportation, and even methods of distribution in Britain, that can be gained by trial or experimental shipments—that information on all these lines that can be gained will be gained this year for the fruit growers by any reasonable amount of attention here and also in Great Britain. On the British side, what I think needs to be done further is, in addition to what I have said, to have a departmental agent at Covent Garden market in London and at the markets in Glasgow and Liverpool, when regular shipments are sent forward, who would inform fruit buyers, fruit salesmen and merchants, in say fifty surrounding places, by either telegram or telephone or post card a day before, that an auction of Canadian fruit was to be held at a certain hour, and thus try and bring in the additional competition of country buyers to that of the operators in the cities alone. We want to get our Canadian fruit back into the towns of England as well as into those great centres, and so we hope this year to do these things and profit as well as we can by the mistakes that we made and which we paid for rather too dearly, I fear, but by which we gained information which we could not have got in any other way than by experimental shipments on the fairly large scale which were made." (Applause.)

Mr. G. E. FISHER: I would like to ask the professor if, in building the box, he has any regard for the size between the thickness and the length? I consider that the length of the box should be some multiple of the thickness. For instance, this Burlington box, when turned up on its edge, which is the only proper way to ship, is just twice as long as it is wide.

Prof. ROBERTSON: The only objection to that one thing from experience is this, that on board steamships unless you have some thicker packages there is a very great degree of loss of space. Steamship space is about six feet high. If you are two inches short there is a good deal of space that is wasted that you have to pay for, whereas if you have thin packages as well as a package like that I think it would serve the purpose of getting the space filled up.

Mr. FISHER: But in arranging the length of your box in proportion to your thickness the length must be some multiple of the thickness in order to have it pack properly to assist the stowage, so that there will be no waste of space in stowing.

Prof. ROBERTSON: I don't know that I have ever given that any thought at all.

Mr. FISHER: In any package I have ever had anything to do with arranging the proportions of we have always given that matter consideration. We have it so that they will always pack both ways.

Prof. ROBERTSON: Take the California and the French fruit packages, there is not one geometrically proportioned as to length and thickness and width.

Mr. FISHER: I think they should be. There is another matter I would like to ask. I don't exactly understand what our relation is to the Government in securing cold storage accommodation on the vessels. If I understand you rightly, you said that all we have to do is to ask for it and we shall have it. Now, I ask for it now—(Laughter)—that the vessel people be instructed to give our shipments of perishable fruits space as long as they have space, without any regard to anybody else. We were told that we could not get space earlier than two days before the vessel sailed. Now, that practically did away with our securing space, because if we could not secure space earlier than two days before the vessel left we could not prepare the shipment and have it there in time.

Prof. ROBERTSON: The arrangements are like this—and then I will speak of what we may do this year. The steamship people in Montreal made a bargain for half of the space for people who were shippers outside of Montreal as long before as they like, but one-half of all the space of each steamship must be held for Montreal shippers, to give them their fair share, and that I suppose cannot be gotten till two days before, but the other half of the space may be bargained for as long before as the men will make the engagement. Then this is the same also with regard to the fruit, that the Goverment

reserves space for two carloads on every ship, and if any shipper that is shipping fruit like that will notify the Department long enough beforehand that he will have the fruit, that space can be reserved for him, but he must fill the space. You see, if a man applies for space and says he will send a whole carload every week, we will provide it; but then he has to send the carload or pay for the space. This is the position now, that if the fruit growers will make up any sort of statement as to how much space they do want, and how much they will send every week, I am authorized to say that we will provide that space for them.

Mr. FISHER: Why not permit an application to the manager of the company in Montreal, asking for space for 500 cases to go by the "Numidian" on Saturday?

Prof. ROBERTSON: For this reason, that if he had already engaged space for butter he had no space left to dispose of.

Mr. FISHER: But have not we just as good a right to that space so long as there is that space?

Mr. WESLEY SMITH: "First come, first served," I suppose, is the rule.

Prof. ROBERTSON: No, this is the rule—and I suppose it can be amended if need be. There was no demand for cold storage space till this year except for butter. Now if there is going to be a demand for cold storage for fruit of any large dimensions, and we know what it is, we can have it provided for; but there never has been till now any demand. I can say I do not think any of those shipments—at least any of those that went from Burlington—would have gone at all if I had not taken the law into my own hands. There was no application for space. If there is an application put in now, or in the spring before navigation opens, space will be provided.

Mr. FISHER: I think we will make application now. I had a conversation with Mr. Robert Harling, manager of the Elder, Dempster Co., and he told me that the money of the fruit-growers was just as useful to them as the money of the dairymen, and they would just as soon carry our fruit as the butter, and all we had to do was to make the arrangement with the Government to do so; and it seems to me that the Government have not a very good reason for making a distinction between butter and fruit. All we ask is an equal privilege.

Prof. ROBERTSON: Let me say, in all seriousness, apart from all banter, that just as soon as the fruit men apply for this space and take it, the Minister says he will apply for the space for the fruit on the same terms as butter; but until now there has been no application for fruit except the trial shipments the Government sent. I did not have any application for space for fruit last season until some Montreal men spoke to me, and I went and had the United States butter hauled out of one hold and had the fruit put in instead.

Mr, FISHER: I am much obliged to you. (Laughter.)

Prof. ROBERTSON: If you apply for any space for fruit it will be provided. The Government of no country is as good as Providence—it does not usually give things until it is asked for them.

Mr. FISHER: I have just returned from Montreal and from going through some of those vessels, and although I thought I had a pretty competent attendant in the first officer of the ship, and that I gave the best attention, I failed to learn how they took the temperature of the cold storage apartments on the vessel.

Prof. ROBERTSON: In each chamber there is an opening in the deck, and down that is a two-inch pipe, thoroughly closed. That goes down two-thirds of the way into the hold, and the thermometer is put down in that pipe and is pulled up and read four times a day. The engineers have given me the reports taken four times a day like that.

Mr. MCNEILL: I would like to ask what your opinion is between the relative merits of the two grapes for popular use, Canadian or foreign?

Mr. ROBERTSON: For my own eating, for just a few grapes, I like the French and the Spanish grapes better; but in the hot weather of summer, if I want to eat a large

number of grapes, as one often does, then, after the first half-dozen, I like the Canadian better. (Hear, hear.) In Liverpool I went to the fruit market one Saturday night and bought grapes at 2s. a pound, and bought nearly as good grapes—except out of condition and off the stems—for 4c. a pound ; 50c. and 4c. were the two prices. One was a little out of condition and the other was perfect. So I think if we keep on pumping at the British public with grapes they will get to like them by-and-bye and eat a great many of them.

Mr. A. H. PETTIT : In regard to grapes, don't you believe if we had a system of cold blast, gathered by pipes leading up with a funnel-shaped mouth to the wind, that would force the air through a cold chamber and drive out the aroma and moisture from the grape compartment, that our grapes would carry better than in a cold storage compartment absolutely closed ? Here we have some grapes to-day on the table kept firm in a cool cellar where they have had plenty of air and exposed, not in cold storage at all. Now I believe those grapes are in better condition than had they been in cold storage. We want the moisture and the aroma of the grape that would collect carried away by some process, and if the air was forced through by cold blast I believe they would go in better condition.

Prof. ROBERTSON : I think the grapes are like the fall apples—they don't require cold storage but require ventilation. The grapes that we landed in England were in capital condition except twenty boxes, so it was not the condition but it was the inherent flavor they complained of, and that would be improved slightly by the means you have suggested. Let me say this, that some of the first grapes were sent over, they thought, without being ripened enough, and I have got a good deal of information from I think the best authority on grapes in the world—a man who sells 50,000 barrels a year—and he says that every kind of grape meant for England should be ripened until it is dead ripe before it is taken from the vine ; that while you may pluck pears and such other things that will ripen on the way, grapes do nothing but deteriorate after they leave the vine, and therefore all the grapes should be thoroughly ripened, and they will cling to the stem longer when thoroughly ripened than if picked too early.

Mr. WHYTE : What varieties were sent in those shipments ?

Mr. M. PETTIT : What varieties of Canadian grapes, if any, did the Englishmen speak favorably of ?

Prof. ROBERTSON : They did not speak favorably, in that sense, of any. The reports all came back that they were not the kind of grape they liked ; but they sent over the Concords and Niagaras, then afterwards the Vergennes and a large number of mixed varieties. There were several different varieties of Rogers, some of the Brightons, and some of the Agawams, and they complained of those that were mixed and said that they ought not to have been mixed. There was no difference in the price between the kinds that are called the best varieties here, like the Brighton, Vergennes and Rogers, and the prices we got from the Concords and Niagara.

Mr. A. H. PETTIT : I notice that many of the Concords brought as good prices as many of the others. One word about the "sleeping" apple that you were speaking about. I imagine where they take the first nap is in the orchards of this country, where they are put in large piles on the warm ground in cool nights, and there left for weeks. There is where you get the sleepy apple for the British market.

Mr. BURRELL : I hope no Champion grapes were shipped to England ; but I would like to bear out as an Englishman, who spent about twenty-five years in England, the truth of Prof. Robertson's remarks about grapes, and I hope we can overcome it. As a matter of fact all of us who come out here do what those people did in the hotel—we spit them out ; but after a while we become accustomed to them and can eat from ten to twelve pounds a day. (Laughter.) I believe we could overcome that if we persevere. Personally I like the Spanish grapes, and they can be bought so cheap that we can never get so big a price for our grapes as we can for our peaches and pears. I would like to ask about the market of Manchester, because I have always been under the impression that it was one of the best markets in England for fruit.

Prof. ROBERTSON : We had no opportunity of getting to Manchester because we had no cold storage ships going there. I offered to the Army and Navy store to get the grapes into the homes of the working people for next to nothing, but they would not take them even on those terms.

Mr. M. PETTIT : I think it will take us much longer to cultivate the taste of the Englishmen by sending Concord and Niagara than it would if we sent Delaware, Lindley, Agawam and Catawba. Those grapes, I am certain, would take in that market much more than the varieties which have been largely sent.

Prof. ROBERTSON : I think some of those were sent, except perhaps the Catawba, which I do not remember.

Mr. MCNEILL : I take exception to that. We have here a different condition in the matter of grapes than we have in any other fruit. Any other fruit we can gather the Englishman has always been used to, only perhaps a little better than he ever got before ; but in this matter of grapes we are introducing an entirely new article. Our grapes differ entirely from the foreign grapes they have been used to, and consequently the problem is an entirely different one. Look at the conditions here in our own country. In the first place I maintain we have not the quality of Delaware ; we can never grow the quantity of Delaware that will ever make them a merchantable article in this country. The prices are not remunerative enough, and never will be, to grow them largely here ; but we have an unlimited country for Concords and grapes of that kind. We are growing them now in unlimited quantities, and we can increase the demand one hundred fold in the matter of Concord grapes ; and I maintain that the popular taste after all is for the Concord grape as against any other variety that is now grown. It is very true that, because there are not many Delawares grown because there is no great profit in growing them except in special cases, the price may be a little higher per pound, but the public demand the Concord grape and they get it, and they will eat twenty pounds of them where they eat one pound of any other variety. Now what we want to do is to put the Concord grape upon the English market, for we can grow quantities of it without limit. We have thousands of acres in Essex county that could be successfully devoted to the culture of Concord grapes. As far as grapes are concerned we simply want to force this new article on the British market. We call it grapes and it is grapes, of course, but it is an entirely new thing to put on the English market, and we ought to put it there upon its merits and take the same course with it as we took with our Canadian cheese, that is put it on year after year, and I have no doubt it will take the same course there as it has with ourselves and become the most popular grape on the market. It was my good fortune to have Thanksgiving dinner in Detroit, and the California grapes were there in a heap nicely rounded up. My contribution to the dinner was a couple of baskets of our ordinary grapes. Well, it was rather humorous to see the way they would nibble at a single berry of those luscious looking California white grapes that were exceedingly ornamental ; but just to see the way that the ordinary Canadian grape went was a caution. They would take one berry of the California grape, but they would take a whole bunch, and sometimes two or three, of the Canadian grapes—and they all went. (Hear, hear.) Now my experience of the English first-class table, I must confess, is somewhat limited, but I have had an opportunity of seeing something of a first-class English table, and what surprised me was the little grape scissors at the base of this pyramid of fruit that was there, and I didn't venture on anything till I saw one lady take a single berry, cut it off and eat it. I made bold afterwards to enquire just what were the habits of the English people with regard to eating grapes—I had been in the habit of eating from five to twelve pounds—(laughter)—and I was rather discouraged on this matter of having to take only a single berry. Well, my friend told me he was acquainted with the habits of the best English tables, and he said that any man that would take more than three berries would be considered a hog. (Laughter).

Mr. BURRELL : But it was a hoggish price ; it was about 15s. a pound those grapes were. (Laughter.)

Mr. MCNEILL : What we want is to put this Concord grape on the English market on its merits, force it on that market ; we can do it, and there is not the slightest doubt

that it will follow the same course that the banana has in our own country, where it used to be sold in small quantities and is now sold in enormously large quantities.

Mr. WHYTE: The reason that Concord grapes sell in large quantities is because it is cheap. (Hear, hear.) In Ottawa this season you could buy any quantity of Concord grapes, ten pound baskets, basket and all, for fifteen cents. At the same time you would pay twenty-five cents and thirty-five cents for Delawares, and Wilder thirty-five cents. Now, if you could grow those others at the same price as Concords there would be a great deal of money.

Mr. MCNEILL: I would rather grow a Concord at one and a half cents than I would grow a Delaware at five cents.

Mr. WHYTE: When grapes go to England they don't want them because they are cheap, they want them because they are good, and they would a good deal rather pay twice as much for the Wilder than they would for the Concord. I always think it is a mistake to send the Concord or the Niagara to the old country. We want to send the very best we have, because the freight is a very large part of the cost of laying them down there, and the freight is just as large on a fifteen cent basket of Concord as it is on a fifteen cent basket of Wilder.

Prof. FLETCHER; I have been carrying on experiments for a good many years bearing right on this subject. Being an Englishman, and having come here a good many years ago, and having what I think is the characteristic dislike of the Englishman for the Canadian grape when they first come, I was surprised in about two or three years that I gradually got to like the Canadian grapes a good deal better than either the Spanish or the California grapes—(hear, hear)—and as a matter of curiosity, whenever I caught a raw, uneducated Englishman, I turned him loose on some of our Canadian grapes; and as bearing on the varieties that are likely to be of use to Englishmen I will tell you the fruit that has taken their best fancy, First of all the Delaware, that is something like the Sweetwater in taste, so they are educated a little to like it. Then comes the Brighton every time, and after that the Lindley, and they think that is something like a rather large Delaware—they don't discriminate very much. As to what Mr. McNeill says about giving it to them as something else than a grape, if you would call that Indian Snowberry or Indian Red-berry they would investigate it as something that they wonted to to know about; but I cannot help thinking it would be a long time before ever they got used to Concords, because that is about the strongest, and if you could teach them to call that strong flavor "musky" instead of "foxy" they will get accustomed to it sooner. Another of my experiments that is amusing is to give an Englishman a Concord or Niagara grape, but before giving it to him I say, "Come and have some of our Canadian Muscats," and they will taste them and say, "They are not as good as the Muscats of Alexandria, but they are nice." Then they take the other and they say, "Yes, they're nice, but they are very much like the other Canadian grapes." (Laughter.)

Mr. BOULTER: I would like to ask if there has been many grapes shipped to the old country before this year, 1897?

Prof. ROBERTSON: I am not aware of many going commercially. I know some have gone to the exhibition. This year we sent over 2,700 cases.

Mr. BOULTER: In sending goods to the British market we should remember the Englishman's taste. There is no use of us arguing from the point as to what is the best thing for the Canadian palate. I agree with Prof. Robertson that although prices have not yielded satisfactorily it would be in the interests of the fruit growers of Canada to continue on sending and trying to educate the Englishman to eat our grapes. In my experience as a canner of fruit and vegetables we find the Englishman will not eat corn. They have got so that they will eat tomatoes. I have been advocating that we should send over corn and force it down that Englishman's throat in some way. (Laughter.) And we did it; I sent them a full car of corn and I told my agents in London, "Put it in the eating houses, put it before them. Find out if you can't make them eat it. Send them recipes of how it should be cooked, and in every shape and manner induce them to learn to eat it," because as soon as you get an Englishman here, like Prof. Fletcher,—he

is honest enough to own it—you can't fill him up, he is hollow to the boots—(laughter)—but the trouble is, he will not eat it unless it is forced on him in his own country. And my theory is to keep right at it, keep sending them grapes. But do not go home with the idea that you know more than those who are over there in trying to make this a success. I think yet exporting fruit will be a success Now the fruit-growers have as good a right to have patronage bestowed on them as the butter men have. The California people studied the interests of the people they were selling to, and put up their fruit in packages and got good prices I was talking to one of the best fruit men in Winnipeg, and I said, "I am sorry you get all Kansas apples." "Well," he said, "we don't get the Canadian apples as we want to get them." That is a trade that has never been spoken of at any of our meetings, and I think if more attention was paid to the Winnipeg market good results would come to us as fruit growers. We should try to follow out these directions that we have heard.

Prof. ROBERTSON: Prof. Saunders a good many years ago was a pioneer in this work of shipping some grapes to England in connection with the Indian and Colonial Exhibition, and perhaps some experience gained then would be valuable at this point.

Prof. SAUNDERS: I might give an item or two of that experience, as I think it is appropriate at the present time; and anyone who has undertaken to make an Englisman eat what he doesn't want has undertaken a large contract, and is raising opposition in the mind of such party that is not easily got over. I think the best way in which to coax along this grape trade is to try and send them those varieties of grapes which are most nearly what the Englishmen want, and those varieties which Mr. Pettit has referred to here and which Mr. Whyte has referred to, where there is an absence to a greater or less extent of that characteristic which is sometimes designated as "musky" and sometimes "foxy," which is got from the wild fox grape blood of this country in the grapes. At the time of the Indian and Colonial Exhibition I had charge of the fruit exhibit, and in arranging in the spring the large pyramid of preserved fruits I came home here and with the aid of some of the most active members of this association, who most cordially went into the work, we succeeded in getting together a very large exhibit of fresh fruit, and among the rest sent over a large number of varieties of grapes. Now those grapes were exhibited under the auspices of the Royal Agricultural Society, and the very best judges that they could find appointed to examine and report on those grapes, and they would not have anything to do with any such grape as Niagara, but said, "Those are not the kind of grapes that we have been in the habit of using;" they didn't like the flavor of them; they had not been educated, as Mr. Burrell has remarked, and this process of education is a little difficult when a man is not a willing subject. They were not willing subjects. While they reported favorably of such grapes as the Delaware and others of that character, and most favorably of all on one of the small white grapes which was exhibited, which had no musky or foxy flavor in it at all, they said "that is the kind of grape we want in England," and I think it is much better to proceed cautiously in this matter and not overload the British market with grapes that they don't want, but try and work our Canadian grapes in first by sending them those varieties that most nearly approach to what the Englishman regards as a good grape. Then, after that, we may work in these Concords and other grapes possibly to better advantge. I think this discussion will be productive of a great deal of good. It is well that we all have an opportunity to ventilate our own ideas in this matter, but at the same time we should understand that in all our food supplies that we have been sending to England and all that we hope to send, as far as success has attended that effort, the greatest success has followed the endeavor to meet the tastes and prejudices—if you may call them so—of the party we are endeavoring to supply, by providing not only the right sort of fruit but putting it up in the right sort of packages and just in the way which purchasers want. If we can capture the market in any way, by guile or any other method, it is all lawful in trade, and we should try every means in our power I think to meet the prejudices of our customers so as to please them and try and cultivate as large a trade as we possibly can. It is the Englishman's money we are after, and the more of that we get the better we shall feel, and he has no objection to that provided he gets the thing he wants. (Applause.)

Mr. RACE: Before this discussion closes I would like to have some definite expression of opinion of that one point that Mr. Pettit brought up, about piling apples up under the trees before being barrelled. That is a custom that is very generally followed by the apple buyers, who have a habit of referring to all members of this association as "experts," and laughing at their so called theories. I have come into conflict on several occasions with these apple buyers on that very point. I know from my experience that the apple is cooler when it is hanging on the tree attached by its own stem. If I put a few barrels in the cellar for winter, which I always do, I like the apples picked from the trees and put into the barrel and then into the cellar; I believe it is cooler; but the apple buyers laugh at that idea; they say it is necessary that the apples should be picked and allowed to lay in heaps before being barreled. If that is a wrong idea this error should be remedied, and a strong expression from such men as Prof. Robertson and other men of this Association to that effect would probably have some effect on these apple buyers. If they are pursuing a wrong process, and thus injuring the apple exportation trade, I think that it should be remedied by notifying them of it.

Mr. BURRELL: Was not Mr. Pettit referring to the early apples and the warm weather?

Mr. A. H. PETTIT: No, I was referring to the fall apples. Apples have been put in piles, and they become mellow and ripe without any crispness about them. I have refused on one or two occasions to pack apples or buy apples if they had been piled for any length of time, because they have been mellow and lose their crispness. There was not two days elapsed between the picking and the shipping of my apples at any time this season, and I venture to say I hadn't three barrels out of 100 slack, wet or waste in the whole lot. It shows if they are picked properly and lightly they had time on the voyage to do what sweating was necessary; but you pile them under the trees in the orchards with the cool air of the night over them and the warm ground underneath and the sun coming out the next day, and in one week your apples have no crispness left—they are simply mellow and you can never bring back to them that life again. They are what you call a sleepy apple.

Prof. ROBERTSON: I frankly confess that I have no information to offer on that topic as to the effect of treating apples in the two different ways; but if any of you are shipping early fall apples in cold storage be sure you send instructions to the consignee to leave them two days on the other side after they come out before they are opened. If they come out of the cold storage very cold into the atmosphere of England they will sweat—meaning that there is a condensation from the air on them; and I find that complaint the same as the egg men complain of the egg sweating. Eggs left two days after coming out of the cold storage are perfectly dry.

Mr. E. D. SMITH (Winona): How long will our fruit keep after it is taken out of cold storage, supposing it arrive in the best condition? The remark was made that it would sell better if kept six days than three days. I presume our peaches would not keep three days. How do our fruits compare with the California fruits in the length of time they will keep after being taken out of cold storage?

Prof. ROBERTSON: We have no definite data, because our experimental work this year was to find these things out. I think California fruit will keep twice as long as the Canadian fruit, because it has a tougher flesh. California peaches and pears will keep longer. There is a notion that fruit that is in cold storage will spoil quicker when taken out. If the cold storage be steady, and anything from 38 degrees downwards, I think the fruit does not gain one day in fourteen in ripening; so if the fruit would keep six days when it is put up here it would keep five days after it landed there. I think some of our fruit, except ripening peaches, would keep for eight days over there.

Mr. MCKINNON: I made a rough analysis of my account sales, and I think I may say, speaking roughly, that the Rogers grapes brought double the price of Niagaras; that the Niagaras and Rogers assorted, half and half of each in the same tray, brought very little more than pure Niagaras; and this other fact struck me, because it surprised me very much, that the Worden grape, which I shipped purely as an experiment, not expecting it

to carry well at all because it is so tender of skin, brought amongst the best prices—I think brought a far better price than either Concord or Niagara. That goes to show that the Englishmen, knowing nothing about the comparative cost of growing either the Concord or the Rogers, very much prefer the Rogers variety of grapes. Another thing I noticed was that the Black Rogers didn't bring so good a price as the red Rogers; that also surprised me.

Mr. BURRELL: I would like to ask one question on that sphagnum or peat moss, whether you find it expensive.

Prof. ROBERTSON: Trial shipments have been sent from Toronto in three different lots, and the reports have all come back that the fruit landed in first-rate condition, but it would not pay at all to ship anything like peaches in a case like that, or the softest kinds of pears in sphagnum without cold storage. If a large shipment was sent without cold storage there would be a heavy loss. Sphagnum has sold in Ottawa I think at about $11 a ton, and I think it can be procured less than that.

Mr. BURRELL: Is it in the form of moss or powder?

Prof. ROBERTSON: Powder form. It rather blackens the fruit when it gets on the paper.

Mr. A. M. SMITH: Is there any bad flavor absorbed from it?

Prof. ROBERTSON: No; it is a very great absorbent.

Mr. BURRELL: I understood it would absorb the moisture and help to keep the fruit in that way.

ADDRESS BY MAYOR SNYDER.

I am here on behalf of the citizens of this town, and the town council especially, to extend to you a hearty welcome. We all know the benefits we have derived from your association in the past by your practical tests of the different classes and varieties of fruits, and by investigating the different diseases and insect pests which fruit trees are liable to, and by considering remedies therefor and publishing them in detail throughout this country, and also by giving the people information with regard to shipping and marketing both at home and abroad. By inviting you here we expect to derive some of this information from the discussions. We have nothing special as a town to attract you, especially at this time of year. We have a number of manufacturing industries here which will compare favorably with any town in the country in proportion to population, which is about 3,000. We hope that your meetings will be well attended, especially by the farmers of this section, and that they will benefit greatly by what they hear.

THE PRESIDENT: On behalf of the Fruit Growers' Association I have to thank you and your town's people for the hearty welcome you have given us. It is especially pleasing to us all to see the ladies here to-night. (Applause.) Where they are interested we all know that the cause is good. (Hear, hear.) We have no doubt that we will be pleased with the meeting in this place. Our welcome has been hearty in every way, and the number of persons here to-night, representing as you do the town of Waterloo, shows us the deep interest that is taken in our society. I have been much struck with the general prosperity of your town, as evidenced by the fine dwellings and prosperous factories. You have, however, also a Dominion reputation as a prosperous town—(hear, hear and applause)—and for that reason I am satisfied that although in the town your interests are more centered in manufactures, still there are evidences that you are interested in fruit culture and horticulture. I am proud to say you have one of the largest local horticultural societies in the Dominion. You have given us support in that way, and when we received your invitation to come here we felt that we could not do less than show our appreciation of your interest in horticulture by accepting it and giving you the benefit of any experience we might have. I believe that this Association is one of interest

to the whole Dominion. Fruit growing is one of the largest industries now in Canada, and we have arrived at a period when we are able to supply not only the local demands, but the supply of fruit is such that we have been forced to look for outside markets. This shows that fruit growing is prosperous, and I am satisfied we will be able to find a market for all our surplus fruit. I am proud to say that fruit growers as a body are one of the most intelligent, progressive and industrious class of people in this commercial Dominion of Canada; and we are going to show the people of the Dominion that although it looked as if we might have a surplus in fruit growing, still we shall be able to find markets for all the fruit that we are able to grow. I think Canada is particularly well situated for the growing of fruit. It is natural to the climate, which enables us to raise the very best specimens of fruit. We have also to thank both the Dominion and Local Governments for the interest they have taken in this important industry. By their aid we have made experiments which at the meetings here have been fully brought out, and which will show the people who are interested in fruit that this industry is not going to go behind that of any in the country. (Hear, hear.) Again I thank you on behalf of the Association.

THE FOOD AND THE MAN.

By Prof. Robertson, Dominion Agricultural Commissioner, Ottawa.

I must congratulate you on the excellent annual address, and this Association upon the most useful educational work it is doing in the Province of Ontario. Some people, who live on farms particularly, have a notion that everything educational is wholly concerned with words—the names of things, language, literature; but I think education is hardly worth the name that does not somehow help a man and a woman, a boy and a girl, to do the things of their ordinary life rather better than they would otherwise be able to do them; and so this Association is doing excellent educational work in helping the people who live on land to make that land produce more, and more beautiful and better things, for those of us who are so unfortunate as to be compelled to live in towns. I bear to this meeting the message of the Minister of Agriculture, who asked me to say that he was extremely sorry that public duties detained him at Ottawa, and made it impossible for him to be here to meet this Association, and to say to the people themselves how much he was interested in the work of the Association and in the educational campaign it was carrying on all over this Province of Ontario. He belongs to Quebec, and notwithstanding the fact that he is a citizen of that Province he still has a very wholesome respect for people in Ontario—(laughter)—and that is rather more than some people in Ontario have for people who live in Quebec, who are quite as good as they are. (Hear, hear, and laughter). Now, sir, I must address myself to the subject that I thought I would say a little about to-night, and that is the food values of fruit for people in Canada. Half the struggle of life is a struggle for food. Of course, you say, that is quite true of savage people and of animals that fight for their share, but it is equally true of the most highly civilized communities, who also fight for their share, and if they fight in a more polite way, with more polished weapons, it is not any the less merciless in these latter days, and to earn a man's bread and butter and his apple sauce nowadays is just as hard as it was in the long ago, when he had to take his part in the war and to go out and fight for what he got. I think, sometimes, the wounds of swords and spears were easier healed than the wounds people get in industrial and other competitions. They struck the body only, and left the soul unscathed; nowadays it is sometimes hard to keep a man's heart and soul his own that is striving to get bread honestly in the stern and severe and merciless competition of these latter days. Anything that will help the people to get better food easier would be a great boon to the people, and it is not want in Canada of good food that makes it hard to make ends meet, but it is the utter waste of food and getting the wrong thing at the wrong time. Now, the struggle for food seems to be a sordid subject; but in Waterloo, I will warrant that more than 50c. of

every dollar that the artizans earn goes for food. And whatever half of all a man earns costs is to him an object of serious concern. If he could save 10c. on this 50c. and still live better, he would have 10c. for fun—and that is worth a lot. (Laughter). There is nothing in life worth living for except fun. (Laughter.) To put in the largest application, that means if a man can make real fun for other fellows and himself he is putting God's sunshine into humanity in the best way. (Applause). Now, the kind of food and the way food is used have a very strong and far-reaching influence on health, and I do not know how many of people's confessed shortcomings are due to moral delinquincies or due to bad digestion. I think there is nothing that makes the world look so bad and so blue, and gives so much apparent cause for the doctrine of the total depravity of the human heart, as the derangement of the human stomach. Man's body means a lot ; and I myself have a little personal confession—I never look out on life without a great deal of hopefulness that it was evening and the morning of the first day. It is always so—not the morning and the evening, but the evening and the morning to come, always the first way, unless my digestion is bad or liver is wrong, then it is the morning and the evening, and the darkness is coming. (Laughter). And more fruit and less flesh would make people have a better view of life. More fruit food and less meat food would make people look out on life with kindlier eyes than they do now. The strength we have for endurance and achievement comes for food. Man is given power to move muscles. He has no power to move any part of his body except as the energy somehow came from food, and even the kind of energy and the way he can use it is in some measure circumscribed and limited to the kind of food he gets. Then personal efficiency for service, their enjoyment, somehow, depends on food ; and if a man was all the while compelled to eat hideous things that looked ugly I rather think he would have hideous thoughts about lots of things and act ugly. You would not believe the effect on the kindliness of behaviour of a boy of having the surrounding of the boy beautiful and pleasant for the boy. If the good Lord had made the earth an ugly place, with trees inverted so that the roots and the earth were on top and scattering on us all the time, you would have a world not only full of savages, but murderous savages all the time. Refinement is one of the greatest things in the world to make man kindly, thoughtful and appreciative, and so God made things beautiful that are fit to eat. Then, let us make enquiry what is man's body ? I am rather afraid I might go contrary to some announcements of this afternoon. One of them said an Englishman's body was a great hollow place that was a cavity from the mouth down to the shoes for holding things. (Laughter.) The body is composed of substances, and is such a house for a man that a man's behaviour is somehow affected by the kind of house he lives in. You don't describe a man when you describe his house any more than you describe a man when you describe his body. Somehow the body a man has with him affects himself a great deal. Now, what I have to speak of to night is mainly man's body, and some influences it may have on the man himself ; so do not mistake what I say as having the same effect on the whole man, though they have a very decided effect on the whole man. A man's body is composed of five different compounds as shown on this chart. There is 60 per cent. of water in a man's body—occasionally you might find on close analysis, perhaps, a little beer or Scotch whiskey. (Laughter.) That would not be at all to the advantage of a man's body, because water is the vehicle in the body for carrying things about inside ; so that when a man has a piece of skin knocked off his hand he does not need to stick a piece of plaster on, but goes on eating things which contain the very essential things that that skin was made of, and the water carries the particles around and the life builds that part over, and there is no vehicle in the body for carrying things around like water, and anything else that you put in with water except solids that go to make nourishment interferes with the carrying power of that vehicle. That applies to the whole range of human nutrition as far as I know. In a man's body you have about one-sixth of albuminoids, such as the white of eggs, and when a man consumes eggs, the whites of the eggs becomes the albuminoids of his body, that is, the substance in his food becomes transformed in his body to repair the waste that goes on all the time ; you have it in the curd of milk, and perhaps, the albuminoids of the body are not nourished in any better way than by the albuminoids of milk. Then you have it in the gluten of wheat. If you chew some raw wheat the little cud

that is left, after you have sucked the starch out, is the gluten of wheat, the same in chemical composition as the albumen of milk or the curd of milk or the fibrine of beef—the lean part of beef. And then you have in the human body some fats—15 per cent. of fats. That varies a great deal. The fat is the fuel, the lubricant stored up to make the motions of the body easy, to oil the joints; and then as a fuel it is like a tender on the engine—it is a store of fuel to be called on at any time it can be burned up to furnish force for any kind of big undertaking. That is why one always delights to see one fat, because one always knows a fat man can do a great deal if he feels inclined to try it. (Laughter.) The carbohydrates, which are the fuels, composing 5 per cent. of the body, are the starches and sugars and gums that are taken in as food, just as wood is burned up in a stove; and you have mineral matter, 8 per cent. that is lime, that is the main constituent of milk, that is why skimmed milk often is the best thing you can give to growing bones. Nothing in the whole economy will give such toughness of bone, fine quality, as a great amount of milk. The opinion nowadays that milk is not the best thing to have in the honse is getting prevalent in some quarters, which I think is very unfortunate. I had some pigs put into different groups—from the very same family, so that the families were the same, the brood was the same, the inheritance was the same—and some of those pigs fed on grain alone with no milk from the time they were weaned. Other pigs were fed a liberal allowance of skimmed milk with a little grain, and after the pigs h d been grown up, fattened and killed, the bones were taken out and put under the test of a lever, and weights were hung on to see when they would break, and the bones would go snap with about 80 lbs. pressure when the pigs had no milk, and when the pigs had milk they didn't look any biggar, but they had that toughness that they would never go snap. You don't know when the strain comes on a boy's mind or conscience, and his body goes snap from weak bones, which is a very bad thing for a boy. You cannot grow boys' bones twice, boys' bones are grown only once. It is worth a lot of information to have boys whose bones are well grown, for all kinds of faithfulness, both for patient continuance in what they believe to be right and achieving things without any consciousness or seeking of self-ease. There is nothing at all for that that is equal to milk. That is why the first foster-mother, the milk cow, is very valuable in giving to the nations faithfulness. Milk is valuable in giving elements that those other things don't furnish at all. That brings me to speaking of things that are wholesome and requisite. The boy's definition of wholesome food is, "Wholesome things are things that are tasteless and nasty." There is no reason why things that are particularly wholesome should not be quite as beautiful and quite as nice as the things that are perhaps not quite as wholesome. On this chart I have shown you the source of some of these things that we call albuminoids and carbohydrates of fats for foods, to show you they came from the same things that those apples and pears and grapes come from. Albuminoids are composed of things in the atmosphere and water—nitrogen and the carbon and the oxygen and the hydrogen. When a man grows a field of grain or an apple tree or a grape-vine thereby he gleans from things that were useless and makes them valuable. That is creating wealth. If a man goes to the Klondyke or some other place, and claims, and brings back gold, he acquires some wealth for himself and community, but he does not enrich the community any more than the man who does these other things by making wealth in useful forms; and so the real wealth of this country after all will always come from the labor of those men who make the most out of the natural resources through the production of food of all kinds. This is merely to illustrate that point of albuminoids, that many human foods come from those sources as well—atmosphere, sunshine, water—and you have from an an acre of Indian corn 873 lbs; that is a pretty large amount of albuminoids—enough to keep a man well nourished for nine years. An acre of Indian corn would serve a man for that period if he could digest corn stalks, leaves and all the rest of it. Now he need not tackle that task unless he is a man who has forgotten his manhood. He might buy a cow, or grow a cow, and make the cow do the work she is adapted for of turning corn-stalks into cream, and he might drink the cream at the other end. There are lots of men go on eating corn stalks instead all through their life. They are unjust to the cow, that is all I can say. As to these other things I will not spend any time further than to say that you have food from these

sources, and they go to make human bodies. They can be gotten in the daintiest of forms, the most delicious of forms, perhaps most elevated forms, in fruit. They can be gotten in the cheapest of forms in the cereals. That is why the Scotch people from their economical habits prefer oatmeal at $2\frac{1}{2}$ cents a pound to peaches at 80 cents a basket. (Laughter.) I will show you from the next chart the comparative value of these foods—cereals, animals and others. Before I pass I would like to observe that the inert atmosphere—in a sense inert although moving—and the inert substance in soil and the inert seed, which stays unchanged, when put together, under the influence of sunshine begin to do things. You put the apple seed that looks dry and unsightly into the soil, bury it and leave it without sunshine, and it will rot, that becomes its grave for all time; but if you put the apple seed in the soil, the apple seed having vitality that is latent, then the sunshine will waken it up in the most gentle way. A man's heel would crush it. Lots of people try to awaken things up in that way, and it does not do. (Laughter.) But though sunshine is so powerful that if you could conceive of the earth getting a little nearer, just sizzling the whole globe in about two jiffies, it is so gentle that it can awaken the apple seed without hurting it. A man cannot think of the most delicate infant awakening more gently. And then it goes on and does things, and sends down roots and sends up shoots, and then it becomes a tree, because this sunshine has been playing on the inert material and making it active—making it do things under its influence. Now, it is no stretch of simile to say that this Association is trying to do that on the horticultural life of Ontario. I don't think it may hope to load information on the fruit growers any more than you would load fertilizers around the apple seed, but if it can have a kindly influence in the way of awakening the men up to seek for themselves and do for themselves, these men will do more because of that kindly influence which is of the sunshine sort. That is the value of an association, and the information and enthusiasm which its conventions can give rise to. Then the sun comes back to the individual, no matter what food he eats; but if you will think that out to its conclusion from its beginnings you will see that the glorious blossoms on the apple tree—considering the things to come from the filthy manure of the barnyards—came that way; and while you say that it is a sordid and common-place kind of life, to go fertilizing an orchard, yet the apple blossoms are the simile and symbol of the highest of romance, and the boy who will believe in sunshine for other people has a romantic life always, an ideal life—a life lifting up and reaching up and going out, a beautiful life in itself as well as the useful to come by-and-bye; and any life that is not like that is hardly worth the living. To go into the sunshine business, and stay in it for a life-time is the meaning of being on earth. In the sunshine business—that is the farmer's task, to grow food from sunshine; it is the fruit grower's task, and in the larger sense it is a man and woman's task to make that sunshine which would otherwise go dissipated, useful if it passes through the apple, more valuable if passed through the man, a thousand fold more valuable on the minds of the other men for the nobler and larger life that even the apple will not nourish. Then speaking for a moment on those classes of food like cereals, to make the food nourishing in its best way, it has to be balanced so as to contain certain proportions of certain things, and the albuminoids and the fats and the carbohydrates, and there is like a standard food in these proportions. By long experiment people who live best eat food balanced in that way—a certain proportion of the flesh-forming and the heat-producing; and oatmeal is actually scientifically a balanced food according to the practice of the best people, it contains about the correct proportions of the flesh-forming and heat-producing. Then wheat is almost as good, but it does not contain quite enough fat, and bread contains still less fat because a large part of the fat is in the bran which is taken off in the grinding. That is why, to make wheat bread a good food, it needs to have a good deal of butter put on it to balance it up for the sake of wholesomeness, and butter is always good; if you can take creamery butter in the winter time so much the better, it will help our creamery business that is needing your support. If it will cost twenty-five cents a pound so much the better. You remember the story of the man who just started housekeeping and was helping himself liberally to the butter when his wife said, "John, don't you know butter costs twenty-five cents a pound?" and he replied, "Yes, I do, my dear,

and it is worth it, and more too." (Laughter.) It would take too long to go over the lists of these foods. Animal food contains a much larger proportion of the flesh-forming part, so that beef would be a very poor kind of food, an ill-balanced food, unless it was mixed with potatoes, which again are very deficient in the flesh-forming parts, the two forming a well-balanced food together. Then if you have very fat pork it is deficient in the flesh-forming part, so you should have beans, which you see contain a very large proportion of albuminoids. You would never think of anyone liking beans and lean roast beef, but you would find people liking pork and beans, and if you take even those common dishes you will find they are well-balanced foods, only some of them are rather unwholesome, and some of them are rather more unwholesome than others; but the common sense of the people in that way has been merely causing them to do what scientific investigation now merely explains. Then if you take a fish like salmon, a very rich food, and have that with rice, you will find it the food of the Japanese, which makes a very well balanced food, about the very same as potatoes and beef, or about the same as pork and beans. I need not pursue that at all by trying to show you that the value of foods in some measure, or the kinds of food, affect the quality of the people. This rather lends itself to a good deal, at least of suggestive study, to see how certain foods affect the people who have lived largely on them. You have rice, the typical dish of the Chinese, a dainty and delicate and rather forceless kind of food, and a forceless kind of people; and if you find people living on fried food and fat pork, you will find the Chinese disposition in regard to a great many things, because the bodies are not nourished, and the nerves and the parts that need to be nourished to make people forceful and self-controlled and masterful.

Then I come to this last chart, and the composition of foods in the whole of fruit, and I have not much to say about them so far as the nourishment they contain is concerned. They are not very nourishing per pound, but they have some effect on the whole system that soothes and pleases and enables the body to make better use of things that are swallowed. Apples contain a very small percentage of the albuminoids and fats, and a good deal of the carbo-hydrates, and the rest is water. Oranges about the same, a great deal of water. Prunes, apricots, figs, grapes, it is not quite so wonderful that some gentlemen are rather quietly boasting to-day that they could nicely put away from five to eight pounds of grapes per day—(laughter)—it was not so very marvellous after all, you see, because if one in the hot weather is exceedingly thirsty, you have so very much water in grapes that it is simply a question of drinking your water in that form and taking it in smaller mouthfuls at that, because the amount of nourisnment in the grape is not so very large. There is, however, a very fair amount of nourishment in the most comforting and stimulating form; and I want to say in this connection, which I didn't mention this afternoon, that the market for grapes is very limited in this country, and an effort is being made to acquire a foothold in the market and create a demand there; but I think it would pay the grape growers to cultivate very studiously and very carefully a consumptive demand for the juice of the grape. I am not in for making Canada a wine-making country, not saying a word either in favor of plebiscite or the prohibition party or the other party; but this I think at any rate is to be known by anyone who has thought out the conditions of life here, that Canada can never be a wine-making country, and never can exist as a wine drinking country. Whatever other peoples may be able to do, a people who live in a climate like ours and whose social and other conditions are like ours, cannot afford to drink wines in any ordinary quantities like they do in the Old Country at all. If you will watch the men who drink wine here and watch the same who drink in England you will find a teetotal difference in the effect on them, their conditions, that are not perhaps unreasonable altogether. Certainly this will not be a wine-drinking country for fermented wines; but I do not find any kind of drink, except milk, so comforting and nourishing when one is working to the edge of his strength sometimes as grape juice unfermented and mixed with any sort of aerated water you like, and some of us in Ottawa have been trying to develop a taste for that, and people who get it once say it is the best drink they can get, and they like it better than anything else they get, only the Canadian make, so far as I have seen samples, does not compare with the United States' make yet for the concentrated grape juice, which is exceedingly agreeable

and very nourishing and soothing in hot weather. I think there is a large possible market for nourishing and pleasing people who will drink for social and other reasons. One cannot stamp out an inherited tendency either in one or two generations, and somehow it is thought to be a courtesy to a man to offer him something to drink or something to smoke or something to eat. It would be well to have something to offer him to help on the grape-growing industry of Canada so as to help on the Fruit Growers' Association. (Laughter.) Then these walnuts and almonds and peanuts are exceedingly nutritious—very dry and a large proportion of fat, so they are very nourishing foods, only they are a little bit indigestible. They play the same part in the economy of human nourishment that cotton seed meal and that class of foods do in nourishing animals, and we find by experimenting on them that a very small quantity is all they can stand per day and be healthy. I might mention in passing that nearly all fruits have a very large percentage of their weight that is not edible. Apples and grapes usually have twenty-five per cent. of their weight, potatoes about fifteen per cent., eggs about fourteen per cent., and chickens—depending entirely on whether the dog has chased the chicken to develop muscle or the chicken has been left to feed to develop fat—(laughter)—you have chickens all the way from fifteen per cent. of bone up to ninety-nine and three quarter per cent. of bone. (Laughter.) In many of the finer fruits you have very little waste, indeed, and in that sense fruit is an economical food to the extent that the part that is edible is extremely satisfying to the system. A man who is truly economical—that is, who believes that true economy is making the best use of things—will choose the most economical foods. Let me recommend it to the farmers who find it hard sometimes to get fresh meat in summer that there is no better midday meal than cheese and potatoes—a food that is known to be nourishing in quality and economical, and certainly a thousand times better three times a day than bacon and potatoes, cheaper to be got and easier to keep in the house. Did you ever think what cheap rice means in helping the Chinamen to make cotton and deals cheaper than you can in Waterloo? It is no use blinking that in Canada we are living extravagantly. When we come to places where people can live cheapest, there they can undersell the other fellows; so it is worth the people's while to study out the best foods to make their brains clear and their bodies strong. In England fifty-one per cent., Germany fifty-three per cent., in the United States about sixty-three per cent. of the total earnings of the people go for food. I think Canada is about half way between the two extremes—about fifty-five per cent. of the ordinary earnings of the people go for food. I want to say this in closing, that with the food there might come a good deal of beauty in appearance with palatability, and that will join to the nourishment of the body the qualities of nourishment with the quality of just a little bit of stimulation to make the best use of the nourishment that is taken; and the women of Canada could not do better, in following what is the highest of the higher education, than study how best they can nourish the people—because woman is always and has always been the nourisher of the people, the nourisher of man's body, the bodies of the family, the nourishers of the men's minds in scores of ways, the nourisher of their hearts in scores of ways; and if the hand that nourishes the people fails at its task how can you save the people? Does it make a woman less of a woman of the highest refinement to know how to make the most of these external things that are put in her care? And a little common sense study of foods in the schools and in the clubs and every other way would redound to great advantage to the people of Canada at the present time. Then that will cause us to make the most of this Canada of ours in every sense we can. I would like to say a word on that. The people in different parts of Canada will make all the more of themselves, however, if they will think out into the lives of others as far as they can, and believe that Canada, while a wide country, a big country, is just one country. Now, the Fruit Growers' Associations have a very large influence in helping to cement that feeling of union in our Dominion. The Fruit Growers' Association of Nova Scotia, in the Annapolis Valley, and of Prince Edward Island and New Brunswick, and away out in British Columbia and up through Quebec, all watching the work of the other associations with interest, learn more of their several Provinces by that work than they would otherwise. That is not the only tendency, but is one of the great tendencies helping to let people understand each other and like each other better. Because we have different

characteristics in our people, we are all the better off on account of that. We have the French, who are a little bit artistic, some of us think; they see things a little different than we see them. It is a good quality if not left alone. Then we have tho Irish, who say than some of us think they might say—(laughter)—but some of them blossom into orators, and they delight us so much that we can have a good deal of compassion for the other men that talk so much, and they do it so well that we don't object to the way they do it—that is the ruling passion of the people in Ireland, and I, of all men, I think, could speak of the utmost kindliness and appreciation of them, but they have a gift of the gab in a wonderful measure. (Laughter.) Then you have the Germans, who intend to keep before us the value of musical culture, and you are not without a good deal of that, in an instrumental sense, in this town, as one can learn from this evening's proceedings. We may call them a singing people, perhaps, in Canada. You have the English who keep on doing things. One characteristic of an Englishman is that he is always energetic, doing something. Scotch people have no chance at all, so they just boss the job. (Great laughter.) Yet we are getting along in Canada pretty well. I hope that we as Canadians will think a little less of our town and our country and our Province and our Dominion and look right out and think of our country and the Empire of which we are no small part, that gives us our institutions and guarantees us a chance to make the most of ourselves; and while doing the best for ourselves in our own limited sphere meanwhile, in the larger sphere do the best we can for our country and humanity and in that way our lives will be helpful in every sense in good works. (Loud applause.)

Prof. L. R. Taft, of Michigan, then gave an address on the legislation of that State in regard to the San Jose scale and other insects. Copies of the Act were distributed.

Votes of thanks to the speaker and orchestra were passed and the meeting adjourned.

Thursday, December 16, 1897.

The Secretary read a telegram from Prof. John Craig, of Ithaca, sending greetings and best wishes. He said Prof. Robertson had been called away and therefore could not give details as to the packages which he had collected at Covent Garden, London, and brought with him to Canada. The various packages were placed on the platform for exhibition and inspection.

Mr. A. H. Pettit drew attention to a ventilated crate that had been specially manufactured, and which he thought would be specially useful during the coming year.

Mr. E. D. Smith: I have here a resolution with regard to the matter of cold storage. I think we are delighted to have found out that it is possible to ship a number of our fruits to Britain with success, and I think we ought to express our feelings with regard to that, and thanks for the information we have gained.

Moved by E. D. Smith, seconded by Jas. Tweedle, That this Association has listened with deep interest to the information furnished by Prof. Robertson and Secretary Linus Woolverton regarding the result of the trial shipment of tender fruit to Britain in cold storage under the auspices of the Dominion Government, and desire to record our thanks for the same. We appreciate the fact that these shipments have been experimental in every sense and consequently perfectly satisfactory results could not have been expected the first season, and while on the whole the results have been unsatisfactory from a present financial aspect, we are glad to know that they lead us to believe that with further experience a permanent and lucrative market may be confidently looked for in Britain for at least pears, peaches and tomatoes, and probably for grapes. We would, therefore, respectfully urge upon the Government, in view of the vast interests at stake, to continue on an extensive scale the experimental shipments another season, putting large quantities of suitable varieties of Canadian grapes continuously upon one or more of the British markets to test fully whether or not the British palate will ultimately become accustomed to and like the flavor, and conducting at the same time further experiments with other fruits to overcome the difficulties found to exist in getting them landed in

good condition. We also desire, at the same time, to record our gratitude to the Burlington fruit growers for their plucky experiments this season on an extensive scale on the same line, exporting tender fruits to Britain, and for the report given here to-day of the results of these experiments, which we are particularly glad to know turned out eminently satisfactory from a pecuniary point of view, confirming the results obtained through the Government experiments that at least a number of our tender fruits can be exported profitably under proper conditions and safeguards.

The PRESIDENT: I think this is a very timely resolution.

Mr. A. H. PETTIT: The experiment of shipping fruit to the British market is one of very great importance to this country. We have a great fruit-growing country. You may take the beef, butter, cheese and all the other products of that nature, and once chill them down it is an easy matter to keep the temperature in that condition throughout the voyage, but our fruits being of a nature that creates heat on the way we need a considerable experiment along that line. During the past year we have made progress, but not such as would confirm the opinion that any and every person may readily ship fruit to the British market through the system of cold storage. I think that the experience we have gained during the past season, if continued for another season or two, will enable us to arrive at conclusions satisfactory to all. I don't think the system of cold storage is perfected by any means at the present time. It may be where you don't have so many transfers to make. The question is whether for grapes it will not be better to have a cold air passage rather than a dry compartment with cold storage alone. All these points we have yet to find out, and all these apply to our other perishable products. I think the resolution is very proper and timely, but we must not give up these experiments until we attain perfect success, and I hope the Minister will still proceed along that line until the system is perfect in every sense of the word.

Mr. MCNEILL: As one not having anything special to do with the shipment, I would like to say that the fruit growers generally are looking with very great interest on these experiments. Although there may be very little said here about it to-day, yet I can assure you that our people in the west are looking very earnestly towards these cold storage experiments, and that no greater disappointment could be experienced than any hint that the Government would drop the experiments at the present time. It is looked upon as the salvation of our industry. I certainly believe that if we have no outlets for our fruit than those in sight except cold storage, that there will be a very grave disappointment in store for fruit growers. I heartily approve of what has been done, and would like to say a word of praise for the exertions of our friend Mr. Fisher, who certainly deserves credit for the plucky way he has taken hold of the matter and what he has done.

Prof. SAUNDERS: I might say this resolution is very timely. I only wish to reiterate what Prof. Robertson remarked yesterday. I know the Minister is in very hearty sympathy with this work and that no pains or efforts will be spared on his part to carry it to a successful issue, as far as any reasonable amount of work or money will do. I am sure the Association will be well backed by the efforts of the Minister, but he will need the cordial co-operation of all the members to make it a success, and I have no doubt that it will eventually result in successful shipments in a large way of many of our fruits, perhaps not all of them, but many of them, and provide an outlet for our surplus which will be exceedingly valuable to the fruit-growing community.

Mr. E. D. SMITH: I was very much delighted with one remark of Prof. Robertson, namely, that they had urged upon the steamship companies the necessity of providing cold blast in the holds of the vessels for winter apples, and that two lines had arranged to carry them in that way, that is, to provide in the hold of the vessel the same temperature as outside the vessel. I have long been satisfied that that was in a large measure the cause of the immense loss to the apple growers of this country—that the price of our apples had been deteriorated in the British market by at least twenty-five per cent., almost entirely by the fact that they are not carried across in good condition; and at the same time I am satisfied they could be carried without a single barrel being slack or wet

or wasted if the temperature in the hold would be made the same as that outside it, which seems to me would be a very easy matter to make by fans or air-pumps, either drawing the hot air and allowing the cold air to draw in itself or by pumping the cold air in as is done by cold storage plants in winter. Just as soon as the temperature gets down to freezing point, those cold storage plants simply use the outside air, and the machinery necessary to draw in the air is very simple. Two or three horse power will run it, and occupies but little room. I have often wondered why our steamship companies would not take hold of this matter and put into operation on the boats what is done by the cold storage plants. By passenger steamship companies the cold air is drawn in the second and third decks from above, so that the temperature can be regulated as they see fit. Shippers of fruit and vegetables find no way by which they could make these steamship companies do this, but when the Government takes hold of the matter and urges it, then they will do something. I am glad to know that they have done something in that line, and if the fact had been disseminated fully that a thorough test was going to be made of it, those lines would have got all the apples. Anyone could readily see what an enormous thing it would be to this country; it would mean millions and millions of dollars in the past ten years if our apples had been carried over there sound, which I maintain they could be by the cold-air blast. Cold storage means an additional twenty-five cents a barrel on the apples. The steamships, I suppose, hope to make a little additional profit on the cold storage. We know we must have cold storage for summer and some of the early fall apples, and for peaches and pears and tomatoes, but the other and cheaper system will be better in my mind for all kinds of winter apples and late fall apples and grapes, and I hope that the Government will continue to prod up and if necessary bring force to bear on the steamship companies to give us this accommodation.

Prof. SAUNDERS: I meant to have made a remark on the suggestion of Mr. Pettit. It seems to me that it is an exceedingly good one. Any of us who have stored at any time any of those musky or foxy grapes in a room know how the odor and flavor becomes intensified. That is especially the case in my experience with Niagara and other grapes of that character; and I think shut up in a closed cold storage compartment, the exhalations from many of those fruits that have that flavor in any considerable degree, would be more or less absorbed by the other fruits and effect the whole to a considerable extent. I think that idea of Mr. Pettit, as he said, of circulating the air, which would help to carry off any exhalation of odor, would do much to free our grapes—at least to some extent—of that objectionable flavor which the English people find in them, and which we know only requires a little education to remove altogether. The difficulty is to get the education in, and if we can get it in any more effectually in that way by the method of cooling fruit, it is a matter well worth consideration, and I hope it will be thoroughly tested. (Hear, hear).

Mr. G. E. FISHER: While I did the business, a number of others in and around Burlington contributed the fruit, and I don't wish to take the credit of having done the thing myself.

The PRESIDENT: I think the remarks we have heard from gentlemen are on the right line. I am satisfied the main trouble has been with the steamship companies. As long as they can put the apples and fruit in the smallest space and get their money for it, they care nothing; but we never get rid of a grievance without an agitation. We are working on the right lines. The Government is certainly to be commended for the help they are extending to us in this regard, and I am glad you have moved this resolution, and would suggest that the secretary be instructed to forward a copy to the Minister of Agriculture at Ottawa. With that understanding, I will put the motion.

The motion was put and carried unanimously.

Mr. G. E. FISHER: By way of encouragement to those who may wish to ship, I might mention a paragraph from a recent letter from Bristol to me, received in the last ten days, which reads this way: "Those who bought your fruit this year did so with much misgivings, but it has turned out so well in their hands that they will be not only ready but eager purchasers another year."

METHODS OF MAINTAINING THE FERTILITY OF LAND IN ORCHARDS.

By Wm. Saunders, LL.D., F.R.S.C., Director of Dominion Experimental Farms.

It is always a source of great pleasure for me to be with you at your annual meetings. I look back with very much interest to my early connection with this Fruit Growers' Association. It may not be known to many of you that I was one of the earliest directors. I believe I was made a director shortly after I was made a member. The difficulty in getting directors in those days arose partly from the fact that they had to pay their own expenses and hotel bills, and in the early times, before we had any Government grant or any endorsation whatever from the public authorities, the work of the Association was carried on mainly through the individual efforts of the members who took an interest in it. I think it must be about thirty years ago when I first had the honor of occupying the position of a director of this Association, associated with my old friends Arnold and Dempsey, and others who have passed away since then to the better land. When the Government proposed to take into its care the Fruit Growers' Association under the Agricultural Act, and give it an annual grant—I think the first annual grant was $400 or $500—we thought a great feat had been accomplished. At that time, from lack of funds and having no journal or annual report to bring our work before the Canadian public, it was naturally carried on with much difficulty. Still we were all enthusiastic in it, we all put our shoulders to the wheel and worked most harmoniously together for the common good, and from those early beginnings this Association has gradually grown to its present position of prominence and importance. I mention those early matters to show what a strong link there is which holds me to this Association, and the reason why I always take such a pleasure in being present with you. I had the honor for five or six years of being president of the Association, and during that time did all I could to further the interests of the work ; indeed, I was occupying that honorable position at the time I was appointed to my present office as Director of Experimental Farms, and had to resign in order to take the work I am now carrying on. My sympathies have always been and still are with the fruit growers and horticulturists of this country quite as strong as with the agriculturists, and I am very glad to have the opportunity of bringing before you to-day a subject which I hope will prove helpful to you, that is, to put in a clear common sense sort of way—so that every farmer can understand it—what should be added to the soil in order to replace those elements which are taken from it in the growing of fruit.

It is the chief aim of all intelligent cultivators of the soil, whether engaged in raising cereal or fodder crops or fruit, to so treat the land as to secure satisfactory crops and at the same time maintain the fertility of the soil so that good crops may be continued indefinitely.

Formation and Nature of Soils.

All soils are the result of the disintegration of rocks by the forces of nature, and the intermixture therewith of organic matter resulting from the decay of animal and vegetable remains. Soils vary much in fertility partly owing to difference in the composition of the rocks from which they have been formed, partly to their mechanical condition and texture and also to the variable proportion of organic matter they contain. These variations are commonly distinguished by special terms, such as clayey, loamy, sandy or gravelly soils, indicating the materials which form the larger proportion of their bulk. The productiveness of a soil also depends partly on its power of holding water and of drawing supplies of moisture from below. Water, which in the soil is usually more or less charged with carbonic acid gas is the universal solvent which nature employs to convey food to the rootlets of plants. A good loamy soil will hold much more moisture than either clay or sand, and hence usually produces better results in cultivation.

Stores of Fertility in Soils.

All soils contain more or less plant food in a soluble form, which is immediately available for the use of growing plants. On the other hand there is always a large proportion of the elements of fertility which exist in the soil in a comparatively insoluble form, which can only be made available gradually by thorough cultivation of the land and exposing its particles to the beneficial action of the air. By thorough working, the power which the soil has of retaining moisture may be increased and the loss of water by evaporation from its surface lessened. Soil is nature's great store-house of fertility in which is laid up treasures more valuable to national life than gold. There are many mineral constituents in every soil, and quite a number of these are taken up by living plants, but in most instances the quantities used are small, and the store laid up in the land ample. There are, however, three ingredients which plants take in comparatively large proportions from the soil, which must in some measure be restored to it if its fertility is to be maintained, these are nitrogen, potash and phosphoric acid. All arable lands contain these important ingredients, and usually in considerable proportions.

It is estimated that an acre of soil a foot deep weighs on an average 3,500,000 pounds, and that good ordinary loam in Europe will contain, on an average, not less than 3,500 pounds per acre of nitrogen, and sometimes more than that. The quantity of potash in the same area usually ranges from 5,000 to 8,000 pounds, and of phosphoric acid from 3,000 to 6,000 pounds.

From the analyses of soils which have been made by Mr. F. T. Shutt, Chemist of the Experimental Farms, during the past few years, many of them representing large areas, it would appear that the soils of Canada compare favorably with those of Europe in their richness in these important constituents. Those analyzed from different parts of Eastern Canada have average per acre as follows: nitrogen 6,200 pounds, potash 6,500 pounds, phosphoric acid 3,600 pounds, while the average of those examined from the Northwest plains give over 10,000 pounds per acre of nitrogen, 10,500 pounds of potash, and 5,000 pounds of phosphoric acid.

Elements Appropriated for the Production of Apple Wood.

Trees during their growth take a very large part of their substance from the air. The carbon dioxide or carbonic acid gas which animal life everywhere is constantly exhaling is absorbed by the leaves of plants and trees and converted into woody tissue and starchy and saccharine material so necessary for the food of animals. If you burn a piece of apple tree wood weighing 100 pounds you find as a result less than two pounds of ashes, 1.29%. The combustible matter destroyed with the exception of a small proportion of nitrogen has all been taken from the air. These ashes include all the mineral matter taken from the soil, and are said to contain about twelve per cent. of potash and about four and a half per cent. of phosphoric acid, with a much larger proportion of lime. On this basis an apple tree would take from the soil for the production of 100 pounds weight of its wood less than two and a half ounces of potash, about one ounce of phosphoric acid, and probably not more than five or six ounces of nitrogen.

Constituents of Apple Leaves.

Let us next consider the constituents of the leaves which, however, are eventually nearly all returned to the soil by their fall and gradual decay. The leaves of several varieties of apple trees have been analyzed by the Chemist of the experimental farms at different stages of their growth with the following results. Gathered on the 25th of May, when they were scarcely fully expanded, each 100 pounds contained an average of about welve ounces of nitrogen, a little more than four ounces of potash, and less than four ounces

of phosphoric acid. The mature leaves collected on the 20th September were found to contain a somewhat larger percentage of nitrogen and potash and a smaller proportion of phosphoric acid, about fourteen ounces of nitrogen, six ounces of potash, and three ounces of phosphoric acid, with fourteen ounces of lime in each 100 pounds of leaves.

Composition of the Fruit.

The fruit of the apple consists mainly of juice, which forms more than eighty per cent of its weight, and when this is expressed we have a residue which cider makers call pomace, composed of the compressed cellular structure of the fruit with the cores, seeds and skin with some of the flavoring material. The juice consists of water with malic acid varying in proportion in different varieties of apples from one quarter to one and a quarter per cent., and sugar from six to twelve per cent., with a little flavoring material. Everything in the juice excepting the water is compounded by the tree from the gases taken from the air, and hence there is no drain on the soil in the formation of this material.

In the pomace will be found the cores and seeds and these latter are rich in nitrogen, and the formation and maturing of the seed is a considerable tax on the vital forces of the tree. For this reason heavy crops are much less trying to the vigor of the tree if the fruit be thinned. The fruit produced is thus improved in size and quality, and the capacity of the tree for future production economized. Apple pomace contains in every 100 pounds about four and a half ounces of nitrogen, two ounces of potash and less than one-third of an ounce of phosphoric acid.

Having considered the composition of the wood, leaves and fruit of the tree, we shall next consider how much of the fertilizing constituents referred to are taken from the soil in bringing the tree to maturity and in the annual production of the leaves and fruit. Suppose we estimate the weight of the trunk and branches of the tree at 1,000 pounds—which is only a rough guess—and that we have thirty such trees planted thirty-eight by thirty-eight feet on an acre, these will have taken from the soil to produce their wood growth from three to four pounds per tree of nitrogen, (ninety to one hundred and twenty pounds in all) and not more than twenty-five ounces of potash and ten ounces of phosphoric acid, equal to about forty-six pounds of the former and eighteen pounds of the latter per acre. This includes all of these important fertilizers which are taken from the soil for the entire growth of the woody structure of the trees on one acre of orchard.

The Leaves.

I know of no basis on which an estimate of the weight of leaves on an apple tree can be founded. It will serve our present purpose however to roughly place them at 100 pounds. On this calculation thirty trees will draw annually from the soil about twenty-four pounds of nitrogen, nine pounds of potash and seven pounds of phosphoric acid, with about eighteen pounds of lime. Since however as already remarked the leaves are always allowed to fall on the ground, where they gradually decay and are most of them returned to the soil, it would be a liberal estimate to allow one-half of the ingredients taken as lost to the land.

The Fruit.

Supposing the thirty trees per acre in the orchard to produce an annual crop of six barrels per tree of 130 pounds each, or 180 barrels, 23,400 pounds per acre, there would be taken from the soil for the growth of the fruit crop to maturity about thirteen pounds of nitrogen, six pounds of potash, and less than one pound of phosphoric acid.

The Waste and How it May be Returned.

In estimating the total withdrawal of fertilizing constituents from the soil as the amounts are small, we may venture to add to the annual drain on the land for the growth of the leaves and fruit, one-tenth of the quantities required for the entire growth of the woody portion of the trees, as follows:

—	Nitrogen.	Potash.	Phosporic acid.
	lbs. oz.	lbs. oz.	lbs. oz.
For $\frac{1}{10}$ of the total growth of the wood	12 ..	4 10	1 14
For the waste of half the annual growth of the leaves	12 ..	4 8	3 8
For the annual waste in the production of the fruit ...	13 ..	6 ..	1 ..
Total	37 ..	15 2	6 6

All the ingredients taken from the land may be replaced by the use of barn-yard manure, each ton of which of average quality contains while in the fresh condition from eight to ten pounds of nitrogen, ten to fifteen pounds of potash and from six to eight pounds of phosphoric acid. If the manure has been rotted under favourable conditions the proportions of the fertilizing constitutents will be somewhat increased. A dressing of about fifteen tons of manure every three years would more than restore the full quantity of nitrogen and more than three times the quantity of potash and phosphoric acid which has been taken from the land. It must however be borne in mind that the active feeding roots of the trees do not cover the entire ground and that they must find all that they require within the area of their distribution hence the return should be liberal.

Nitrogen may be more economically applied by the plowing under of green clover. A fair crop of this sown in the spring and plowed under late in the autumn will give to the soil from 100 to 150 pounds of nitrogen, and if left on the orchard as a cover crop and plowed under the following spring, from eighty to 100 pounds per acre. This crop will also gather potash from the soil and subsoil and present it in available form for the use of subsequent crops to the extent of 100 to 150 pounds per acre and phoshoric acid from thirty to thirty-five pounds. The nitrogen which the clover crop supplies to the soil is taken largely from the air and the fruit grower thus obtains assistance from nature in his endeavours to maintain the fertility of his land. An unlimited store of this valuable element exists in the air which is composed of four parts by weight of nitrogen with one part of oxygen and clover in common with other leguminous plants, has the power of taking in and storing this element in its tissues. This work is said to be done through the agency of colonies of bacteria located in the small gall-like swellings, so common on the roots of thrifty growing clover plants. The roots of clover extend over a wide area and penetrate to a great depth in the subsoil and they are thus able to draw upon supplies of plant food lying beyond the reach of other crops and in this way this plant acts as a permanent enricher of the soil. A careful study of the root system of red clover, has shown that plants one month old have roots extending seven inches into the ground that at two months some of the roots had reached a depth of two feet, and at four months to a depth of four to five feet. In addition to the gain of the fertilizers referred to, the organic matter in the roots and tops of the clover plowed under, improves the texture of the soil and makes it more retentive of moisture. The growing clover also acts as a catch crop during the summer and autumn and appropriates the nitrogenous fertilizers which are brought down by the rain and which when falling on bare ground, on account of their ready solubility pass through the soil and are lost in the drainage waters.

Nitrogen may also be conveniently given in the form of nitrate of soda. This occurs in large beds in Peru, and other parts of South America, mixed with common salt and earthy matter from which it is extracted and purified. Each 100 pounds furnishes about

fifteen and a half pounds of nitrogen to the soil. The quantity usually recommended is from 100 to 200 pounds per acre. As this salt is very soluble and easily wasted by leaching, it should always be used as a top dressing, and it is more economical to divide the quantity to be used into two or three portions and apply them at intervals of one or two weeks.

Sulphate of ammonia is another source of nitrogen. It is a product made from gas liquors and is more expensive than the nitrate of soda. Each 100 pounds of the sulphate of ammonia supplies twenty pounds of nitrogen to the soil. Other sources of nitrogen are dried blood which contains from ten to ten and a half per cent., fish waste containing from eight to ten per cent. and guano.

Sources of Potash.

Probably the cheapest source of potash is unleached wood ashes. These contain from five to six per cent of potash, and about two per cent of phosphate of lime. When leached they contain the same proportion of phosphate of lime but the proportion of potash is reduced to about one to one and a quarter per cent. Ashes usually contain also a considerable proportion of lime. Large quantities of unleached ashes are still shipped every year from Canada to the Eastern States where they are sold to farmers at from $13 to $18 per ton.

Kainit is a very important source of potash. This is a a crude natural potash salt, found in large quantities at Strassfurt, in North Germany, lying in beds more than 1,000 feet below the surface. It contains about twenty-two to twenty-three per cent, of potassium sulphate, equal to about twelve per cent. of pure potash. This is said to be associated with magnesium sulphate, about seventeen per cent. magnesium chloride about fourteen per cent., and common salt, sodium chloride twenty-seven per cent. The quantity of this crude salt recommended to be used, is from 300 to 800 pounds per acre. In another stratum of these valuable potash deposits at Strassfurt, a layer is found consisting mainly of muriate of potash and chloride of magnesium. This is known in commerce as carnallit and contains about the same proportion of potash as kainit. This deposit ranges from fifty to 150 feet thick, and from it most of the potash salts of higher grade are manufactured, such as the muriates and sulphates of potash, each containing about fifty per cent. of potash. Some idea of the importance of these potash deposits may be formed from the fact that more than 9,000 men are employed as miners and labourers in connection with the works. The prices at which these potash salts are usually sold are about as follows, kainit $12 to $15 per ton, muriate of potash $42 to $45 per ton, and sulphate of potash $42 to $50 per ton.

Sources of Phosphoric Acid.

Phosphoric acid is the third of the substances referred to as largely used by growing plants. The chief sources from which this material is obtained are the bones of animals, mineral phosphate of lime or apatite, and basic slag a waste product formed during the purification of iron.

The bones of land animals in their fresh condition contain about forty-six per cent. of phosphate of lime, four per cent. of carbonate of lime, a small proportion about two per cent. of potash and soda, and forty-eight per cent. of gelatine, fat and water. The gelatine contains from three to five per cent. of nitrogen, and the phosphate of lime from eighteen to twenty-three per cent. of phosphoric acid. The phosphate of lime as it exists in bones is insoluble in water and, but very slowly soluble in the soil. It is rendered wholly and quickly soluble when it is treated with sulphuric acid which changes the phosphate to the superphosphate. Bones may also be reduced by the use of unleached ashes, placing the bones whole or coarsely ground in layers in a suitable vessel and covering them with layers of ashes mixed with about one-eighth of their weight of freshly

slacked lime and the whole moistened with water. The ashes being rendered still more caustic by the lime acts on the bones and gradually softens them until they can be crushed between the fingers to a soap-like mass. When reduced to this condition the compound may be mixed with dry muck or loam and applied to the land—100 pounds of hard wood ashes are said to be sufficient to reduce about 100 pounds of bones.

Phosphoric acid may also be supplied in the form of superphosphate of lime made from the mineral phosphate. This as supplied by the manufacturers usually contains from eight to ten per cent. in the lower grades, and thirteen to twenty per cent. of scluble phosphoric acid in the higher grades.

Thomas' slag, known also as basic slag or odorless phosphate, is a third source of phosphoric acid. Many iron ores contain minute quantities of phosphorus which reduces the quality of the ore. In the manufacture of such iron into steel, the process is so conducted that a chemical action takes place in the presence of lime at a very high temperature whereby the phosphorus in the iron is converted into phosphoric acid, and combined with lime forming a phosphate of lime. This is said to be easily decomposed and rendered soluble by the products arising from decomposing humus in the soil and is thus presented to the rootlets of plants in a form easy of assimilation, It is stated that the German factories now turn out about 400,000 tons of this slag annually, and a considerable quantity is also produced in Great Britain and the United States. The phosphoric acid in this waste product is said to be present in the proportion of from thirteen to twenty-one per cent. The slag also contains about fifty per cent. of lime and varying proportions of oxide of iron, magnesia and silica. It is odorless and tasteless.

Exhaustion Produced by Crops of Fruit.

The exhaustion of the soil seems to be greater in all cases from the production of the fruit than it is from the growth of the substance of the tree or vine. The ashes of the pear according to Wolff of Germany contains a little more than twice the quantity of potash that is found in the apple, the proportion of phosphoric acid is also one-third larger. In the fruit of the plum the potash is given as a little higher than that of the pear, and the phosphoric acid the same as in that fruit, whereas in the fruit of the cherry the proportion of potash is the same as that in the pear, and the proportion of phosphoric acid somewhat larger. It should not be forgotten that in the growing of all these fruits the drafts on the soil for potash are heavy, and hence this element should be supplied with a liberal hand.

It seems when you look at the figures I have given you that almost any soil, however poor, ought to continue to grow good crops of apples for a long time, seeing the large stores of the elements of fertility which are laid up in the land; but you must consider the importance of the point I have already mentioned, that the roots of your trees occupy only a limited area, that they must take all the material they require from this limited area; and hence the importance of treating your soil liberally and regularly with such things as careful analyses have shown are really taken away from your land, and which makes the land poorer every season you grow your fruit unless you take the pains to restore to that land an equivalent.

The peach ranks about with the plum in its consumption of potash but uses twice the quantity of phosphoric acid, whereas in the production of grapes the soil is drawn on to the extent of three pounds of potash, per 1,000 pounds of fruit and fourteen ounces of phosphoric acid. While the grape uses these elements of fertility freely in the production of its fruit it uses only about one-fourth this quantity in producing the wood and branches.

The raspberry and blackberry are said to consume one-fifth less potash than that of the apple for the same weight of fruit, and the strawberry according to the analysis of Dr. Goessman contains about two pounds twelve ounces of potash for every 1,000 pounds of fruit, and about fourteen ounces of phosphoric acid. The strawberry plant according

to the analysis of the Chemist of the experimental farms consumes about five pounds of nitrogen, five and three quarter pounds of potash and one and four-tenth pounds of phosphoric acid for each thousand pounds weight.

This subject is a very important one, and I hope I have made it plain. The soil is the fruit grower's savings bank. There he has stored a large amount of capital. If he uses that capital carefully, if he returns—as he would if he wanted to keep up his savings bank balance—something equivalent to the drafts he makes on it, or a little more, instead of having his account grow poorer from year to year, he will have it become better and richer, his land will be in better condition to continue to give him good crops, and considering the enormous productiveness which is attained by this intensive method of agriculture, he can well afford to deal with the soil in a liberal way. I thank you for the very kind attention you have given me under such unfavorable conditions of voice. (Applause).

Mr. WHYTE: Dr. Saunders says fifteen tons of stable manure were necessary per acre. How many average cart loads or wagon loads would that be? It does not give a very good idea to those who have not weighed a load.

Prof. SAUNDERS: Carts and wagons vary so much in size it is difficult to answer that question. We bring from town to the farm one and one-half to two tons of manure on our large wagon box, and I suppose that would make five or six cart loads. Manure is generally sold by weight where it is sold at all, at so much per ton, and I have adopted that form of expression in the paper for the reason that it is much more accurate than it would be to say so many cart loads. I suppose a cart load of manure would weigh somewhere in the neighborhood of half a ton, but if it is fresh and strawy it would not weigh so much as if it is well rotted and wet.

Mr. E. D. SMITH: I have weighed a good many. A square wagon box packed up as high and packed on as solid as it can be weighs two and a half tons. That is a two horse wagon load, rotted fine.

Mr. HUGGARD: Which plan with clover is most beneficial?

Prof. SAUNDERS: Plowing clover under is most beneficial in the autumn, but it is very beneficial to have the ground covered in the autumn; and where it is cold in the winter and where you are liable to have bare ground I think it would pay the fruit growers to incur a little loss, in fertilizing constituents, and to plow under in the spring, in order to gain the advantage of that cover crop in the winter so as to protect the roots of the trees from injury. The figures I have given are but approximate. We have only been carrying on these clover experiments at the farm for three years, and so much depends on the conditions of the roots and tops of the clover when spring comes that another season I might be able to give you figures which would show a larger proportion of nitrogen. If clover is wintered well—and it does winter well in the greater part of the fruit growing districts—I think it would make a better showing than is given in this paper. I think that the advantage of clover would be sufficiently great to warrant any fruit grower in the fruit growing districts leaving the crop until the spring and plowing it under then. I think taking one season with another he would get the most advantage in that way. I may say that we became so impressed with the importance of this subject of plowing clover under at Ottawa that this past year we have sown clover with nearly every variety of grain sown in our large fields, and I think in two or three years we shall be able to bring the land up in that way to a high state of fertility. We have found by careful experiments that ten pounds of Mammoth Red Clover per acre is about the best proportion to sow. We sow that with our grain—barley, oats and wheat. We find it do very well with oats, although the oats being rank and heavy in growth are more likely to smother the young clover plants than wheat or barley, still we get very good results in Ottawa with the oats. We find as soon as the crop is taken off we have the ground well covered with the young clover plants. They grow rapidly as soon as the shade which the grain has given them is removed. Later they act as a catch crop, catching the fertilizing matter brought down by the rain and storing it up in their tissues.

We have a heavy mat of growth by the fall, and in the spring turn that under and leave it for the next crop of grain, and there is thus added to the soil a store of fertility which will return you very good results in after crops. My impression is that it would be wise to do this every year. It costs a dollar an acre to do it, and it gives the farmer as much nitrogen as he would get from at least ten tons of manure, and the roots of the clover plant going down so deep bring up potash and phosphoric acid. Though they do not really add these to the soil, they bring them up from such depths and store them in the tissues of the plant and place them within the reach of subsequent crops, so that the clover may be regarded as an enricher of the soil in potash and phosphoric acid as well as in nitrogen.

Mr. A. H. PETTIT: Do you consider the turning under of the clover any protection to the roots?

Prof. SAUNDERS: One would think that it would act as a mulch in that way perhaps almost as effectually as it would the other way; yet you have to bear in mind that the turning under of the soil loosens it up and makes it more permeable by the air, and that the cold is more likely to penetrate a loose surface of that character than it is one where the clover has been allowed to grow and the foliage covers the ground. Another point is; if there is a very little snow the clover leaves will catch it in a way that bare plowed ground will not. Every farmer and fruit grower must be expected to use his own judgment in these matters. I have tried to give you the results which have been obtained by us under both conditions, and the experiments should be carried on by every man of common sense according to his own judgment.

Mr. TYE: How many bushels of ashes would you recommend to the acre for apples?

Prof. SAUNDERS: A bushel weighs I believe about forty pounds.

Mr. BURRELL: More than that; nearly sixty pounds.

Prof. SAUNDERS: It depends a good deal on the moisture in the ashes. If they are very dry they would not I think weigh more than about forty pounds; they might weigh fifty, or more than that if they had been exposed to the air and got damp. Supposing them to weigh fifty pounds, then sixty bushels of ashes would give you 3,000 pounds, and taking five per cent. of potash as the quantity in the ashes, which is about what you can reasonably calculate on, you would have one hundred and fifty pounds of potash added to your acre of land, which would be a very fair dressing, and you would also have about sixty pounds of phosphate of lime. You would have besides that a considerable quantity of lime in these 3,000 pounds—probably 600 pounds at any rate.

Mr. TYE: You made a remark that pears require more potash. Would you apply more potash to pears than apples?

Prof. SAUNDERS: I think so decidedly. When we know that potash is taken out of the soil by a crop we must restore it if we want to maintain the fertility of the land, and according to the analyses that have been published the pear fruit takes more potash from the soil than the apple does.

Mr. MCNEILL: You also noted the immense store of mineral food in ordinary soil; in addition to this artificial way of improving the soil, you would also of course strongly recommend the cultivation of the soil, the original manure—from manus, the hand—the working the soil to make this inert food available in addition to adding the material from the outside?

Prof. SAUNDERS:—I would for ordinary crops; there would be no question as to the advantages of cultivation in such case. But we know there is much difference of opinion among fruit growers as to the desirability of keeping their orchards cultivated or uncultivated, that is in grass or clover, that much must be left to individual judgment. If a man finds his trees are making too much wood, and he does not want to stir his soil on that account he can add from some of these other sources sufficient plant food to repair the waste.

Mr. E. D. SMITH: Why will not the apple tree roots penetrate down and take out fertilizing material from the soil?

Prof. SAUNDERS: No doubt they will to a certain extent; but when you pull up an apple tree and notice where the large proportion of the feeding roots are located you will find they don't usually run more than two feet below the surface. Of course there is a difference in varieties, but I think as a rule you will find the feeding roots of the apple, or most of them, are within two feet or a little deeper than that from the surface. You will also find that as the apple tree grows, the feeding roots of the tree are more towards the outer circumference of the root area a great deal more than they are in and about the trunk. The idea that a good many people have is that if they put a heap of manure around the trunk of the tree they are feeding it in the best way; but if they would study the growth of the roots they would find that there are very few feeding roots immediately adjacent to the trunk of the tree.

Mr. E. D. SMITH: A good many of us think we have noticed that where an apple orchard is continuously cultivated for a long term of years, instead of getting the good results that we expected, when there is a heavy drain on the soil by heavy crops the apples are small, showing apparently that the fertility has become exhausted. Although we may have had no large crops of apples for several years, and though there has been a heavy dressing of manure, when the test comes the crop seem to be deficient, on good soil too.

Prof. SAUNDERS: Is this where other crops have been taken from the land?

Mr. E. D. SMITH: No, nothing taken off the ground, but coats of manure put on the ground at intervals, and then when a heavy crop came the apples were small when we expected they would have been large.

Prof. SAUNDERS: There are other conditions involved in producing apples of a certain size besides the condition of the soil. As I have explained, water carries everything to the rootlets There is no other way for the tree to get any food except by solution in water. Now, if the season happens to be a dry one, it is easy to understand that the amount of water in the soil is reduced, and the ability of the roots to get this amount of material, which they must have in order to produce the full size and quality of the fruit, is much lessened by the conditions of the climate; we find the question of season to be the most important of all in growing cereals. You may have your land so charged with fertility that you can hardly get anything more into it with reason, and yet if you happen to have a bad season, if drouth comes on you at a time when you should have moisture in order to be successful, very often you will not have more than half a crop.

Prof. TAFT: I was very well pleased with Prof. Saunders' address, but I think he ought to have kept silent on one or two points. He advised you in the first place not to sell your ashes, but to use them at home. Now, speaking as a Yankee, I think that is pretty poor advice. (Hear, hear, and laughter.) We have been using your ashes and we like them, we think they are first rate, and really that is one of the best fertilizers, and where our fruit growers can get ashes they find they can get lots of fruit, and it will be large and of high color and of good quality, so I think that is pretty poor advice. (Laughter.) Regarding this matter of the apparent running out of orchards, it seems to me that cultivation, as we generally make use of it, instead of securing and conserving the plant for wood-building, results in depletion of the soil, whether it is in an orchard or in any other crop—results in running out of the soil far more than the actual loss of taking out plant food in cropping. On the other hand take the prairie, and soil allowed to remain so, improves, and it seems to me that we ought to get a little advice from that, and if we follow along that line and try to cover that soil in the winter, and turn under something each spring, then we can keep up that soil; and in our own practice we have tried to keep every acre of our orchard and every acre of vegetable garden, a similar soil, covered during the winter with some crop of this kind. While the advice given regarding this clover is excellent, we have not been able to use it as far as we like. It is all right to supply the food, and as a cover crop, where you can get it off early enough. But in our bearing orchards we don't like, for instance, in the case of a peach orchard, to seed down clover and similar crops very early, and if we wait until the middle of August, or even later than that, as

we generally like to, we find that the season is so dry that we cannot get a good catch. The result is that the clover is very weak and often winter killed. For that purpose we find the Crimson clover better than the Mammoth, and it is apt to be winter killed after September, and its growth at best is not so large ; and although oats do not supply nitrogen, except what it takes from the soil, we use also largely them as a cover crop. We sow the oats when we work the orchards the last time. They will get to a height of a foot or two feet before they are cut down by the frost, and they will supply a large amount of humus. We value that fully as much in our orchards as a practical supply of nitrogen for our peach crops. We have too much nitrogen there when the growth is rank and results in winter killing, but this humus turned under will aid in holding the plant food, preventing the leaching of the soil, and thus we find it conserves the food if it does not supply it ; and we have used this crop too with our crimson clover, sowing a bushel, possibly, of oats with the crimson clover ; it acts as partial nurse crop and will tend to hold the snow. Of course in Ottawa I suppose they won't need to hold that snow so much, but with us it blows off and leaves the ground bare ; and holding the leaves as well, it will lessen the injury from the freezing and prevent largely the leaching of the valuable elements out of the soil. So that we find these cover crops, whether oats or clover or rye, of great value. Another reason that we like them is that we find along in September and October, after a period of drouth, rains and warm weather are likely to start late growth of the trees and result in winter killing, Now, if you have that cover crop there, it tends to take up soluble food, will check the growth of the trees and aid in the ripening. Our orchardists are using them very largely for this purpose alone.

Prof. SAUNDERS : I think as a dutiful and loyal Canadian that I did good service to the Association in advising Canadians to keep their ashes and use them at home. (Laughter). We are not so much concerned—although we wish our neighbors well—in the prosperity of the Michigan farmers as we are in that of the Canadian farmers ; and I must only reiterate the advice given from that standpoint. I am much obliged to Prof. Taft for the suggestions he has made, because he has put the question in another light. I had not supposed that any of our orchards were too rich ; and where that occurs, and the soil becomes highly charged with nitrogen and you find a strong rank growth of wood, the cover crop Prof. Taft suggests would be admirable—that of the oats ; but the plowing under of the oats merely returns to the soil the fertilizing elements which they have absorbed and assimilated. Every plant takes up a certain amount of these elements from the soil and stores them in its tissues ; and these elements are returned in a very soluble form when the plant is plowed under. There was another point which Prof. Taft's excellent observations emphasized, and that is this : That where the soil contains a large proportion of nitrogen, the leaching that Prof. Taft has referred to becomes sometimes a source of serious loss to the soil, because all the nitrogen compounds are very soluble and easily washed away. It is not so with either the potash or the phosphoric acid compounds. They in a very short time after they are applied lose to some extent their solubility and are stored up in the land for future use.

Mr. BURRELL : I think this is an extremely valuable discussion. Speaking of the Niagara district I certainly have not observed any peach orchards that have any excess of nitrogen, and I do not think there are a great many of them in our district ; but this question of the Crimson clover is a very valuable one to our particular section. I have been trying for the last three years to ascertain what time it would be best to sow, the amount of seed, and the practical results and so on, and as Prof. Taft says, I found that in the earlier sowing the results have certainly been very much better, and after a great number of sowings, I find it is always most satisfactory to sow at the end of July, and by that time, although one year we did not get very good results as it was so dry—three years ago—the last two years I have succeeded in getting a growth of from five to eight inches high by the end of November. At that time the average plant would be about fourteen or fifteen inches in root system, containing as far as I have estimated 600 to 800 to a thousand nodules of bacteria, nitrogen secreting nodules ; and Mr. Veers, who has made a very close study

of the Crimson clover, tells me that he thinks if that were plowed under it would give an equivalent to seven or eight tons of barnyard manure. I was under the impression that even if it should winter kill there would not be very much loss unless it was a very open winter, that the loss of nitrogen would be comparatively small; that even if it did freeze in the winter it would still be a profitable crop, and if it didn't freeze in the winter of course we know it is very much more valuable. In our section we have succeeded at the end of May in getting a growth of 2 and 2½ feet high, and the results of such growth have been most satisfactory, showing it is equal to a dressing of ten to fifteen tons of barnyard manure. We sow about twenty pound of crimson clover per acre, because the seed being twice as big as the red clover seed you speak of requires a bigger sowing. I believe it is one of the most valuable crops to follow a strawberry crop, and if I were a large strawberry grower I would always plow down my strawberry bed after the first crop and sow crimson clover. I think many growers who are supplying a large amount of wood ashes to their strawberry crops believe it to be the best fertilizer we can give. The land is fairly rich in nitrogen generally for the first year of the strawberry plant. The second year, as the fruit takes so much potash and phosphoric acid, we supply ashes, and so far as I understand it the bacteria work far more readily when there is a good supply of lime and potash, and as the ashes contain both these elements to a large extent I believe it is an ideal crop for clover to follow, and in each case I have had far greater satisfaction on the strawberry plowed under by my clover than in any other shape, and in that way you get the nitrogen as well for the next crop.

Prof. SAUNDERS: I didn't mention the crimson clover for the reason that we have had such poor success with it in Ottawa. It always winter kills with us, and the only way we can get a crop at all is to sow it early in the spring and sow it alone, then we get a fair crop at the end of the season; but the root system of the crimson clover, being an annual, is comparatively shallow and since the roots are valuable and rich in nitrogen, we prefer the deeper rooted clovers; but if you can use it to advantage in Niagara it is a good thing. I would like Prof. Fletcher to give us a little of his experience with tests of crimson clover.

Dr. FLETCHER: The results of the tests of crimson clover were practically as Prof Saunders has said. Sowing at the different times, we have never been able to carry them over winter in a satisfactory way—three-quarters of the plants were always killed. Sown in the spring they made before September a good head of green manure to be plowed in. It is not with us a valuable crop to sow at all, and we have substituted for it the Mammoth Red if we wanted to winter it over, and then plow it in in the spring. One important point in sowing the seed of the clovers is to recognize the difference in the size of the seed, and where you sow ten pounds of the red clover, sow six of Alsike and sixteen or eighteen of Incarnatum or crimson clover.

Mr. BURRELL: Prof. Saunders mentioned that the roots of the Crimson clover were valuable so far as nitrogen was concerned. You are only alluding to its growth that year?

Prof. SAUNDERS: Yes; we have no experience with it the second year.

Mr. BURRELL: The second year that we plowed it under the tops contained two-thirds more nitrogen than the roots, and the nitrogen is constantly passing into the tops till the time of maturity, therefore it is more valuable to plow it under before blossoming.

Rev. Mr. ANDREWS: The difficulty to get clover seed to take in the summer is getting the land solid enough if you plow it, and also having the shade. In England, they use crimson clover to a great extent for sheep food, and they adopt this plan; directly a crop of wheat or barley or oats is taken off, having a drill which cuts sharp into the ground and putting it right on to the bare stubble and that takes very well. I have tried an experiment this year which promises to be fairly successful, and it is this: The last time I cultivated my corn I sowed it with clover and the catch seems to be very good.

Dr. FLETCHER: Do you roll it?

Rev. Mr. ANDREWS: No.

Dr. SAUNDERS: We find sowing clover during the first part of July very successful if the land is rolled, but it must be rolled immediately. The rolling presses the surface of the soil, and the ground water which is finding its way up to the surface and being lost by evaporation is, by the pressing of the soil in which the seeds lie, retained, and this gives more favorable conditions of moisture for the first few days to the clover plant and helps to start it evenly and uniformly.

Mr. JONES: Ashes has the effect in stiff soils of making them very sticky. Of course, we overcome that difficulty somewhat by getting large quantities of humus in the soil, but nevertheless, it causes it to be more compact and harder to cultivate. I think the German potash salts might possibly be more advisable.

Dr. SAUNDERS: Where there is that difficulty of the ashes making the soil more tenacious, the use of the German salts might be preferable, but the addition of fifty or one hundred bushels of ashes to an acre of land makes so small a proportion of the soil after you plow it in, that I should hardly think that it would as a rule have much influence in modifying the actual physical character of the soil. I know it does in some cases, but as a rule I should hardly expect that it would; but where it does, then I think the kainit would not be open to the same objection.

Mr. JONES: I was speaking now rather of stiff clay soils that have been under cultivation for 100 or 125 years, or perhaps longer, and as far as I know, clay cultivated in that way gets more packed and closer grained year after year.

Dr. SAUNDERS: Of course clay soils, as they are made up largely from granite rocks, contain a larger proportion of potash in unavailable form, that is, not immediately available, than sandy soils, and as a rule do not need so much potash, since they have a very liberal store in their constitution naturally, and if a soil is worked so as to get that potash in a soluble and available form, the crop can get a good deal from what the original store laid up in the ground will supply.

Mr. MCNEILL: I think you will find few farmers on clay ground who will think there is much benefit in using ashes. Where you require special quantities of it fruit growers are in favor of it. There is a very strong prejudice in the minds of the farmers against using ashes, and to day they are selling them because they don't believe they are any good, and they are dealing with it from what they believe to be experience. I live right opposite an ashery and the ash pedlars go round near my place and they get a full supply and I get all the leached ashes for nothing. There are hundreds and hundreds of loads there that have been dumped into the marshy places to fill up land, showing the appreciation that farmers have of ashes. I put hundreds of loads of leached ashes on my land and I get some very fine results from their use. I find them to have splendid effects under certain circumstances, but I believe the average farmer does not get the results that he is led to believe from the reports of such societies as this and from sandy soils. What has been said in regard to cover crops is particularly true. Different crops require different treatment. I would be very glad if I could get a cover crop and get my grapes too. I get much better results by plowing my vineyards in the fall. There are two or three reasons for that. I believe that one of the chief reasons is that we must of necessity cut a great many roots in plowing the land. During the growing season the upper and richer portion of the soil is being filled with grape roots. When you plow that you cut a great many of these. In the following spring these roots strike out again and once more fill the soil with roots. I notice that in the middle of the furrow we cut larger roots than usual, and I was led to examine those roots and I found where the roots were cut in the fall, during the winter they actually had nodules on them and in the spring were ready to send out a dozen branches from where we had cut them in the fall. I believe the cutting them in the spring instead of in the fall would cause a considerable delay, and that is one of the advantages we have had from plowing the vineyards in the fall. We always plow in the fall and of course there is the additional advantage of forwarding the spring work.

RATES OF FREIGHT ON APPLES.

Mr. BOULTER moved the following resolution in reference to rates of freight on apples, seconded by Mr. HUGGARD :

That the President, A. H. Pettit, Geo. Fisher and the mover be a committee to wait on The Traffic Association of Canada, in regards to the present rates on apples and other fruits to Manitoba, Northwest and British Columbia, and if possible, receive a uniform rate from different points in Ontario and a reduction in the present ones.

Mr. BOULTER, in supporting the resolution, said : When we started this Association we had no uniform rates. By united action we succeeded in not only getting a uniform rate on all the goods packed, but also a uniform rate to the different points in Ontario. As Prof. Robertson remarked, the home market is a very important one. From travelling through Manitoba for the last fourteen or fifteen years, I am satisfied it is going to be a very desirable market for the fruit growers of Ontario. I have a large orchard myself and I would like to see a chance for us to send our surplus apples to that country. At present, a large proportion of the apples used in Winnipeg are American apples. To get a barrel of apples there the uniform rate is 150 pounds in a barrel. Now at present, a barrel of apples going to Winnipeg would cost from $1.10 to $1.20 a barrel, to Calgary it will cost from $2.25 to $2 75. To Victoria, about 2,000 miles the other side of Winnipeg, it will cost about two cents more than to Winnipeg. That is on account of the competition we have with the Great Northern and the Northern railways, and down in the Kootenay and Slocan country there is a large amount of apples used. I have a great respect for our American friends, but I want our boys to eat Canadian apples. I think we will make some headway with this Freight Traffic Association. We succeeded in getting a uniform rate from every point in Ontario, and we should endeavor to get the rate of apples so that a person can buy them and consume them in Calgary and those points west.

The PRESIDENT : I think this is rather an important matter ; in fact, I referred to it in my address, that we should look after the markets of the Northwest and Manitoba, because I believe in the near future there will be a population there that will demand a large quantity of fruit. They never will be able to raise the apple to any extent in that country, and we should be able to send our apples out there at remunerative rates to the grower. I think the resolution is in the right direction and should be supported.

Mr. MCNEILL : Why limit it to apples ? We have a high rate on all other classes of fruit.

At the suggestion of the President, Mr. Boulter amended the resolution to include all fruit, and, as amended, the resolution was put and carried unanimously.

REPORT OF COMMITTEE ON REVISING THE CONSTITUTION AND BY-LAWS.

Mr. RACE reported on behalf of the committee on by-laws. He explained that when this Association was organized it had but one object, to further the fruit culture of the Province. Since that time its functions have so largely widened that it has embraced other things besides fruit culture—floriculture, forestry and everything pertaining thereto —and still the constitution has been referring all the way through only to fruit culture. It was found necessary to change it so as to make it cover and embrace all these different departments that have been taken up during the last few years. Another reason why it is necessary to revise the constitution, is that it conflicts in some of its provisions with the Agriculture and Arts Act of the Province of Ontario.

The PRESIDENT : That can only be considered a notice of motion as far as the constitution is concerned. We cannot change the constitution at this meeting.

Mr. RACE then read the report from the beginning.

Your committee appointed to revise and amend the constitution and by-laws of the Ontario Fruit Growers' Association, beg to report that they recommend the following changes, substitutions and amendments:

Art. I.—To remain unchanged.

Art. II.—Changed to read: "Its object shall be the advancement of the science and art of horticulture in all its branches and forestry by holding meetings for the discussion of all questions relative to horticulture and forestry, by collecting, arranging and disseminating useful information, and by such other means as may from time to time seem desirable."

Art. III.—To remain unchanged.

Art. IV —Changed to read: "The officers of the Association shall be a president, vice-president, a secretary and a treasurer, or a secretary-treasurer, two auditors, and thirteen directors."

Art. V.—To remain unchanged.

Art. VI.—Changed to read: "This constitution may be amended as provided for by section 32, sub-section 1, of the Ontario Agriculture and Arts Act."

Art. VII.—To be amended by the substitution of the words "horticulture and foresty," for the words "fruit culture," in the fourth line.

Art. VIII.—To remain unchanged.

It is further recommended that the by-laws be amended by striking out clause 1 and substituting therefor:

"The Board of Directors at its first meeting shall appoint from among its own number or otherwise a secretary and a treasurer, or a secy.-treas., and from among its own members an executive committee to consist of three members, one of whom shall be the president."

Recommended that an additional clause be entered here to read: "The president and vice-president shall be *ex officio* members of the board of directors; and the president, or in his absence, the vice-president, an *ex officio* member of all committees."

Clause 2. To be amended by changing the words "fruit growing" in the third line to "horticulture and forestry."

Clause 3. To be amended by changing the words "fruit culture" in the fourth line to "horticulture and forestry."

Clauses 4 and 5 to remain as they are.

Clause 6. To be amended by changing the words "five members" to "ten members."

Clauses 7 and 8 to remain unchanged.

Clause 9. To be struck out and the following substituted therefor: "The executive committee shall authorize all expenditure, and audit and pass all accounts, which shall thereafter be paid by the treasurer."

Clause 10. To be amended by striking out the first words "It shall be the duty of," and changing the words "to keep" to "shall keep."

Clauses 11 and 12 stand unchanged.

Clause 13. To be amended to read: "The order of business shall be; (1) Reading of minutes; (2) Reading of Directors' report; (3) Reading of Treasurer's report; (4) Reading the Auditors' report; (5) Reading reports of Standing Committees; (6) President's Address; (8) Miscellaneous business."

Clause 14. To be amended to read: "These by-laws may be amended at any general meeting as provided for by section 32, sub-section 1, of the Agriculture and Arts Act."

Clause 15. To be struck out and the following new clause added: "The election of officers shall take place at the morning session of the last day of the annual meeting in

each year, the newly elected officers to assume their respective duties and responsibilities at the close of the said meeting."

The sub-clause to clause 15 to be amended by striking out all the words preceding the words : " The reasonable and necessary expenses of directors and officers in attending meetings of the Board of Directors and of Committees, shall be provided from the funds of the Association."

Clause 16. To be amended to read : " It shall be the duty of the directors of the Fruit Growers' Association of Ontario to encourage the formation of horticultural societies in affiliation with this Association."

Clause 17. To be struck out.

Clause 18. To be amended by changing the last word " ten " to " twenty-five."

Clause 19. To be amended by striking out the words "at their own request."

Clause 20. To be amended by striking out the words " local fruit growers " in the first line, and the word " to " in the second line.

Clause 21. To be struck out.

Clause 22. To stand unchanged ; also sub-clause to clause 22, except changing the word " of " used the third time in the first line of the latter to the word " for."

And your committee would recommend that the clauses of the amended and revised constitution and by-laws be numbered consecutively from the beginning, removing all " constitution " and " by-law " distinctions.

M. Pettit, Chairman.

The President cited article six of the constitution to show that any changes would have to be deferred till next year, and considerable discussion took place on this point.

Moved by Jos. S. Scarff, seconded by Mr. Beall, and resolved, that the report of the special committee on constitution and by-laws be received and considered as a notice of motion, to be acted upon at our next regular meeting to be held in St. Catharines, and that copies of proposed changes be printed for distribution amongst the members of the Association.

CONSTITUTION AND BY-LAWS OF THE ASSOCIATION.

Constitution.

Art. I. This Association shall be called "The Fruit Growers' Association of Ontario."

Art. II. Its object shall be the advancement of the science and art of fruit culture by holding meetings for the exhibition of fruit and for the discussion of all questions relative to fruit culture, by collecting, arranging, and disseminating useful information, and by such other means as may from time to time seem advisable.

Art. III. The annual meeting of the Association shall be held at such time and place as shall be designated by the Association.

Art, IV. The officers of the Association shall be composed of a President, Vice-President, a Secretary, or Secretary-Treasurer, and thirteen Directors.

Art. V. Any person may become a member by an annual payment of one dollar, and a payment of ten dollars shall constitute a member for life.

Art. VI. This Constitution may be amended by a vote of the majority of the members present at any regular meeting, notice of the proposed amendments having been given at the previous meeting.

Art. VII. The said Officers and Directors shall prepare and present at the annual meeting of the Association, a report of their proceedings during the year, in which shall be stated the names of all the members of the Association, the places of meeting during the year, and such information as the Association shall have been able to obtain on the subject of fruit culture in the Province during the year. There shall also be presented at the said annual meeting a detailed statement of the receipts and disbursements of the Association during the year, which report and statement shall be entered in the journal and signed by the President as being a cor-

rect copy ; and a true copy thereof, certified by the Secretary for the time being, shall be sent to the Minister of Agriculture within forty days after the holding of such annual meeting.

Art. VIII. The Association shall have power to make, alter and amend By-Laws for prescribing the mode of admission of new members, the election of officers, and otherwise regulating the administration of its affairs and property.

BY-LAWS.

1. The President, Vice-President and Secretary-Treasurer shall be *ex-officio* members of all committees.

2. The Directors may offer premiums to any person originating or introducing any new fruit adapted to the climate of the Province which shall possess such distinctive excellence as shall, in their opinion, render the same of special value ; also for essays upon such subjects connected with fruit growing as they may designate, under such rules and regulations as they may prescribe.

3. The Secretary shall prepare an annual report containing the minutes of the proceedings of meetings during the year ; a detailed statement of receipts and expenditure, the reports upon fruits reeeived from different localities, and all essays to which prizes have been awarded, and such other information in regard to fruit culture as may have been received during the year, and submit the same to the Directors or any Committee of Directors appointed for this purpose, and, with their sanction, after presenting the same at the annual meeting, cause the same to be printed by and through the Publication Committee, and send a copy thereof to each member of the Association and to the Minister of Agriculture.

4. Seven Directors shall constitute a quorum, and if at any meeting of Directors there shall not be a quorum, the members present may adjourn the meeting from time to time until a quorum shall be obtained.

5. The annual subscription shall be due in advance at the annual meeting.

6. The President (or in case of his disability, the Vice-President), may convene special meetings at such times and places as he may deem advisable ; and he shall convene such special meetings as shall be requested in writing by five members.

7. The President may deliver an address on some subject relating to the objects of the Association.

8. The Treasurer shall receive all moneys belonging to the Association, keep a correct account thereof and submit the same to the Directors at any legal meeting of such Directors, five days' notice having been previously given for that purpose.

9. The Directors shall audit and pass all accounts, which, when approved of by the President's signature, shall be submitted to and paid by the Treasurer.

10. It shall be the duty of the Secretary to keep a correct record of the proceedings of the Association, conduct the correspondence, give not less than ten days' notice of all meetings to the members, and specify the business of special meetings.

11. The Directors, touching the conduct of the Association, shall at all times have absolute power and control of the funds and property of the Association, subject however to the meaning and construction of the Constitution.

12. At special meetings no business shall be transacted except that stated in the Secretary's circular.

13. The order of the business shall be : (1) Reading of the minutes ; (2) Reading of the Directors' Report ; (3) Reading of the Treasurer's Report ; (4) Reading of the prize essays ; (5) President's address ; (6) Election of officers, and (7) Miscellaneous business.

14. These By-laws may be amended at any general meeting by a vote of two-thirds of the members present.

15. Each member of the Fruit Committee shall be charged with the duty of accumulating information touching the state of the fruit crop, the introduction of new varieties, the market value of fruits in his particular section of the country, together with such other general and useful information touching fruit interests as may be desirable, and report in writing to the Secretary of the Association on or before the fifteenth day of September in each year.

The President, Vice-President and Secretary shall be *ex-officio* members of the Board of Directors and of all Committees. The reasonable and necessary expenses of Directors and officers in attending meetings of the Board of Directors and of Committees shall be provided from the funds of the Association.

Local Fruit Growers' Association.

16. It shall be the duty of the officers and directors of the Fruit Growers' Association of Ontario to encourage the formation of local fruit growers' horticultural societies in affiliation with the Ontario Association.

17. Any one may become a member of such local society for one year upon payment into its treasury of a minimum sum of one dollar ; and a compliance with clause 18 of these by-laws shall constitute him also a member of the Ontario Association for the same term.

18. On the receipt of the names of such members, with the required fees, the secretary of such local affiliated society may transmit their names and post office addresses, together with the sum of eighty cents for each to the Secretary of the Fruit Growers' Association of Ontario, who will enter their names as members of that society, entitled to all its privileges, providing the initial number of such names be not less than ten.

19. Each local society so affiliating, with a membership of not less than twenty-five shall be entitled to a visit from some member of the board of directors or other prominent horticulturist once a year, at their own request ; it being understood that the railway expenses of such speaker shall be paid by the Ontario Society, and the entertainment provided by the local society.

20. The proceedings of such local fruit growers' horticultural societies shall, on or before the 1st day of December of each year, be forwarded to the secretary of the Ontario Society, who may cull out such portions for the Annual Report to the Minister of Agriculture for the Province, as may seem to him of general interest and value.

21. These local societies, if formed in cities, towns or incorporated villages, may be formed under the Agriculture and Arts Act (see sections 37, 46 and 47), and receive their due share of the Electoral District grants for the support of such societies.

22. Each local affiliated society is further expected to send at least one delegate to the annual meeting of the Fruit Growers' Association.

The Directors of the Fruit Growers' Association of Ontario of the Agricultural District in which such society is formed, shall be *ex-officio* a member of the executive committee of such local society and receive notices of all its meetings.

AGRICULTURAL DIVISIONS.

1. Stormont, Dundas, Glengarry, Prescott, and Cornwall.

2. Lanark North, Lanark South, Renfrew North, Renfrew South, Carleton, Russell, and the city of Ottawa.

3. Frontenac, city of Kingston, Leeds and Grenville North, Leeds South, Grenville South, and Brockville.

4. Hastings East, Hastings North, Hastings West, Addington, Lennox, and Prince Edward.

5. Durham East, Durham West, Northumberland East, Northumberland West, Peterborough East, Peterborough West, Victoria North (including Haliburton), and Victoria South.

6. York East, York North, York West, Ontario North, Ontario South, Peel, Cardwell, and city of Toronto.

7. Wellington Centre, Wellington South, Wellington West, Waterloo North, Waterloo South, Wentworth North, Wentworth South, Dufferin, Halton, and city of Hamilton.

8. Lincoln, Niagara, Welland, Haldimand, and Monck.

9. Elgin East, Elgin West, Brant North, Brant South, Oxford North, Oxford South, Norfolk North, and Norfolk South.

10. Huron East, Huron South, Huron West, Bruce North, Bruce South, Grey East, Grey North, and Grey South.

11. Perth North, Perth South, Middlesex East, Middlesex North, Middlesex West, and city of London.

12. Essex North, Essex South, Kent East, Kent West, Lambton East, and Lambton West.

13. Algoma East, Algoma West, Simcoe East, Simcoe South, Simcoe West, Muskoka, Parry Sound East, Parry Sound West, Nipissing East, Nipissing West, and Manitoulin.

SAN JOSE SCALE.

The SECRETARY read the following report :

Early in the month of June it was reported that this terrible insect enemy had been found in an orchard near Niagara. Your executive, desiring that our Association should be foremost in every good work in the interest of fruit growers, resolved upon decided steps for the purpose of stamping out this evil, and of preventing its further introduction. An article was written by the Secretary for the *Canadian Horticulturist*, describing the insect and warning growers against it.

The Secretary also wrote letters at once to the Minister of Agriculture, both of the Province and the Dominion, asking for united effort in the matter, and that Prof. Panton of the O. A. C., Guelph, and Prof. Fletcher of Ottawa be at once despatched to investigate the extent of the evil. In response to our request, both these gentlemen were sent on Thursday, 10th of June, and in addition Mr. W. M. Orr, Provincial Superintendent of Experimental Spraying, and Mr. John Craig, Horticulturist of the Central Experimental Farm.

About thirty growers representing our Association, especially those living in the Niagara district, met at St. Catharines, and proceeded with the party to Mr. Thonger's farm, ten miles west of Niagara. Here the scientists, sent by the government, examined the trees said to be affected, and identified the insect as the dreaded San Jose Scale. They found a large number of trees affected. The party then gathered together and appointed Mr. W. M. Orr, Chairman, and L. Woolverton, Secretary. After several addresses the following resolution was carried unanimously.

Moved by L Woolverton, Secretary of the Ontario Fruit Growers' Association, seconded by W. H. Bunting of St. Catharines, and unanimously resolved :—1. That this meeting, representing the Ontario Fruit Growers' Association and the fruit growers of the Niagara district, desire to thank the Hon. Sidney Fisher, Minister of Agriculture for the Dominion, and the Hon. John Dryden, Minister of Agriculture for Ontario, for the kind consideration shown by them in our welfare in sending us professors J. Fletcher and J. Craig from the Central Experimental Farm, Ottawa, and Professor J. Hoyes Panton of the Agricultural College, Guelph, and Mr. W. M. Orr, Superintendent of Spraying for Ontario, to meet us for the purpose of obtaining our views regarding the best means to be employed for the prevention of an invasion by the San Jose Scale.

2. That this meeting earnestly request the Ministers of Agriculture, both for the Dominion and the Province of Ontario, to send out competent inspectors to inspect the orchards and nurseries in southern Ontario at the earliest possible date, and that, in case the area affected should be found to be small in extent, that the trees and plants affected be utterly destroyed and the owners compensated for the same, and if the pest is found to be widely scattered, we request that very effective measures be adopted for the destruction of the insect.

3. That we ask the Dominion Government to pass vigorous legislation prohibiting the importation of nursery stock from the United States, except under the most rigorous inspection, and that the ports of entry through which such stock may be admitted, be confined to one or two points only.

4. That the importation of fruit from States where the orchards are known to be infested with the San José Scale be also entirely prohibited.

Another meeting of the growers, about Winona, Hamilton and Burlington, was held at the Royal Hotel, Hamilton, on Saturday the 19th of June, at which the same officers presided, and the same gentlemen were present to represent the Dominion and the Province, except Dr. Fletcher. Prof. Panton of the O.A.C. Guelph, Prof. J. Craig of the Central Experimental Farm, Ottawa, and others addressed the meeting. A committee, consisting of A. H. Pettit, E. D. Smith, A. W. Peart, Geo. E. Fisher and W. M. Black, was appointed to bring in a resolution. The following is a copy of the resolution which was unanimously carried :

Resolved,—

1. That the importation from the United States, or any other country where the San José scale is known to exist, of nursery stock and such fruits as are affected by the scale, be entirely prohibited ;

2. That a thorough inspection of all nurseries and of orchards in those districts in which the scale has been found to exist be at once entered upon, and than the trees so affected shall be uprooted and burned; and that the growers who may have trees affected by the scale and thereby be subjected to serious monetary loss, be in a measure compensated for their destruction;

3. And we beg most respectfully to request the Honorable Minister of Agriculture to at once take such action as will effectually destroy this enemy to the horticultural interests of our country, and prevent the importation of trees and fruits in which may be concealed the germs for future development.

The secretary was instructed to forward copies of this resolution to the Members of Parliament representing fruit sections, asking them to urge upon the Government the most vigorous action possible.

Mr C. C. James, Deputy Minister of Agriculture, then laid before the meeting the San Jose Scale bill as it had been presented to the Legislature by the Hon. John Dryden, Minister of Agriculture. He explained the bill clause by clause, pointing out the force of each, and alluding to difficulties that had been met with in drafting it. Reference was made to the fact that the prohibition of importation of stock could be considered only by the Dominion Parliament. He further explained that the question of compensation was one likely to be discussed and opposed by some members of the Legislature. He pointed out the fact that the bill was very stringent, but Mr. Dryden considered the great damages threatened to the fruit interests demanded heroic or radical treatment. The meeting then decided to hear the papers by Mr. Orr and Dr. Fletcher before entering upon the discussion of the bill or taking action.

THE SAN JOSÉ SCALE.

By. Mr. W. M. Orr, Fruitland, Ont.

It is uncertain where the San José Scale originated. It is known to exist in Australia, Chili, the United States and Canada. The first reliable information that we have of it is that it was found in the San José Valley, California, in 1870. It was at once recognized as a serious menace to the fruit-growing interest of the State. The spread of the scale from the point of original infestation was rapid, its area increasing in every direction. In 1873 it had become a serious pest. In 1880 Professor Comstock said it was the most pernicious scale insect known, and that he had never seen any other species so abundant and so injurious. In view of its serious nature he named it *aspiditiotus perniciosus*. It was not discovered east of the Rocky Mountain until 1893. Now it has been found in nearly every State, and quite extensively distributed in some of them.

Trees from New Jersey nurseries have been the principal source of infestation in the Eastern States and Canada. The source of their infestation was Japan plum-stock imported direct from the San José Valley, California, in 1886 or 1887.

Professor Smith reports that he has located the scale in nearly every county in New Jersey, the number of localities actually ascertained being upwards of 100.

Mr. H. G. Hubbard, one of the assistants of the Department of Agriculture at Washington, was sent to Florida in the spring of 1894 to visit the infested district. He reported that many thousands of trees were infested, including nearly every orchard within a radius of five or six miles.

Professor P. H. Rolfs reports that the orchard where the scale was first found is now practically killed, less than five per cent. of the trees remaining. Several other sections were found to be infested, and out of 1,200 acres of orchard about De Funiak springs, 160 to 200 acres are affected.

Professor J. M. Aldrich, of Idaho, says that it is the most dreaded of all insect pests and earnest effort is made to prevent its getting a foothold in new localities.

In Massachusetts frequent occurrences have been found, among them being four points near Boston. This is of special interest in view of its being the most northerly occurrence of the scale. In Talbot county, Maryland, J. H. Reip's orchard of fourteen

acres, consisting of apple, cherry, plum and peach, from one to eight years old are all infested. At Riverside, E. Dow's orchard of twenty acres is practically all infested and many trees have died.

In Briggs and Showman's orchard of 20,000 trees the scale was discovered; after a critical examination only thirty trees were found infested. On a further examination within three months about 1,000 trees were found infested.

Professor Smith of New Jersey urges upon the owners the supreme necessity of stamping it out if they wish to preserve their orchards.

In some cases the infested trees have been uprooted and burned. In other cases thorough spraying has been given. The results so far obtained from spraying, however, are far from satisfactory. In a letter dated January 13th, 1896, Professor Smith reports that in South Jersey orchards matters are much worse than they were a year ago.

The Georgia Experimental Station Bulletin, 1897, says, two years ago few orchardists in Georgia had heard of the San José Scale. To-day, however, our fruit growers are aghast at the prospect; for the rapid increase of the scale and its power to devastate are better understood.

It is at last realized that not only are our orchards in danger but the existence of all deciduous vegetation is threatened should the pest once become distributed generally throughout our forests; for in that case all hope of it is final extinction would be lost and it would remain a standing menace forever. The people are clamoring for detailed information, for remedies and immediate and stringent legislation. Far the best prescription is the axe and the matchbox. Where the trees are badly infested their loss is inevitable, even should remedial treatment succeed in riding them of the pest, for their vitality will be found to have been sapped to such an extent that they will never prove profitable. Time, money and future trouble will be saved by adopting heroic treatment. Moreover it is almost an impossibility to absolutely extinguish the scale when once fully entrenched without the destruction of the wood on which it nourishes. Our first advice therefore is under any and all circumstances to grub up and burn infested trees. It will pay in the end.

The latest bulletin published by the Ohio Agricultural Experimental Station dated July, 1897, says: The presence of this insect on any ones premises is a calamity and uncontrolled becomes a public danger that should not be tolerated. Against this most insiduous pest both nurserymen and fruit growers are alike practically helpless in detecting its presence until it has ceased to be the insignificant atom that it at first appears, and has become master.

Heretofore orchards and nurseries were considered as the only places in special danger, but recent discoveries of the pest on forest and ornamental trees shows that this was a mistake. It has been found on the black walnut, mountain ash, basswood, maple, willow, poplar, elm and chesnut.

It is usually the case that as we become more familiar with a species, some vulnerable point is found, or a stage during which it can be managed with greater ease than at other times. It must be confessed that in the case of the San Jose Scale, the better we come to be acquainted with it the more we see to fear of its ravages, and of the great labor involved in its eradication. No one who has not seen the work of this pest where it has had full sway can understand its fearfully destructive nature. If then, the variety affected is not satisfactory or if the trees have passed their best, or the inner bark has been discolored, it would be far better to end the matter at once and save expense and trouble by burning the trees. The only scale to be trusted is the dead scale. As far as any practical service is concerned from natural enemies, this subject might be dismissed with these words "there are none." After making experiments there is nothing to indicate that either the fungous or the insect enemies have had any influence even in holding the pest in check. We have little if anything to expect for the present at least, from the aid of natural enemies.

The Scale in Canada.

When the Hon. John Dryden, Minister of Agriculture, learned of the occurrence of the San José Scale at Mr. C. Thonger's orchard, at Niagara, he directed Professor Panton of the Agricultural College, Guelph, and myself to visit the orchard and learn the extent of the infestation, and if possible ascertain from what source it came.

It soon became apparent that the pest had been introduced on nursery stock, and as we know that two nurseries in New Jersey had been infested, I wrote to all the nurserymen in Ontario and to all dealers that imported trees asking for a list of all the stock that they had imported from these nurserymen in the past five years, and the names of the parties to whom it was sent. In this way I located about one thousand trees that had been sent to eighty-five points in Ontario, all the way from Chatham to Ottawa. I have visited about sixty of these points and located the scale at four of them. In some cases the trees were all dead, in other cases they were clean and doing well.

1. The first known or reported occurrence of the San José Scale in Ontario was on trees in the orchard of Mr. John Van Horn, in the County of Kent, near Chatham, in February, 1897, on trees purchased from the Parry Nurseries in New Jersey in 1895. Mr. Van Horn noticed that some of the trees were dying, and that a peculiar encrustation was forming on them. He sent specimens of the wood to Professor Fletcher, of the Experimental Farm, Ottawa, and was at once informed that his trees were infested with the San José scale. Vigorous measures to exterminate them were at once begun. They were treated with whale oil soap, two pounds to the gallon, two applications, followed by two applications of sulphur, salt and lime solution. Mr. Van Horn was not satisfied with the results, and to make sure of their destruction uprooted and burned the infested trees. Mr. Van Horn wrote in November saying: "The scale is completely exterminated in my orchard. I have watched closely all summer and cannot find any trace of it." But on examining the trees with him after this writing, we located the scale on several trees within a short time, the probability is that a considerable portion of his orchard is infested.

2. Part of the same lot of trees which were bought by Mr. Van Horn from the Parry Nurseries, New Jersey, were sold to another man and planted on a farm some miles from Mr. Van Horn's. These were found infested and were uprooted and burned last spring. I have not been able to visit this farm and do not know whether any infestation remains.

3. The third occurrence was in the orchard of Mr. C. Thonger, in the County of Lincoln, near Niagara-on-the-Lake. He thinks that the scale came on nursery stock purchased from S. Oumpson, of Niagara, a local dealer, who said that he purchased the stock from F. E. Young, of Rochester, N. Y., in 1894. In the spring of 1897, Mr. Thonger noticed that his trees were not doing well, and presented an ashy greyish appearance. He sent some of the affected wood to Professor Howard, Chief of the Department of Agriculture, Washington, who pronounced it San José Scale and advised that prompt and thorough means be taken to stamp out the pest. Mr. Thonger began at once earnestly working to accomplish this. He has sprayed his trees every week during the summer with whale oil soap solution, and used a wire brush successfully on the trunks and larger limbs, but he says that it is easier to destroy the ninety-and-nine on the trunk and larger branches than the one on the small twig. Mr. Thonger is not at all satisfied with the results of his efforts to destroy the scale. In his pear orchard of 150 trees, where the infestation was first discovered, the vitality of the trees was seriously impaired, and after treating them all summer, as some of them were showing signs of blight, he uprooted and burned them all. He says that the infestation in his peach orchard of sixteen hundred trees covers eight times the area it did last spring. He says that he is convinced that we cannot live in this country as fruit growers along with the scale. He thought at one time that we could control it, but the apathy shown by fruit growers, and the labor and expense of treating it, has changed his mind, and he believes that it cannot be treated successfully.

Mr. Thonger courteously received interested visitors, and gladly gave them all information in his possession. Many fruit growers received their first practical knowledge of the San José Scale and how to find it from him.

4. Was on trees purchased from Lovett's Nurseries, New Jersey, in 1894, and planted on a farm between Grimsby and Hamilton. Eight trees were found infested and were at once dug up and burned.

5. Was on trees traced from the Lovett Nurseries in New Jersey, purchased in 1894, and planted on a farm between Hamilton and Oakville. Two trees were badly infested and were immediately destroyed by fire.

6. Occurrence No. 6 was on the home farm of Mr. John D. Wigle, near Kingsville, in the County of Essex. The infestation was brought to this orchard on Abundance Plum trees purchased from a dealer in 1894. They were planted alongside of a pear orchard of about sixteen hundred trees, nine years old.

In company with Messrs. G. Mills and M. Bromer, County and Township Fruit Tree Inspectors, we examined this orchard and found all the plum trees and about one hundred and fifty pear trees badly infested. There is little doubt but that the whole orchard is affected beyond cure.

7. Is on Farm No. 2, belonging to Mr. J. D. Wigle, about half a mile distant from first orchard. This orchard consists of about five hundred plum trees which were bought from another dealer and planted in 1884. We found about one hundred trees infested. We examined a peach orchard adjoining and found it infested.

8. Was in a peach orchard near Kingsville. Our time was limited; we only examined a few trees but found the scale. We did not see the owner, and have no information as to where the stock came from.

9. Was in a pear orchard half a mile from either of the other orchards examined. We did not see the owner and have no further information about this orchard.

10. Was on farm No. 3, belonging to Mr. J. D. Wigle, about one mile and a half from occurrence, No. 9. We found the scale quite prevelent in this orchard. Some of the trees planted here were bought from the same dealer as those on farm No. 2, and were planted the same year. It is probable that every orchard in this immediate vicinity is affected. Mr. Wigle noticed that many of his trees were not doing well but could not discover what the trouble was until he found the fruit covered with the scale.

11. Was an orchard near Niagara-on-the-Lake. The owner was not at home, and I could not get any information as to the source of infestation.

12. Was on orchard of about three hundred peach trees, located alongside occurrence No. 11, many of them badly infested. I could not get any information about this orchard as the owner was absent from the country.

We view with great anxiety the introduction of this most dreaded of all fruit pests into our country. We are surprised and alarmed at the extent to which it has already spread, and the serious damage done. Although it was thought two years ago that this scale could not exist in our country, and that we had nothing to fear from it, it now appears that the climatic conditions are favorable. That we are in its life zone is proved by the rapidity with which it has multiplied in infested sections. Not only are our orchards and our vineyards in danger of destruction but our forests also, except only conifers, pines and cedars. If unchecked there is no question but that it would soon overrun the country destroying all deciduous trees and plants and causing a loss of millions of dollars.

We do not know what extent of country is liable to be infested with the scale. It has already overrun the bounds assigned it by some leading entomologists in the United States. We have found it flourishing where it had withstood a temperature of twenty degrees below zero. And Professor L. R. Taft, Horticulturist of the Agricultural College, Michigan, informed me that it had successfully withstood a temperature of from twenty to twenty-five degrees below zero in Michigan.

As to the natural enemies of the scale, as already noted, Professor Webster says there are none of any practical service. The only treatment that has been effectual in very case is burning. Whale oil soap solution has failed in some cases. Hydrocyanic acid gas has not been altogether satisfactory. Some have reported satisfactory results

from the use of pure kerosene. Others have used it with partial success, but killed numbers of their trees. Our experience is limited and reports of results of the different treatments in other localities are conflicting. There appears to be different results in different localities from similar treatment.

Professor L. O. Howard, of the United States Department of Agriculture, Washington, says that the scale still exists in nurseries and orchards in nearly all the States where it has been located, and there is little or no doubt that its dissemination is constantly going on, and it is doubtful if it can ever be stamped out where it has been thoroughly established. It is therefore impossible to say that the scale is completely exterminated from any orchard or nursery until a number of years have elapsed.

We know that many American nurseries are infested and for our own protection we should have legislation authorizing the thorough inspection, and if necessary the treating and quarantining of all nursery stock and fruit coming into the country, whether accompanied by a certificate of inspection or not. We have been receiving from the United States fruit infested with the scale for the past ten years, and nursery stock for four or five years.

We found California pears this season in Toronto and London infested with the scale, which might easily have been communicated to some tree or plant. They have laws requiring strict inspection of our nursery stock and fruit entering their State. They have guarded their interests, while we have neglected ours.

If we are going to exterminate the scale from the Province, and it should be done at any cost, it will take a considerable sum. A number of inspectors will have to be put at work at the earliest possible date. In each township in the fruit district there should be a man at work by January. He should have authority to destroy infested trees at once. If this is not practicable the trees should be marked and arrangements made for their destruction not later than the 20th of April, for as soon as warm weather comes the young insects will be running, and the infestation is sure to spread, not only in the home orchard, but it may be carried by insects and birds to orchards a mile or more distant.

As it is for the public good that this pest should be stamped out, some compensation should be made to the owners of trees destroyed.

The State of Massachusetts has spent seven hundred thousand dollars in the past five years in endeavouring to exterminate the gipsy moth. The area infested is now much less than it was, but the commission appointed to deal with it ask for two hundred thousand dollars for next year, and estimate that it will cost over a million dollars more to rid the State of the pest. From eighty to three hundred men are engaged in this work throughout the year.

We found a few specimens of plum lycanum in almost every orchard that we examined south and west of Toronto. It is easily distinguished from the San José Scale. It is unarmoured and may be compared in appearance to half a brown pea attached to the underside of the limbs. It does not seem to flourish in this country. Although we had St. Lawrence plum trees badly infested with them ten years ago they have been controlled by spraying with kerosene emulsion in April.

Every fruit grower should have a pocket lense, which can be procured at from fifty to seventy-five cents. Trees should be examined, especially those planted within the last five years, giving special attention to those that are not doing well The San José Scale can be identified by its being armoured round, and having the surface of the tender bark or fruit discolored reddish or purple.

To the surprise of every one, this minute, wingless, silent enemy of fruit growers has spread from the Rocky Mountains to the Atlantic Ocean inside of five years, and now covers the continent from ocean to ocean. Frost and drought, fire and flood are not to be compared to it. They come and go, but it has come to stay, unless drastic measures are taken to exterminate it.

INSECTS AND SPRAYING.

Dr. James Fletcher, Dominion Entomologist, then addressed the Association as follows:

"Mr. Orr's very able and admirable report of this infestation in Ontario is very complete All I can do is to draw your attention to some of the dangers in regard to this infestation, and to warn you against taking as gospel some of the late writings of certain specialists in the United States who have studied this insect. The most dangerous reports which have appeared are by two leading men there who have lately stated that this is not such a serious insect as it was supposed to be. Now, don't for your own sakes believe that. The San Jose scale is without comparison the most serious pest which has ever occurred in Canadian orchards. If you want to confirm this for yourselves, you have only to visit some of those orchards which Mr. Orr has mentioned. In the orchard of Mr. Thonger there were a great many trees so thoroughly covered with the scale last spring that, notwithstanding any treatment he might have applied or any method he might have used to eradicate the pest, those trees would have died. At the same time, notwithstanding his careful and constant attention, the scale has spread, as he has told us, through a large part of his orchard during this summer. Another dangerous statement—not for entomologists, but for farmers—is this: That this scale does not spread very rapidly. Now, the experience of Mr. Thonger tells us that practically it does spread very rapidly. An infested tree becomes seriously infested during the summer in which it is first infested, but does not spread very rapidly compared with some other insects. We find, however, that one infested tree becomes a very serious source of infestation to other trees; it becomes almost useless itself in the second season. It has been calculated that this insect will kill a vigorous tree in three or four years. It is not as much at home here as in California and, therefore, the fatality to the trees has not been so rapid. With regard to treating trees, there are three methods advised: (1) Total eradication—dig up the tree and burn it; (2) Treatment with soap mixtures; and (3) Treatment with gas. But it must be borne in mind and should have very great emphasis laid upon it, that a tree once seriously infested can never be sound again—never be a profitable tree for you to save and keep in your orchards; Mr. Thonger's method of cleaning his trees with a broom or brush, which has been referred to, is a very dangerous thing to make public. It looks to be so effective that many people who will not take the great care Mr. Thonger does and follow up with a thorough spraying, might adopt it, but it is utterly impossible to brush a tree on all its little twigs where these scales spread to; and if you shelter yourself behind the assumption that you have cleaned the tree, when you have only half done it, you have left your work in just as bad a condition as it can be for the scale to go on and destroy other trees; for, if you left it alone, the tree would have been killed by the scale and would have been taken out as a consequence, but if you save it, it will go on spreading the infestation, and that is why I think this is a dangerous method. Although it appears to be effective, it is most ineffective, because it will leave enough scales alive to do a great deal of harm. With regard to the life history, it is not worth while telling you the details. It behooves everyone of you to say to everyone you come in contact with that this is a serious pest and that we have to fight against it and to do it now. Now, whatever condition our bill may be left in when it comes through the Legislature, the very fact that your Minister has prepared that bill should make every fruit grower in this country recognize that he is doing all he can to help you in this matter. When the first scare arose in 1894, as a warning to fruit growers I used up several pages of my report in telling fruit growers to wake up, that the scale would most probably come here, and, if so, it would do them a great deal of harm. Now, it is an important matter to find out whether a scale found in an orchard is really the San Jose scale or not, because there are some other scales that are so nearly like it that it takes a specialist to distinguish them under a compound microscope. I do not mean the ordinary lens or magnifying glass; a microscope is a much stronger instrument with which small bodies are examined, and a special instrument is necessary to tell whether this is the San Jose scale or not. Now don't suppose that because you find a scale in great abundance on

your trees that, therefore, necessarily you have this insect. In the orchard of Mr. Hendershott, near St. Davids, there was a scale that was said at once by some persons to be the San Jose scale because it covered the whole tree. It is necessary to understand the life histories of insects One of the peculiarities of scale insects is that you may find a single tree very seriously infested even unto death, and yet the species does not spread to other trees around it. That was the case in Mr. Hendershott's orchard The trees were killed because they were standing beside the fence where they got no cultivation, no encouragement to make a healthy growth. The consequence was that being in a feeble condition the scale attacked them so seriously that they died. If that man's orchard had been condemned and he had been obliged to destroy a great many trees, there would have been useless loss. It was not the San Jose scale, but it was one that could be scarcely told from it except by microscopical examination. Such examination was made, and in confirmation, instead of that orchard being infested at this end of the season, it is perfectly clean, and some of the few scales which were on the other trees have been destroyed by their natural parasites. I only want to emphasize that it is important to identify the scale exactly. Now, you have not time and it is not advisable for you fruit growers to get microscopes and examine these matters for yourself. Why should you? You have your government officials that are being paid for doing these things. You have simply to send specimens to Guelph or Ottawa and get a report on them that will relieve your anxiety, or tell you whether or not you must take special measures to eradicate the insect. It is most important to know what the insect is. Here is a piece of one of the peach trees taken from Mr. Van Horn's orchard. He thought he had his orchard entirely clean of this insect, and he sent me some twigs from the trees on which there were a few of the Forbes scale, but on the same twigs there were just two of the true San Jose scale, so he found that he had not quite cleaned out his orchard, and all his trouble will have to be taken again ere this orchard is clear. Mr. Orr found other trees. Mr. Van Horn is a man who has shown that he has great energy and is very public spirited. The moment he found there was the slightest chance of this being the San Jose scale he sent off specimens to be examined. Directly he was told that they were, he asked for the proper remedy and at once applied it, and as a consequence the scale has been almost entirely eradicated. An orchard near his, his son-in-law's, which was infested from a single tree sent by him from the same consignment, has not yet been examined, but probably will be found in the same state as Mr. Van Horn's. Another danger. Sometimes, as Mr. Orr has told you, this insect attacks a great many different kinds of trees and shrubs. It also attacks a great many kinds of timber trees. The subject for discussion is the San Jose scale and how we can know it. It is an exceedingly difficult matter for you as fruit growers, and I would not advise you to worry yourselves or to waste your time looking through the microscope to find out whether it is the scale or not. Put it in an envelope and send it to one of the sources of reference you have, and you will get information you can rely on; but there are one or two rule-of-thumb methods by which you can at any rate come to some sort of understanding yourselves as to whether it is the San Jose scale or not. One of the characteristic effects of the San Jose scale on the young green wood is a very decided reddening or purpling of the tissues beneath the bark—you will find traces of it, particularly in the pear. (The speaker here broke the twig he was holding and passed it around to illustrate this point.) Then you may lose some time in deciding whether the large scales on the young wood are the San Jose scale, the same as the small ones. I have told you that you may find two or three different kinds of scales on the same wood, but these female San Jose scales that get onto the young wood appear very much larger than those that are lower down on the twigs. The other danger that I refer to is this, that as this insect attacks a great many different kinds of trees, it means that every cemetery, every ornamental ground, every garden in the country, as well as the orchards of the fruit growers, are liable to be destroyed by this insect if it increases and nature does not provide some remedy against it. Now, in cleaning out an orchard it is not at all an unusual practice either in the United States or here in Canada to overlook smaller shrubs that are growing beneath infested trees. I have here a piece of currant bush grown in one of the infested Canadian orchards, and the bushes were almost as badly infested as the trees were. Now, suppose these trees had all been eradicated and the bushes left, the trees subsequently planted

would be infested from the bushes, if you will examine that twig you will see what an exceedingly easy matter it would be to overlook the scale. You will also see on the twig many other objects that are frequently mistaken for the San Jose scale. Not only are there scales that resemble the San Jose scale so closely that it can be decided what they are only by microscopic examination of what may be called the "animal" beneath the scale, but there are many things that look like scales and which are not. There are some corky objects or organs upon the bark of many trees or shrubs that are known by the name of lenticels. I will give you a rough and ready way of telling whether suspicious objects found are lenticels or scales, namely, push them gently with your nail; if they are scales they will be moved off very easily; if, on the other hand, they are lenticels, you will have to tear the tissue of the bark to remove them. I have had, during the last year, a great many different objects sent in to me to know if they were the San Jose scale, and, although I knew that many fruit growers and people who don't study entomology very closely had rather vague ideas about what insects were, I was rather surprised to find large caterpillars and spiders and beetles sent in to know if they were the San Jose scale. (Laughter.) But I do not mention this to discourage such sendings. Find out all you can. It shows a demand for knowledge on this subject by the people who are interested, and that is just what we want to stir up. Now some of you gentlemen may have thought yesterday morning that I rather scolded in talking about the neglect of spraying. You may think what you like of me—that I scold you, or anything you like—but do spray your trees if you want to save your money. It is not only saving seventy per cent. of your fruit, it is saving seventy cents out of every dollar, and that is what we want to do. That is why I keep on—line upon line, precept upon precept. That is why Mr. Orr keeps at it with his reports from year to year; that is why the Entomological Society keeps on year after year advising, Spray, spray, spray! But it must be acknowledged that the fruit growers do not seem to see the importance of this information. How much discussion on insects did you have last year? Not a minute. Nobody, apparently, thought that fruit growers were interested in insects at the last annual meeting of this society; there was nothing asked about insects, but yet it was one of the worst seasons for insect injuries that we have had for many years. Now, gentlemen, I tell you *you* are interested in insects. You have about one hundred different insects that attack your various crops every year. Out of that one hundred, about ninety-five have been sufficiently studied for specialists to give you a remedy which will save you a large proportion of your loss; therefore, if you have not got time to make money, you are a peculiar class of people; and knowing about these things generally enables you to find time. Just one word more while I think of it. Mr. Orr spoke of the San Jose scale as an armored scale. Now, you may wonder what an armored scale is, because it is just another of those descriptive words that the entomologist uses for his own edification. An armored scale in contrast with an unarmored scale is an insect which covers itself with a separate scale in the same way as the Oyster-shell Bark-louse. A short time after the young scale hatches it comes to rest and then secretes from its body a waxy protecting scale. This makes it impervious to many treatments. The New York plum scale belongs to another class, the brown hardened scale in this instance being really the skin of the insect, but it is almost as impervious to treatment as the others. As Mr. Orr told you, it succumbs when treated with the kerosene emulsion. The San Jose Scale has the most enormous power of multiplication. One scale may produce a family of over three thousand millions in a year. They spread over the tree upon which they are born and very soon reduce its vigor, so that it is almost impossible to save it. Why it does not spread rapidly to other trees, when it spreads so rapidly upon the tree itself, is because this insect has the power of motion for only one or, at most, two days, when it is very young, immediately after birth. Instead of going through the ordinary process of being produced from the egg, then the larva, and then to a chrysalis form, and then a perfect insect, as most insects do, the egg period is passed inside the mother insect, so the San Jose scale practically bears young alive. One female when matured—it takes about forty days for it to come to maturity—begins to produce young at the rate of from ten to fifteen in the twenty-four hours, and keeps that up for six weeks, so that there is a family of between four hundred and six hundred in the first

brood, and when these young are forty days old, they again may produce from four hundred to six hundred, and the total of that, if you work it out, you will find comes by the end of the season to thirty-two hundred millions. Now, that is an enormous family.

A DELEGATE : Do they produce that many in a year ?

Mr. FLETCHER : Yes ; in one year there are four or five broods, according to climate; in Georgia and the Southern States there are probably six broods ; in Canada there are probably four broods, because the young begin to appear about the middle of June—certainly not sooner than the middle of June—but they breed from the middle of June until the frost comes. On boughs of infested wood sent to my office in the first week in September, when they became warm, the young insects came out of the scales and I examined them. The question may be asked how do these minute creatures, so small that they have been likened to grains of powdered sulphur, get from tree to tree. It has been discovered that they are carried by the wind, by other insects and by birds. There are many instances where the scales have appeared first close to a bird's nest or on the top branches of trees, showing they had been carried there by birds, and we know they are carried by other insects. There is nothing remarkable in this. We know that some insects can only get to their proper places of breeding by the help of other insects. The blister beetles, which are parasites of bees, can only get into the bee hives or the different nests of wild bees by being carried on the bees to those nests. The small eggs are laid in flowers, and when the flowers are visited by the bees, the larvæ, which can live for several days before they get any food at all, by instinct attach themselves to the bees and are carried to the nest. These little insects, the minute a bee comes near them, attach themselves to it and are carried to the nest. Similarly, the young San Jose scale larvæ mount upon birds or other insects which visit the tree where they are born and are by this means transported to other trees or plants. So there is every danger that this pest will spread widely from orchard to orchard every summer. Every infested tree will become a centre of infestation, and now is our only chance to fight it—we must fight it at once and as hard as we can ; and, therefore, I will merely add a word or two more to what Mr. Orr has said as to this great danger. Lately there have appeared in newspapers some statements which are calculated to do much harm, namely : that the San Jose scale is only an ordinary injurious insect similar to many others which we have had to fight against. In answer to this, I assure you this is entirely wrong, for it is by far the worst pest we have ever had to deal with. If you don't believe me, go to one of the infested orchards and see for yourself. But notwithstanding the gravity of the case, it is not hopeless if all concerned will do their best in helping to control it and to prevent further introductions. Nature in time provides a natural check on the increase of insects which occasionally appear in enormous numbers. This has been to a large extent the case in parts of California. I had a letter from one of the fruit inspectors in California who says, " I see you have the San Jose scale in Canada. With us it is not now a pest at all." And yet we know it was so there a few years ago, and it destroyed whole orchards. Then we may look forward hopefully to such a state of affairs here in the East. It is not a matter to be too much discouraged about, because we know we can all do something for it, and in time it will probably disappear ; but unfortunately we do not know how long it will take, and it may ruin us while we are waiting, so we must not trust to that. Mr. Burrell, in his observations at St. Catharines, has found a few specimens of two parasites of the scale and brought them to-day. These are both lady-bird beetles—one very small, which is a valuable parasite, and the other is the Twice-stabbed Lady-bird, which is abundant in some orchards, and probably is the cause of Mr. Hendershott's orchard being cleaned of the Forbes scales since last spring. They were there, but now we can hardly find any specimens.

There is another very important matter that has been touched upon. It is important to us because a great many fruit men will try it and may damage their trees. I refer to spraying with pure kerosene oil. Now, this recommendation of spraying with pure kerosene oil I do not endorse. I have seen good results from it, but I have also seen disastrous results, and though it is strongly recommended by Prof. Smith of New Jersey, one of our leading economic entomologists, and has been confirmed by

work done in the United States division of entomology at Washington, at the same time I say the results are such that it is not wise for us yet to adopt the remedy. There are from time to time new remedies coming to the surface in this work of fighting insects, but we must be cautious in adopting new methods. A few years ago a material was very highly recommended by some entomologist for fighting the canker-worm, and some fruit growers destroyed dozens of trees by using it. Therefore, let us wait before trying these new remedies, and I would recommend you for the present not to use the pure kerosene. If you like to do it, you may get good results, but I will have nothing to do with it till I get better results than I have in the few experiments I have tried. What then can we do? Is there any remedy for the scale? It is not a question of doing something, but what is the best remedy? The best treatment so far as I can find from my experiments is to spray the trees in the autumn with the kerosene emulsion—the mixture of two gallons of coal oil with one gallon of soap suds, churning these together till it is of a creamy nature, which takes five minutes, and then mix that with from four to six times its quantity of water. This should be sprayed over the trees as soon as the leaves fall; and then in the spring before the new growth begins these same trees are to be sprayed with soft soap or fish oil soap made with potash so that it will remain liquid, and of the strength of two pounds in one gallon of water. Now remember the strength. Mr. Thonger's experiments were spoken of and it was stated that he had tried the whale oil soap specially, but he didn't get the best results because he used a mixture which did not contain enough soap. He used one pound in five gallons. You must follow the recipe if you want the results. Mr. Thonger was experimenting when he used a weaker solution more frequently to get the same results. He found that he did not get them, and we are told distinctly in every Bulletin that has been published on this subject that two pounds of soap to one gallon of water are necessary. As a consequence, he has not cleaned out his orchard as it ought to be. It is difficult to spray the tops of trees thoroughly with mixtures, so if you want to do effective work you must prune your trees down to the lowest possible size you can without "breaking the heart of the tree," as fruit growers say. Spray your trees directly the leaves fall with the kerosene emulsion. During the winter prune them down, and then in the spring spray them again with the whale oil or fish oil soap. Whale oil soap is much more expensive in Canada than in the United States, but, if the fruit growers of Ontario require large quantities they certainly can get it in the same advantrgeous manner as the people in the United States. The wholesale price in the United States is four cents a pound for the best potash soap that you would require to use in this work. Here, I am sorry to say, it is sometimes twenty cents, bought in small quantities, and that is why fruit growers have hesitated to go to the expense necessary; and as we have been so much fed with pap in this country by governments—in this matter, as is usually the case—we are waiting till the Government helps us. Now, gentlemen, this is not a matter for the Government to help you in at all. They may do it, but it is of free grace if they do. Every man has got to stand on his own feet and fight his own fight. Fight your own battle now. This is a very bad insect. You have had bad insects before, but you didn't go whining to the Government about them. Be men about this as you are about other parts of your work. Go ahead and find out if this is in your orchard, or not; and let me remind you that such a suicidal policy as trying to hide the fact, if you are so unfortunate as to find the scale on your trees, is not worthy of you as Canadians, for the only way to stamp out this terrible enemy is to report it promptly on discovery. You should get to work at once and find out if you have the San Joseé scale on our trees. Send in your specimens to one who knows, to find out if you have this scale, and if you have, fight it for all you are worth.

At the conclusion of Mr. Fletcher's address the proposed San Jose Scale Bill was fully discussed. As the bill has since become law and the wishes of the Association largely met, it is unnecessary to repeat here the details of the discussion which were mainly in the form of individual opinions of the various clauses of the bill and suggestions which have been incorporated in the bill. The following resolution was passed:

Moved by A. H. PETTIT, seconded by G. E. FISHER, that a commission be appointed, consisting of the President, Mr. E. D. Smith, M. Burrell, Mr. C. C. James, and A. H. Pettit, to take into consideration the matter of the proposed Bill by the Ontario Legislature for the destruction of the San Jose Scale, and to

more carefully consider the provisions therein contained and its connections with such legislation as may be deemed necessary to have passed by the Dominion Government to thereby cover the whole queston of restricting as well as the destruction of the insect already imported, and to also proceed to Ottawa and lay it before the Minister of Agriculture for the Dominion.

All that need be given here in regard to the scale is to print the Act as finally passed and that is now in force in the Province of Ontario. It reads as follows:

AN ACT TO PREVENT THE SPREAD OF THE SAN JOSE SCALE.

HER MAJESTY, by and with the advice and consent of the Legislative Assembly of the Province of Ontario, enacts as follows:

1. This Act may be cited as *The San Jose Scale Act.*

2. In this Act the word "Minister" shall mean the Minister of Agriculture for the Province of Ontario.

The word "Plant" shall mean any tree, vine, shrub or plant, or any part of a tree, vine, shrub or plant, or the fruit of any tree, vine, shrub or plant.

The word "scale" shall mean the San Jose Scale insect in any of its stages of development.

3. No person shall import or bring, or cause to be imported or brought into the Province of Ontario, for any purpose whatsoever, any plant infested with scale.

4. No person shall keep, or have, or offer for exchange or sale, any plant infested with scale.

5. For the purpose of scientific investigation the Minister may from time to time, by writing given under his hand, except such persons as he may deem proper, from the operation of the two preceding sections, and while acting under such permission, such persons shall not be subject to the penalties imposed by this Act.

6. Any person having reason to suspect that any plant in his possession, or in his charge, or keeping, is infested with the scale shall forthwith communicate with the Minister in regard to the same, and shall furnish the Minister with all such information in regard to the source or origin of the said infestation and the extent and nature of the same as he may be able to give.

7. Whenever the scale exists, or is supposed to exist on any plant, the Minister may direct a competent person to make an examination and inspection and may order that any plant so infested, or such part as he may deem advisable, shall be immediately destroyed by burning either by the person appointed to make the inspection, or by the person owning or having possession of the said plant or some other person so directed in writing, and the person so directed shall make a full report to the Minister in writing as to the nature and extent of the work so performed, together with a fair estimate of the value of the plant destroyed.

8. For the purpose of enforcing this Act, it shall be the duty of every inspector appointed under *The Yellows and Black Knot Act* to make careful examination and inpection for the occurrence of the scale within the municipality for which he is appointed, and to report forthwith to the Minister every case of infestation, and neglect to make such report shall render the inspector liable to the penalties imposed under section 11 of this Act.

9. Any person appointed by the Minister under this Act to inspect, or to destroy any plant, for the purpose of enforcing the provisions of the Act, shall, upon producing his authority in writing, have free access to any nursery, orchard, store, storeroom, or other place where it is known, or suspected, that any plant is kept.

10. Upon the recommendation of the Minister there may be paid out of the Consolidated Revenue Fund of the Province to the owner of any plant so destroyed a sum not exceeding one-fourth of the value thereof (not including fruit) as reported upon by

such officer or other competent person, appointed as aforesaid, but nothing in this section shall apply to any plant imported into the Province within a period of one year prior to the examination by the officer aforesaid.

11. Any person neglecting to carry out the provisions of this Act, or any person offering any hindrance to the carrying out of this Act, shall, upon summary conviction, be liable to a fine of not less than $20 nor more than $100 together with costs, and in default of payment thereof shall be subject to imprisonment in the common goal for a period of not less that ten days nor more than thirty days.

12. The Lieutenant-Governor in Council may by order direct that other scale insects than the San Jose Scale may be included in the provisions of this Act, and thereafter during the continuance of such Order-in-Council the word "scale" in this Act shall include all such other scale insects. Public notice of such Order-in-Council shall be given by publication in two successive issues of *The Ontario Gazette.*

FURTHER HINTS ON SPRAYING.

Dr. FLETCHER, being asked to continue his talk on insects, said : At the last meeting of your Association there was very little said about injurious insects, and apparently very few questions were asked about them. Now, it is not that they are not of interest to you ; but you are mistaken in your idea that there are other things of more interest to you. Any one cause which deprives you of a large percentage of your profits every year is of very great importance to fruit growers, the same as anybody else whose business is making money ; and every year you lose much from the attacks of the same kinds of insects, which recur year after year and concerning which already practical remedies are known. A practical remedy is one which is so easy that it can be applied without fear of making mistakes—is yet effective, so as to carry out the work that you propose to do with it—and at the same time does not cost too much, in fact, does not cost more than it is worth ; and if you have a remedy which meets all these requirements you then have a practical remedy. Then, I say, you have practical remedies already known and worked out for most of the insects which attack your crops. I have found that the insect each man considers the worst in the country is the one that he suffers from. There are some of frequent occurrence that it may be well to speak of We have spoken a good deal about spraying in this meeting, and I think you are all pretty well persuaded that spraying is a good practice. Bulletins are appearing from time to time giving the results of this spraying work, and in Mr. Orr's concise report you find evidence that it paid very well indeed those fruit growers in whose orchards he sprayed, to have their trees treated—so much so, that some of them said, if they had sprayed their whole orchard, they would have made a very great saving this year. I know such has been the result of spraying in nearly every instance where it has been practised carefully and with proper materials. Now in spraying it is practically of just as much importance to use a proper instrument as it is to use the proper materials ; therefore you must have a good spray pump ; and I would advise you all in looking for a spray pump, instead of looking for the lowest priced ones first, begin at the top, at the highest priced, and work down till you come to the one that you can afford. There is no such false economy as buying a cheap pump or trying to do this work cheaply, and the saving that you make in a few dollars originally expended in buying a pump is only comparable with that very foolish but very frequently practised economy—or false economy—of buying cheap seeds. I have a great number of seeds submitted to me every year for examination, of the different clovers, and quite recently I had a sample of two large purchases which had been made of alsike seed. Now, the difference between the prices of these seeds was two cents a pound, and when you buy one pound the difference between seven and a half cents and nine and a half cents seems a good deal ; but when you remember that you only want from six to eight pounds for a whole acre, you see what a foolish economy it is, for in saving twelve cents you may lose many times as many dollars in the crop you reap and subsequent labor in eradicating weeds. So with spraying. In buying a cheap spray pump you may not

only provide yourself with what will provoke a great deal of bad temper and perhaps some bad language, but you will not save what you intended—a paying percentage of your crops. Now, there are a great many spray pumps, and there is only one shown here to-day—and I may say it is a good pump. You will do better to pay an extra dollar or two for the bearings, and such parts as are likely to be subjected to the corrosive effects of copper mixtures, to be made of brass, because it is a small initial cost but a very great improvement and a saving in the life-time of the pump sometimes of three or four years. Now, then, having a good pump and nozzle, to get good work we must use the proper materials. Get rid of the idea, which is so prevalent that it has to be mentioned at meetings like this, that Paris green is a panacea for all the ills in the way of insects. It is perhaps needless for me to remind you that the different kinds of insects may be all divided into two classes, in accordance with the way in which they eat their food—and their food is our crops. The first class consists of those which have, as we have, mandibles, with which they bite the substance of their food—the leaves or fruits which they eat. The second class includes those insects, which, instead of jaws, have their mouth parts modified into a small tube with which they suck out the liquid contents of plants—the sap, as we say—and leave the plant depleted of the sap which is necessary, and so the plant dies. But the practical application of this knowledge is, that these two classes of insects must be treated in two different ways. Those which eat their food can be treated by the application of any poisonous material to the surface of the food, while the others must be treated with some material or substance which kills them by simply coming in contact with their bodies. There are suitable remedies for both of these classes. There are also a great many different kinds of injurious insects which have attacked fruit crops during the past season, for which practical remedies are known. I will not take up your time now by speaking of all of these, but will merely speak of some of the worst. All insects have been given names, so that when the names are once known you can recognize the insect again. The most serious pests which attack your fruits every year do not exceed 120 in number, therefore it is only a matter of learning the names of about 120 insects. One of the worst which you have to fight against every year is the Codling Moth. I will speak of that one. Now, the usual practice, and the best remedy for the Codling Moth is to spray your orchards as soon as the apples have formed. The practice of spraying them during the time flowers are out is not only injurious to bees, but it is foolish and wasteful as far as the fruit grower is concerned. It was thought at one time—we are gradually getting more information about all these things—that the eggs of the Codling Moth, were laid inside the flower. We now know from accurate observations that the egg is laid on the side of the apple, and that the young caterpillar, after hatching, eats its way into the apple through the calyx end. Knowing the life history of an insect is the secret key with which we unlock all the necessary information for the application of remedies from which we are to get good results The Plum Curculio, one of the frequently-recurring insect pests, is best treated with the Paris green spray—and there is a general recipe for Paris green spraying, which is applicable to all plants upon which it is necessary to spray this poison, and that is, one pound of Paris green and one pound of fresh lime in 200 gallons of water. If you make the mixture stronger you will certainly burn some delicate foliage, and if you make it weaker you will not kill some insects. Those who have had experience find that this mixture can be safely used on peach trees if mixed in that way. The curculio here attacks your peaches, your plums particularly, and also in some districts the apple. Spraying with Paris green is the best remedy which has yet been tried for this injurious insect. An insect which has done a gread deal of harm in the past is known as the Cigar Case-bearer. It is one of the small caterpillars that builds a case around itself, and from the resemblance of this case to a miniature cigar it was first called the Cigar-shaped Case-bearer, but that name has been contracted down to Cigar Case-bearer. As much as possible we always use the same popular name for the same insect, because frequent applications for information are made, and if the insect is not spoken of under the proper name it is impossible to give the proper remedy. This insect has been treated very satisfactorily by Mr. Harold Jones, of Maitland, by spraying his trees, just at the time the young insects move out on to the young buds, with kerosene emulsion. This mixture of kerosene and soap is a very fatal

insecticide for all insects upon which it falls. It runs over the body and closes up the breathing pores—insects do not breathe through their mouths as we do, but through breathing pores along their sides, and a drop of oil placed on an insect is a very much speedier way of killing it than cutting its head off, because its head is only of use to it for eating its food, and for biting sometimes. Another insect which is doing a great deal of harm in Western Ontario now, is the Oyster-shell Bark louse—a bark louse not in the least similar in appearance, nor indeed in life history, to the San Jose scale. While the San Jose scale is viviparous, bearing its young fully formed to go out at once and begin their life, the Oyster shell Bark louse only lives apparently for a short time, and for the rest of the year appears on our trees, as it does now, in the shape of a waxy scale, covering a mass of white eggs. These eggs hatch at one time of the year, in this part of Canada probably from the 25th June till about the 4th or 5th July. There are two methods of treatment for this insect which are effective. One is the spraying of the trees with kerosene emulsion during the winter or about the beginning of July, when the young are moving about on the twigs. If it were possible to reach every insect with the spray, the summer application would be the best, but unfortunately the leaves are so thick at that time of year that I think the most effective treatment is in the spring before the leaves open, when the trees may be sprayed with the kerosene emulsion and very good results secured. At the same time we know that this insect, perhaps more than any other, attacks weakened trees; therefore, if you find trees badly infested with the Oyster-shell Bark-louse, the first thing to do is, if your orchard is in grass, plow up the grass, cultivate the land, and fertilize the trees so as to give them renewed vigor to throw off the attacks of its enemies, and then apply your remedies for the insect, to destroy it from the trees.

Mr. Burrell: What is the strength of kerosene emulsion in the winter for Oyster-shell Bark-louse.

Dr. Fletcher: One to nine—the standard Riley-Hubbard formula. The tent caterpillars have been very abundant and injurious all through Canada during the past year. In British Columbia they were a perfect plague. Through the Northwest Territories and Manitoba alike they were destructive to all shrubs that were liable to their attacks. In Ontario it has been injurious in this part of the Province on orchard trees as well as in Nova Scotia. In the Ottawa district, for miles along the Ottawa river, groves of aspens have been stripped of every vestige of leaf, and serious injury has been done in the ornamental grounds at Ottawa. Now, I have very little sympathy for any one who lets the tent caterpillar destroy his trees. The life-history is well known. The eggs are laid about mid-summer, and in a very few weeks the young caterpillars are formed inside the eggs—they can be found there now fully formed; but they do not emerge from the eggs till May, and then for some time after they have emerged they are very conspicuous in the orchards by reason of their silvery-white tents, which can be very easily picked off by any one who sees them on his trees. Again, during the winter the eggs are very conspicuous, and those who have once learned to recognize them find them easily, and they can be hand-picked from the trees in the same way that the nests containing hundreds of young caterpillars are in the spring. If these precautions have been neglected, the ordinary spraying which should be applied to all fruit trees year after year, of Paris green and Bordeaux mixture, to kill leaf-eating insects and fungous diseases in the spring, will equally well destroy the tent caterpillars. I do not think of any other widespread pests, which during the last season have been troublesome, but if for a few minutes you will ask questions concerning any particular insects I will answer you shortly, giving the best remedies for those you want to know most about.

Some pests have been very abundant in some sections, but they have decreased in numbers at other places, and the ordinary infestation of cut worms and canker worms, bud moth, cigar case-bearer, insects that we have year after year, have all succumbed to well known methods. I need not tell you that if you want information about these insects I shall be delighted to help you all I can if you let me know your wants.

A Delegate: Canker-worm?

Dr. FLETCHER: The canker-worm is very hard to fight, because we find that if it is allowed to grow more than half its size it is not so susceptible to injury from Paris green as many other insects. When canker-worms infest an orchard they never appear very suddenly. Sometimes you notice them only after they have multiplied enormously, but they have by that time been some years in the orchard, although you have not noticed them. The female moths have no wings and consequently cannot fly. Therefore, if an orchard is thoroughly cleared of this pest it must take some time before it can be again infested. The females are spider-like creatures which run fast and are easily carried from orchard to orchard on farm implements, etc., and one batch of eggs will give enough caterpillars to start an attack, which, if not controlled, might end in the defoliation of the whole orchard. The best remedy where the trees are small is spraying with Paris green early in the spring, directly after the flowers have dropped; and, if the trees are sprayed with Paris green and Bordeaux mixture, that is the best remedy for canker-worm. Along the shores of Lake Erie, where there are some very large trees, and in some parts of Nova Scotia where trees have been planted very close together, it is impossible to spray them on account of their closeness and of their size; then the old-fashioned method of painting on the trees a mixture of printer's ink and oil, or resin and castor oil, as explained in my annual reports, which are at everybody's disposal, is the best remedy.

Rev. Mr. ANDREWS: The same caterpillar was on the raspberry the last few years.

Dr. FLETCHER: There are two caterpillars which attack raspberries; one is known as the looper on account of the way it walks, and the other, which is hairy, is the caterpillar of the Raspberry Saw-fly. Both of these are easily treated with hellebore or Paris green. The Paris green may be used, because the fruit is not formed when the caterpillars occur.

Mr. TYE: One caterpillar is a small one which covers the whole limb with a web as it eats, and the other one clears the leaves of the tree off as they go.

Dr. FLETCHER: What tree?

Mr. TYE: Every tree.

Dr. FLETCHER: You probably refer to the red-necked caterpillar of the apple—the remedy is to cut off the bough, bearing from 150 to 200 caterpillars. The first one—with the web—is probably the tent caterpillar that I spoke of?

Mr. TYE: No, it is quite small and brown; it will cover half a limb over as it goes.

Dr. FLETCHER: Then it may be the Fall Web-worm. Paris green, or cutting off the webs directly they appear, are the best remedies. I should like to ask the fruit growers present if they have noticed, during the past summer, injury to grapes by a very small caterpillar which attacked grapes, webbed them together, and ate out the contents, not particularly injuring their appearance, but injuring them for the consumer considerably? I found them in grapes from the whole Niagara district. Was it noticed by growers here?

Mr. MCNEILL: An occasional one—perhaps four or five in twenty acres.

Dr. FLETCHER: I don't know any remedy to suggest, because it is too rare. It was found by Dr. Saunders many years ago, and has not occurred very much, but I noticed them this year for the first time. The grapes, I fancy, remain hanging on the bunches, do they not?

Mr. MCNEILL: Yes, and are looped together in a way.

Dr. FLETCHER: The caterpillar, when full grown, drops from the grape and passes the winter in the chrysalis state. I don't know of any remedy and merely ask for information.

Mr. JONES: I know of a small green worm, about half an inch in length, recently introduced into Canada. It eats right into the side of the apple when the fruit is green.

Dr. FLETCHER: It grows an inch longer before it is full grown. Mr. Woolverton sent me one specimen, but it is not at all of common occurrence. Spraying with Paris green is the remedy which has been used in the State of New York.

Mr. DERMOTT: Is the plum borer the same thing as the peach borer?

Dr. FLETCHER: No, it is not the same. The plum boarer is the larva of one of the bronze Buprestis beetles. The peach borer is the caterpillar of a moth. The remedies for both are the same, though.

Mr. TWEEDLE: What do you call the insect that gouges the young apples and pears with holes?

Dr. FLETCHER: That probably may be the same insect that Mr. Jones asked about—the green caterpillar of a gray moth that comes out late in the autumn, the Gray Pinion is the English name of it—or, on the other hand, it may be a beetle. There is a beetle that gouges plums as you describe and cuts a crescent much larger than the Plum Curculio. Most of these insects work early in the morning.

Mr. TWEEDLE: We hunted in vain for that in the day time, and a neighbor suggested to look for them just at dusk. It is a green worm about five-eighths of an inch long.

Dr. FLETCHER: I have generally found these caterpillars early in the morning—probably they feed all night.

Mr. DERMOTT: Is there any better method of destroying peach borers than just digging them out?

Dr. FLETCHER: Mr. Martin Burrell has made a careful study of the peach borer during the past summer. I don't know, as far as my own experience goes, which is very limited, that there is a much better remedy; but he has been trying some washes during the past summer. The wash that I have recommended is the Saunders wash, made with ordinary soft soap diluted with a saturated solution of washing soda, and in that about two ounces of carbolic acid may be used to the gallon. So that it is a carbolized soap wash.

Mr. DERMOTT: Would that be a preventive, or a cure?

Dr. FLETCHER: A preventive—its object is to keep the insects from laying eggs on the tree.

Rev. Mr. ANDREWS: When should that be applied?

Dr. FLETCHER: That depends on the time the peach borer begins to lay eggs in this district, at any rate soon after midsummer, and it should be kept on for the later months of the season.

Mr. BURRELL: No experiments are satisfactory unless they have been carried out for a good length of time. There is this much about the peach borer: any application that does not stop on the trees for a considerable length of time is practically no good, because we have ascertained beyond any doubt that the peach borer moth does not commence laying its eggs until—at least in our orchard—July 15th to 20th; so that if the borers are all cleaned out of the trees you would be perfectly safe in applying your washes then. But then the moth would keep on emerging right on from that time till the end of October. Prof. Smith, of New Jersey, says early in October is as late as they fly, but I find them to the end of October, so that if the wash won't stop on the tree till the end of October it is no good. The only wash that is able to do that is the wash recommended to me by Prof. Smith, composed of ordinary cement and skim milk; and this wash, when we applied it about the 15th July or earlier than that, was almost as good in the middle of September as it was when I applied it; and, although in our experimental part we do not have enough borers to make a test case, Prof. Smith tells me it has been satisfactory to him, and I would rather have it than any other wash. Prof. Langton has come to the conclusion that most washes are not satisfactory, although the coal tar one has been very good with him; but the main thing is that no eggs are laid before

the 15th July, and that they are continually laid from that until October, so that the war would have to be carried on all the time.

Mr. Orr: I would like to ask Prof. Taft what is his opinion in regard to the San Jose Scale—whether it is advisable to treat it, or destroy it at once; what his experience has been in Michigan?

Prof. Taft: I agree entirely with the remarks made this afternoon, that if a tree is badly infested it will not pay to try to save it; at once cut it out and burn it. On the other hand, a small, valuable and healthy tree I would attempt to save by spraying; and our law provides for that. It says that the inspectors shall either order the trees to be effectually sprayed or destroyed. That was based on our experience in spraying. It has, of course, to be thoroughly done, and it will take at least two applications to make anything reasonably sure of it.
coulter

Mr. Burrell: What do you spray with?

Prof. Taft: I have used generally for the first spraying the kerosene emulsion made with a large quantity of whale oil soap, about one part of kerosene and four of water.

Prof. Fletcher: That is a winter wash?

Prof. Taft: Yes; I am speaking now entirely of winter washes. Following that I have used the whale-oil soap applied hot, at the strength of two pounds to the gallon of water, and have seen no great difference, I tried them both side by side, and they seemed about equally effectual. As Prof. Fletcher says, if we spray thoroughly, and can reach all of the insects, it is just as easy to kill the hundredth one as it is the ninety-nine; but it does require very careful, thorough spraying, and it is impossible to spray a large tree effectively.

Mr. Orr: Would you head the trees in before treating?

Prof. Taft: Yes, I always practise that—head in and thin out; take out all the branches that I think can be spared from the tree, and thus of course reduce the surface to be sprayed as well as to give it a better chance to spray what remains; and in cutting back large trees, in case of the peach and apple I have cut both so as to leave nearly odd stubs to the arms, and in that way only can we expect to spray thoroughly and effectually.

Mr. Orr: What is your summer treatment?

Prof. Taft: We have not done anything, because we have only found about four orchards where we attempted to save the trees at all. In the other cases there were only one or two trees in the place, and we thought it best to take them out, root and branch, and burn them. At the end of our spraying examinations we had remaining, growing, only about four orchards that had any scale on, and those were cut back and sprayed, and we found practically no scale—not enough to spray at that time. We found recently on one or two places a few scattered scale, and they would be sprayed, and we hoped to clean them out, but when we would have sprayed in the summer time we found nothing.

Mr. Tweedle: Did you cut the trees in the summer?

Prof. Taft: We did not find anything to spray.

Mr. Tweedle: How would the trees stand it by cutting them back?

Prof. Taft: In the case of the peach they would be injured, but I think it was during March and April they were cut back, and our spraying was done then too.

Mr. Burrell: This spraying was kerosene, one to four?

Prof. Taft: Yes, using whale-oil soap instead of hard soap. I had soap made by Goode of Philadelphia, that is potash fish-oil soap that was sold at a cost of three and a half cents a pound, and in preparing this we made the water practically boiling, and dissolved the soap, and used at the rate of what would be finally a pound of soap to five gallons of water, and then added our kerosene at the rate of a gallon to four gallons and

applied it as warm as it was at the time. We had to use gloves, in fact, to handle the spray rods. It was probably 160° to 170°.

The CHAIRMAN: A question has been handed in—"What is the value of dried moss in packing fruit for export, such as can be got from Welland County?" Has any one any experience or knowledge of this matter?

Mr. BURRELL: I have heard of some person in Toronto sending some pears to England packed in that way, and with good success. Prof. Robertson spoke about it yesterday; I asked him that question. It is a great absorbent—very, very dry, and I suppose it is the same thing as sphagnum—peat moss—which Prof. Robertson explained is a very strong absorbent, and also it kept heat in, and he thought it would be a good thing in an ordinary compartment, not cold storage, because it would protect the fruit and absorb the moisture.

The PRESIDENT: I can partially answer that question, regarding the latter part of it. We always use this sphagnum moss for packing the trees, and have done so for years. Formerly we obtained it for the hauling, some twelve miles from our premises at Fonthill, but for the last two or three years there has been a company operating that, having purchased the marshes there, and we have had to purchase moss from them. Last year for the first time we purchased it put up in bales all ready picked. I forget the price, but it was not great. Any one can obtain it from this company in Welland County, who are trying to introduce it as bedding for horses.

Mr. E. D. SMITH: In what shape do they offer it—full of little roots, or clean?

The PRESIDENT: No, all the roots are picked out, and the moss itself has been picked apart, and it is packed in bales ready for use.

Mr. TWEEDLE: I heard it is sold in St. Catharines for horse bedding at $11 a ton.

The PRESIDENT: My recollection is it was about $10 a ton, taken in quantity.

REPORT OF THE FRUIT COMMITTEE.

Your committee have much pleasure in reporting that considering the short crop of apples for the season of 1897 we find a very creditable display on the tables before us at the annual meeting for this year.

First we find a collection of apples shown by Mr. Dempsey, of Trenton, consisting of twenty-four varieties, all very fine for this year. Among them worthy of notice is an extra choice plate of Northern Spys, a fine plate of Ontarios, some good specimens of Mann, Fallawater, Stark, Hubbartsons, Non-such, etc. There was also among this collection some of the newer sorts, such as Boiken, a large sized yellow, only fair in quality, but apparently a good keeper; another known as Horn, very fair size, red and rather handsome in appearance but quality only fair; and also another very handsome apple resembling somewhat a large sized well colored Wealthy, and quite equal to that variety in quality and about the same season. Mr. Dempsey also shows eight varieties of pears, among them the Idaho, Mount Vernon, Josephine, Duchess de Bordeaux, the latter a new pear of good quality, medium size, season December; a fine Buerre Grise, Kieffer, and a seedling from Josephine.

Mr. Huggard, of Whitby, shows a good collection of apples mostly standard varieties, but among them a seedling of fair size and appearance, fair quality, and said to be an extra good keeper. This seedling was grown by Mr. S. Wilson, of Whitby. Mr. Huggard also exhibits several varieties of pears of his own growing.

Mr. Wellington shows a number of American pippins of good size and splendid keeping qualities.

Mr. A. M. Smith, of St. Catharines, shows a nice collection of pears, among them fine specimens of Anjou, Buerre Diel, Josephine, Lawrence, Mount Vernon and Kieffer.

W. M. Orr, of Fruitland, shows two plates of well preserved Vergennes grapes.

R. C. Tye, of Haysville, shows a fine sample of Drop d'Or apple, and a Mr. Stewart shows a large, very fine appearing seedling, but of poor quality.

There is also an exhibit of a large Prussian apple called Brood, grown at Port Dover. It is a very large, handsomely colored, apple, irregular in shape and only fair quality.

Prof. Saunders shows a collection of sixty varieties of apples, grown at the Experimental farm, Ottawa, half of them of Russian origin. A few of the latter are worthy of cultivation, but many of them are worthless for this country. Among the old standard sorts were fair sized samples of La Rue, Ontario, McIntosh Red, etc.

T. H. Race.
Geo. E. Fisher.
M. Pettit.

WELCOME FROM THE LOCAL HORTICULTURAL SOCIETY.

Mr. J. S. Lockie said : "I am here on behalf of the Waterloo Horticultural Society, to welcome this Association to Waterloo ; and it is now eminently fitting that we as a Society should welcome this Association, because had it not been for them, I think there is very little doubt, we would have had no horticultural society in Waterloo so far. We had no personal experience in the making of horticultural societies save what we knew of others. In a town not a hundred miles from here they formerly had a horticultural society. The main object and end of that society seemed to be to have an exhibition and to take prizes. The whole of their money was spent in that way ; and when you looked at the prize list you saw that about three prize-winners won the bulk,—say ninety per cent., of the prizes. In some respects that was a representative exhibition, for those three, and a few others that assisted not only exhibited all that they could raise themselves, but they were in the habit of scouring the country for a week or two before the exhibition to beg and borrow plants, fruits, flowers and vegetables—anything that would take prizes. Then, of course, these three took a great interest at the beginning of the year in getting subscribers—getting sufficient names to enable them to get the government grant ; and then when they had their exhibition on, these parties were invited to pay twenty-five cents apiece and go in and see where their money went to. Of course there was only one result of that ; people tired of that kind of a thing, and the society died a natural death ; and I have no doubt but these three individuals were chief mourners at the funeral. (Laughter.) Having had that experience, we had no desire to imitate that condition of affairs ; but when Mr. Beall, kindly sent by your Association, came here and invited a few of us to discuss the matter, he placed it in an entirely different light from what we had ever known of. He first took the Agricultural and Arts Act, showing what assistance the Government gave to such societies, and the conditions applying to those grants, and took very strong grounds against spending the money in prizes, as a way that was unprofitable and unsatisfactory ; and he showed us that by purchasing plants, bulbs, literature, employing lecturers, all the members and the community would be benefitted, while in the other way only a few were benefitted, and there was a good deal of dissatisfaction as the result. He made the matter so clear to us, and laid before us what he considered an ideal horticultural society, that we agreed to see what could be done ; and the seed that Mr. Beall sowed fell on good ground. Probably you are aware that the majority of the people of this town are Germans or of German extraction ; and if there is any one thing more than another that a German cares for it is his home and his garden, the growing of his vegetables and small fruits, and having flowers in his home. (Hear, hear.) So we had no difficulty. It really required very little labor. In a very short while we had seventy-five members for that year. The success of the Society was almost unprecedented. It was exceedingly satisfactory—so much so that the next year, without any effort, we had 125 members ; and this, our third year, we have 155 members. That

is not a bad showing for a town of 3,300 inhabitants. And to give you an idea of what good has been done I will just show you what we have distributed during this year. We got from your Association and distributed to our members twenty-five new Japan lilacs, seventy-five Japan lilies, twenty-eight Conrath raspberry, and thirty-seven Dempsey pear trees. Regarding the lilies I may say that we got a splendid lot of bulbs, and I saw one Japan lily growing in the garden of a gentleman whom I see before me, that had thirteen flowers growing on it; so they were exceedingly satisfactory, and we are very much obliged to your Association for them. Then of what were purchased by us we distributed sixty-seven plum trees, sixty-seven cherry trees, 402 raspberry plants, thirty-seven Hydrangea grandiflora, thirty-seven rose bushes, 612 house plants, and 1,860 hyacinth bulbs I think it requires no explanation on my part to convince every one that such a distribution must have a great effect in a small town like this; and that effect will be shown in future years. The hyacinth bulbs have been exceedingly satisfactory. Probably a good many of the members have not grown hyacinths before, and now you can hear children going to the school telling each other about the beautiful flowers they have in their houses See the influence that this had. The children saw the dry, hard-looking bulbs come there, and they saw the parents take the tin can or the flower pot, and get some earth, and put these bulbs in there and set them away in the cellar, to stay there for six weeks or two months, and were very anxious to know why this was done. Then they saw that dead bulb brought up, and a spike started, and they watched that spike day after day till it blossomed out a beautiful and fragrant flower, as good as many of the richest men have in their conservatories. We well know that your Association has done a great deal, and has the assistance of the Government, which is correct, and that the main object of that has been to encourage fruit growing in this country as a great source of wealth as well as health; but we consider that the Government is not at all out of place in assisting floriculture in this way. The province of a government is not only to see that the children are educated, and to preserve the peace and order and lives and property of the citizens, but to encourage industry, to encourage home-making, to educate the children; and I can see nothing that has a tendency to encourage home-making more than growing flowers about the house and garden. (Hear, hear.) I consider that children brought up under such influences will be very likely to be better men, intelligent and industrious citizens, and therefore the Government is doing wisely in assisting in this way. We have an exhibition, but it is not quite like the one I mentioned to you before. Everything is free. The town council kindly gives the use of the hall free, and we make it open to everybody, not only to members of our Society, but to all who choose to bring anything to assist in making an exhibition here. Not only that, but we have conveyances to bring and return anything that is heavy and valuable. Sir, you would require a visit here to know the interest that is taken in that exhibition, and the pleasure and satisfaction it gives. Where prizes are given you must of necessity classify your exhibits; you must place each in the one place; but this is entirely different. We have a committee of our ladies here that have excellent taste, that arrange these on the table and in the centre and around the sides of the hall, and they place these for the best effect; and I think anyone considering this for a moment will see how you can arrange flowers and shrubs of the different colors and make a beautiful display—very much better than you can where there is to be judging. Why, sir, it would surprise you; you would consider this platform a fairy bower if you saw the way the ladies have it decorated with plants Where you have prizes you are certain to have a good deal of grumbling. Mrs. Jones is not satisfied because the judge favored Mrs. Brown; and so it goes. But now you will hear the expressions, "Well, this is splendid, and I'm going to have something to help make it better next year!" That is the feeling with regard to it. We of the Waterloo Horticultural Society have a creed. We believe in the Waterloo Horticultural Society—that it has done a great deal of good here, not only benefitting the members, but encouraging an elegant and refined taste, and it has been for the improvement of our town and our homes and our public parks. And we believe in our town. We know and feel that we have a prosperous town, a busy town. Most of our factories are working time and a half just now, and we have a steady, sober, industrious population; and I can tell you more than that, we have neither a pauper nor a drunkard

in the town. (Hear, hear.) Then we believe in the Ontario Fruit Growers' Asssociation, not only for what they have done for us, but what they have done for the good of our country; and while we are aware of what has been done by them in the past, we expect greater things in the future. And we believe in our country; we believe in Canada. Many of us have been born in distant lands, and, of course, we revere those lands with affection—he would be no man who would not—but with all that we love Canada. We consider we have as grand a country as the sun shines on—a country well governed, with good laws well administered, where rich and poor are equal in the eyes of the law, and the highest position in the land is open to the humblest subject, where education is free to all, and where the afflicted, the unfortunate and the feeble-minded are protected and cared for; and, sir, we are proud to know that this Canada of ours forms no inconsiderable portion of the greatest and grandest empire the world has ever seen. (Applause.) It is therefore with pleasure that we welcome you as an Association to the town of Waterloo. We have not been able to entertain you as has been done in other places, but we have been gratified and pleased with the meeting, and hope for good results, and we wish you still further success in your work. We trust for a great deal of good through your influence and your exertions in the future, therefore we wish you God speed.

Mr. W. M. Orr, vice-president, responded as follows:—It affords me a great deal of pleasure on behalf of the Ontario Fruit Growers' Association to tender you our hearty thanks for the very warm welcome you have given us. Perhaps this is nothing more than we might have expected in this loyal town in this Queen's jubilee year, for again Wellington, in the person of our President, led his forces to Waterloo. (Applause and laughter.)

I am glad to know that you have a prosperous Horticultural Society here. I can see from the large company present that a deep interest is taken in your work, and I am glad that this not only refers to your own society but extends to ours. The Ontario Fruit Growers' Association has been in existence for thirty-seven years. During all those years a great deal of hard work and good work has been done. We have men who have made a thorough study of all the branches. We have men who can tell you everything about an apple, from the forbidden fruit right down to the last seedling in Ontario. We have men in grape culture that have greater variety than they had in Palestine. Every year they are trying to get better grapes; and that is not all, they are trying for bigger bunches. They are not going to be satisfied until they get them as large as the bunches of Eschol. Then we have experts in strawberry growing who grow magnificent strawberries, supplying us during the regular season, but they are not going to be satisfied until they can furnish them all the year around for us. Then we have men who are skilled in dealing with insects—worms and bugs and all these things that trouble fruit growers. They can tell you all about them, from the insects of Egypt right down to the San José Scale. (Laughter.) That covers the whole ground. I forgot to say that we have men in floriculture as well, and we have one gentleman at least who has perfected it so completely that he can live on two meals a day, and he makes up for the other by feasting himself on a bed of roses. (Laughter.) I am very glad, indeed, that you have such a prosperous society here. From the time that our first parents made the mistake and were turned out of the Garden of Eden, not for cultivating wrong but for illegal consumption of fruit, right down to the present time, there never has been a time when agriculture and floriculture has been in a more prosperous condition than it is to-day; and I rejoice to know that, as has already been said, we have one of the finest countries under the sun. There is not a finer land that the sun shines upon than Ontario, and there is not a more happy and prosperous people on the face of the earth to-day than we in Ontario (applause); and I rejoice to know that right here in Waterloo you have one of the very best horticultural societies there is. Now, sir, with all the accumulated wisdom I have referred to with regard to the fruit growers in the different lines, we lay it all at your feet, you can gather and glean, and it is all yours; all we ask in turn is that you tell us how to carry on a local horticultural society successfully. (Applause.)

THE CHRYSANTHEMUM.

By H. L. Hutt, B.S.A., Ontario Agricultural College, Guelph.

The chrysanthemum, or "Mum," as she has been rudely nicknamed, has been justly called by one writer "The Autumn Queen," and by another "The Star-eyed Daughter of the Fall." Coming into bloom in the month of November when all nature in our northern clime seems to be in its most sorrowful mood, I sometimes think this grand flower has been given as a compensation for the loss of summer friends, and to help us to be bright and cheerful at the Thanksgiving season.

The increased attention which is being yearly paid to its cultivation, shows that its popularity must be based upon real merit. One writer has said that "the transcendent merit of the chrysanthemum lies in its almost limitless variety of form, texture and color of flowers," to this I think might be added the ease with which it may be cultivated. It is not now the flower of the florist only, but it is being more generally grown throughout the country in the homes of amateurs.

Its History. Very little that is new can be said of its history, yet something along this line may be of interest. The chrysanthemum has had its origin from one, or perhaps two, small, single-flowered species of plants native to Eastern Asia, their nearest relatives in this country being the disreputable ox-eye daisies. For many centuries before it was introduced into Europe or America it was cultivated, improved, and brought to great perfection by the painstaking gardeners of China and Japan. In the latter country it is the national flower, and may be seen upon all of the modern Japanese coins. The "kiku," as it is there called, is also one of the crest badges of the imperial family, and is used on the official seal, On the ninth day of the ninth month is held the annual "Feast of Chrysanthemums," when, it is said, the people not only revel in the beauties of the "mum" but feast on a cold slaw made of its petals. To some unknown Dutch voyager is probably due the honor of first introducing it into Europe. This was about the end of the seventeeth century, but it was not until the second decade of the present century that the flower came into general cultivation.

The first seedling raised in Europe was in 1827, and the first chrysanthemum show held in England was at Norwich in 1829. New varieties were from time to time brought in by the tea ships, and the list of varieties under cultivation increased each year. The first plants of the Pompon section were sent to England in 1846 by Robert Fortune, a collector for the Royal Horticultural Society, and in 1860 he introduced the first varieties of the Japanese type. From that time to the present the interest in its cultivation has steadily increased.

Just when the chrysanthemum was introduced into America we do not know, but the first chrysanthemum exhibit for prizes on this continent was held at Boston in 1861, under the auspices of the Massachusetts Horticultural Society. In 1868 it was styled a chrysanthemum show. These shows are now common annual occurrences throughout the country. The chrysanthemum show at Toronto last month was probably the finest exhibit of its kind that has ever been held in Canada, and excellent smaller shows were held in many towns and villages throughout the Province.

Possibilities of Development. At each annual exhibition new varieties are being introduced, and something new of interest is added to the development of this "Star-eyed Daughter of the Fall." The size has been greatly increased and the variety of shades of color has been multiplied. The variety which created the greatest sensation at the time of its introducti on was the one named after Mrs. Alpheus Hardy, this being the first of the hairy or ciliated type, which is now repretented by many excellent varieties in various shades of color. With all the new shades of color which have appeared, we have still, however, to wait for the much talked of blue chrysanthemum. How long we may have to wait is hard to tell.

What, to my mind, is most needed now in the way of improvement, is the development of constitution and strength of stem in the plant. Many of our finest varieties, in

order to show their bloom, have to be supported like cripples on crutches and staked with a forest of props. When these supports can be done away with a considerable step in advance will have been made.

Methods of Culture. Open air culture in the flower border is not altogether satisfactory in this latitude on account of the danger from early fall frosts, although in the southern part of the province I have frequently seen them grown in this way. The Pompon varieties, with their bright colored, little button-like flowers are the hardiest and best adapted for this purpose, as are also some of the early flowering larger varieties. Small plants may be set out as soon as danger of frost is over in the spring. They should be planted from one and a half to two feet apart, in good rich garden loam, kept well cultivated, and watered if necessary. The quality and quantity of bloom will be almost in direct proportion to the amount of attention given them.

1. Plant in suitable condition for furnishing cuttings. 2. Sample of cutting.

A well-rooted cutting.

Open Ground, Followed by Pot Culture. This is the method usually followed by amateurs who have not the time or conveniences for growing the plants from first to last in pots. About the last of August the plants are lifted from the beds in which they have been growing all summer and are potted in eight or ten-inch pots. This must be done carefully, with as little injury to the roots as possible. After potting they should be well watered, and shaded during the hottest part of the day for a week or so until the roots become established in the pots. They may then be kept out of doors and allowed to get all the sunshine possible, taken into the house as the nights become colder, and placed in bright sunny windows where their blossoms will look out and smile in contentment upon the blustering storms of November and December.

All Season Pot Culture. This is the method by which the best results are obtained, and as it is practiced altogether in the production of exhibition plants, and frequently also by amateurs in their home collections, I shall speak of it more fully and in detail.

Propagation. When the plants have done flowering they should be cut down to within a few inches of the soil. A forest of little shoots will spring up which may be used to start new plants. These cuttings may be taken any time from January to May, but as a rule those taken in February or March give the best results. The cutting should be about three inches long, made with a smooth cut at the bottom just below a joint, and the

lower leaves should be removed. The roots may be started by inserting the cuttings in clear, sharp, gritty sand. If but a limited number of plants are wanted they may be started singly or otherwise in small flower pots. An old bread pan with a perforated bottom and filled with about three inches of clear sand makes an excellent propagating bed for the use of the amateur. It goes without saying that the sand should be kept moist, and for a few days after the cuttings are inserted they should be shaded from the midday sun by placing over them a sheet of newspaper, but as soon as established in their new quarters the more sun they can get the better.

Chrysanthemum as first potted into three-inch pots.

1. "Mum" in four-inch pot ready for first heading back.
2. As headed back.

Potting. As soon as it is well rooted and a few new leaves have formed, the young plant should be potted into a three inch pot. When the roots have filled this, as may readily be seen by straddling the stem with the fingers and tipping the plant out, it should be repotted into a pot one or two sizes larger, from which size it should be potted into a six or eight inch pot, and allowed to bloom in this, though better results are obtained by getting the plant into an eight or nine inch pot a month or two before the time of bloom. When potting into any size of pot larger than four inches, an inch or so of broken pottery, brick, or charcoal should be placed in the bottom of the pot to assist drainage.

The Soil. The soil for chrysanthemums, or in fact any pot grown plant, requires considerable attention. No absolute rule can be laid down as to what mixture is the best, as soils vary so much in different parts of the country. One of the chief ingredients in any mixture should be well rotted sods or turf. We prepare this by cutting the sods in the fall, piling them upside down in a large heap, with a few layers of rotting manure throughout the heap. During the following summer the heap is chopped down and turned, and when needed for potting enough sand is added to make the mixture friable so that it will not bake in the pots. A little bone meal mixed with it at this time gives good results afterwards.

Watering. Many amateurs are at a loss to know how to water pot-grown plants properly. One of the best rules that can be given for the guidance of such is to withhold water till the soil begins to look dry on top, then give it a thorough soaking. A florist

can always tell when his plants need watering by the hollw sound that the pot gives when rapped with the knuckles. The frequency with which plants need watering depends much upon the temperature aud the amount of moisture in the atmosphere, as well as upon the exposure to strong sunshine. Rain or soft water is the best. Besides watering the soil it is well to occasionally syringe the foliage, or to take advantage of nature's watering by placing the plants outside during a gentle rain.

"Mum" in six-inch pot, ready for second check.

"Mum," grown as a tree plant.

Exposure to Sunlight. Chrysanthemums revel in sunshine. There are a few plants like the Calla lily, begonia, and fuchsia which do best when not exposed to the strong midday sun, but the chrysanthemums can hardly get too much of it, provided the temperature does not get too high accordingly. When grown in a window where the light comes all from one side, the plants should be turned every day or so to keep them growing symmetrically, otherwise they are likely to turn their backs upon the household and smile upon the strangers in the street.

Training and Staking. The method of training the chrysanthemum depends very much upon the object sought. If the grower desires to get an extra large bloom the plant should be trained to a single stem. All of the lateral buds should be pinched off as they appear and the terminal bud only allowed to develop a bloom. In this way we get an immense flower but the plant is to say the least top-heavy and unsightly.

Rose Travena.

Ivory.

The best looking specimens, both plant and bloom considered, are grown as bush plants. To obtain a plant of this kind the terminal bud must be pinched out when the plant is five or six inches high. In a short time five or six shoots will branch out, which must also be stopped when four or five inches long, and the operation repeated upon the shoots which branch out from these until we get a bushy symmetrical plant, having plenty of good strong branches upon which the bloom will appear later on in the season. If quality rather than quantity of bloom is desired the weakest of these flower buds may be pinched out and the vigor of the plant directed into the larger buds left.

Staking will be found necessary to support the branches by the time the plants are half grown. The neatest and least conspicuous stake we have yet found for the purpose is made of stout, corrugated steel wire, like that used for stays in wire fences. These may be painted so that they will hardly be discerned among the dark green of the foliage. We use three of these stakes to each plant, the length varying from two to four feet according to the height of the plant. Two or three hoops of much smaller wire are tied around these forming a circular trellis with the plant in the centre, keeping it in shape with as little unsightly staking as possible.

Growing Exhibition Plants. For the growth of large exhibition plants, more care is necessary than can usually be given by the amateur, and unless he has a green-house it is hardly worth while attempting it. To get a standard plant, which is expected to assume tree-like proportions by October, a vigorous growing variety must be selected

Mrs. H. Cannel.
Philadelphia. Judge Hoitt.
Gladys Spaulding. Mrs. Geo. Glenny.
Jora. Enfant des Deux Mondes.
Joey Hill. Louis Boehmer.

Helen Bloodgood.
Pitcher and Manda. Harry Balsey. Good Gracious.
Mrs. G. A. Magee. C. H. McCormick. F. L. Ames.
L. B. Bird.

Maud Dean.

Louis Boehmer.

Bride of Roses.

and started early. It must be trained to a single stem and allowed to grow to a height of from three to four feet before it is stopped. A bushy head may then be formed by repeatedly nipping back the branches at every first or second joint.

Another popular way of growing chrysanthemums is what is known as "Single blooms in five inch pots." The beauty of these is the dwarf size of the plant and the large size of the bloom, although I think the beauty of the plant as a whole is improved by allowing three or four blooms to a plant. To obtain such plants it is necessary to start the cutting in May, pack the soil in which they are grown very firm, keep in small pots, and pinch back lateral buds as required.

Infant des Deux Mondes.

Rohallion.

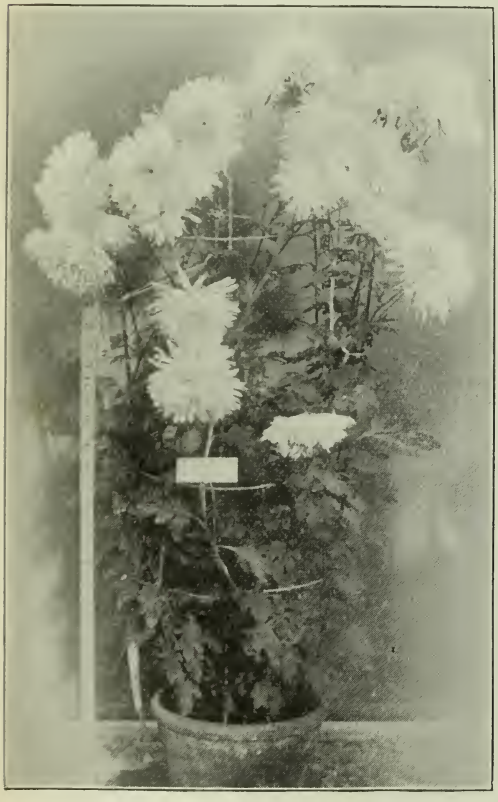
Classification and Varieties. Any classification of chrysanthemums nowadays is a difficult matter and very unsatisfactory. The best classification, and the one usually adopted, is as follows: Pompons, Singles, Anemones, Chinese Incurved, Chinese Reflexed, Japanese Incurved, Japanese Reflexed and Hairy Japanese. But with all the crossing and re-crossing, which has produced so many intermediate varieties, it is often difficult to say to what class any particular variety belongs to. The list of varieties, too, has become so long that only a few of the best of each class need be mentioned.

The *Pompons* bear small button-like blossoms, an inch or an inch and a half in diameter, of a great variety of colors. The plants are of dwarf habit, hardy and very free flowering. Rose Travena is the most desirable variety of this class I have tried.

The *Single Chrysanthemum* is built on the same plan as the Ox-eye Daisy. An endless variety of these may be obtained by sowing seed, but, as a rule, they are hardly worth while cultivating.

The *Anemones* have only one or two rows of ray flowers, which may be wide spreading or drooping. The centre florets are usually the same color as the rays, but are quilled and very much shorter. Judge Hoitt is a typical variety of this class.

The *Chinese Chrysanthemums* are characterized in the typical forms by the regular globular form of the flower, and the evenly imbricated petals of medium width. In the incurved section the petals arch gracefully inwards towards the centre, while in the reflexed section the petals are curved backwards. A few of the best I have tried of this class are: *Ivory*, an early, pure white, of dwarf habit; *Mrs. L. C. Maderia*, a symmetrical, compact globe, of bright orange color, and *Mrs. George Glenny*, a profuse bloomer, bearing medium sized flowers of a pale sulphur yellow color, a beauty when loaded with bloom.



Viviand-Morel.

W. H. Lincoln.

The *Japanese Chrysanthemums*, and the numerous hpbrid forms which have emanated from them, make up the majority of our large flowered varieties. Some have flat petals, in others they are fluted, quilled or twisted. Some are broad and short, others are long and slender, almost thread-like. In some the petals are incurved over the centre, in others they are reflexed.

The petals of the hairy varieties are covered with hair-like granular growths. This type is one of the most recent introductions, and already includes many choice varieties. An extensive list of grand Japanese varieties might be given. In our collection at the College we have about 130 varieties, but I shall mention only a few of the most desirable ones, including the various shades of the different types.

Maud Dean. This is a variety which can hardly be commended too highly. The flowers are large, a beautiful shade of lilac pink, and of great substance. The plant has stiff, strong stems, is short jointed and of healthy compact habit.

W. H. Lincoln. The habit of this variety, like the one just mentioned, is nearly all that could be desired. The flower is large, and probably one of the best of the bright golden yellows.

Joey Hill. Flowers very large, florets broad and reflexed, cardinal red above and old gold beneath. The plant is healthy and free flowering, but rather tall.

Rohallion. An excellent pale yellow. The flowers are medium size, the florets semi-quilled and curled. Plant healthy, vigorous and a profuse bloomer.

President W. R. Smith. A rather tall growing variety for window culture, but one of the best to grow as a standard. Flowers large, late, incurved and of a very pleasing shade of light pink.

Lilian B. Bird. This is also a rather tall grower, but the bloom is very striking, being made up of long straight quilled florets, of a soft shade of light pink. One of the latest to bloom.

Iora. An exceedingly artistic flower of light pink color. It is also a quilled variety, but unlike the one last named, the florets are curled and twisted. The plant is moderately short jointed, vigorous and very free flowering.

L'Enfant des deux Mondes, or The Child of Two Worlds, is one of the finest of the hairy varieties. Flowers large, pure creamy white and densely covered with granular hairs. Plant of good compact habit and a profuse bloomer.

Louise Boehmer is a beautiful magenta pink, of the hairy class, and similar to the last mentioned variety in almost everything but color.

To those who would like to get more information on the subject than could be given in a short paper, I would like to recommend some literature which would, no doubt, be of interest to them. One of the best books on the chrysanthemum is "Chrysanthemum Culture for America," by James Morton. As an excellent work on floriculture generally for the amateur, I could not recommend anything better than "Vick's Home Floriculture," by E. E. Rexford, the popular writer on that subject in the *Ladies' Home Journal.*

CACTI.

By James Lockie, Waterloo.

I have been requested to offer a few remarks on the cultivation of Cacti, those peculiar children of the sun, natives of the warmer portions of this continent, the largest number having been found in Mexico and Texas, with one trifling exception they are purely American. In their native countries they grow under very varied conditions The Phyllocactus and Epiphyllums are Epiphytes or air plants growing on trees without any soil, the wet ground and tropical heat furnishing the necessary moisture, here they will not grow as air plants but thrive in sandy soil, while the Epiphytal Orchids found in the same localities can only be grown in moss instead of soil and in warm moist conservatories. Nearly all the other varieties of Cacti grow on barren sandy plains or in crevices of rocks in localities where the heat of the sun is intense and the rainy season short. Botanists tell us that the skin or bark of Cacti has very few breathing pores, resembling in this respect the skin of apples, pears, plums, and other fruits so that they absorb the water through their roots during the rainy season, and enjoy the strong heat where plants with soft porous leaves could not live.

Growing under such different conditions, the problem with cultivators has been to find the most suitable soil to grow them in, and the opinions have been nearly

as numerous as the cultivators, and as they have done well in very different soils I think we may conclude that they will grow in any soil if sufficiently open and porous so that water may pass freely for water logged soil is certain death to Cacti. I have found sods from a sandy knoll suitable, by paring off the grass; the under part is a net-work of fine porous roots in sandy loam in which they thrive. The strap leaved varieties may have some leaf mould added as they can stand richer soil. Formerly Cacti were kept in pots the year round, but now nearly every one plants them out in summer. Mix the ordinary garden soil with an equal quantity of sand, and have the situation elevated so that water will run off. They enjoy the sun and rain and the growth they make is surprising. Their fresh healthy appearance is a contrast to the shrunken specimens in pots. Phyllocactus when planted out enjoy the heat but should be shaded from direct sunlight which is apt to scald and burn them. Regarding the different varieties, these are so numerous and varied that time will only permit the briefest mention. The Phyllocactus the flat or strap leaved spineless family are the best known, easily grown and generally most satisfactory. Some are day, others night bloomers, and all are very floriferous. The variety Latifrons, or the Queen Cactus is one of the best and when a good size can be depended on for plenty of flowers every summer. They are pure white, six inches in diameter, fragrant, opening at night and closing next morning. This plant is often wrongly called "The Night Blooming Cereus," which is an entirely different plant. It is Cereus Grandiflora, of a semi-climbing habit, with rope like stems, seldom thicker than a man's thumb, having four to eight slight angles or ridges. The flowers are ten inches in diameter with a rich perfume; but while this plant is very easily grown and largely used to gratt other varieties on, flowers are very rare, so that Latifrons is a much preferable plant to grow. The Epiphyllums or Crab or Lobster Cacti easily grown, and profuse bloomers in February and March, being of a rather drooping habit they are improved by being grafted on the Pereskia stock, or on some of the Cereuses and make handsome umbrella like plants and less liable to damp off at the neck. The Cereus are a large and very varied family, from the creeping Flagelliformis or rat tail up to Cereus Giganteus fifty to seventy feet high in a straight unbranched column, all are easily grown and mostly free bloomers.

There is a subsection of which Pilocereus Senilis, "The old man Cactus" is the best known representative being covered with long white hairs. it is one of the wonders of plant life I have never heard of its blooming and think a flower on it would be an incongruity. Of the round spiny Hedgehog Cacti there are various families and numberless varieties, nearly all are free flowering, and their various colored spines make them handsome plants when not in flower. The Opuntia family are excellent bloomers, the great drawback to their cultivation is their spines which are very fine and slightly barbed so that they pierce the skin readily are painful and difficult to remove. In districts where they live outside, and do not require handling, they they make a magnificent display of brilliant flowers, a clump in bloom is a sight worth going far to see. The conditions necessary to success in growing Cacti are more easily provided then for most other plants, and may be briefly summed up as follows. Sandy porous soil, small pots, all the sunlight and heat possible, in summer, with plenty of water, but cool and dry in winter. If the temperature is over fifty degrees in winter they require some water to prevent drying out altogether, but not sufficient to start growth, they require rest.

As a class they are not much troubled by insects, or subject to disease. The mealy bug is about the only troublesome insect, and for that spraying with alcohol is a certain remedy rot is caused by over watering, as soon as seen cut off the decayed part back to the fresh, lay in the sun for several days until the cut has callused, then insert in sand, but not deeply. Keep shaded and slightly moist until roots form, then replant in proper soil. This is the common method of propogation by slips or cuttings.

Trusting these remarks may increase the interest in this curious and beautiful class of plants as I am certain every one will be delighted in growing a few Cacti.

THE CANNA AND THE GLADIOLUS.

By Mr. H. H. Groff, Simcoe, Ont.

In speaking to a joint meeting of two societies having different interests, it will be necessary for me to combine with the instructive and entertaining the complaints and trials with which I must contend. While I have no desire to urge my personal interests on you to-night, it is only fair to say that I am not a commercial grower or dealer but a scientific amateur (or amateur scientist) who has given years of labor and all necessary expense to a work of small but select character, actuated by love for beautiful things and the pleasure of doing a thing well.

In repeatedly appearing before this association, I feel that an apology is due those interested in fruit growing for the stress that is put upon their patience and valuable time by my interest in the decorative aspect of horticulture. I say this with great seriousness, because, at least so far as my experience goes, the blooms of their orchards are to them the most beautiful of flowers, bearing as they do a prospect of more material things than sweet perfume and pure delicate beauty of coloring.

The request is frequently made of me, in my efforts to inform and entertain our members, not to use scientific and botanical terms. Now I am fully in accord with the idea, that the use of unnecessarily intricate and technical terms is worse than absurd, when one is speaking with the view of conveying information ; but, on the other hand, when the simple terms of classification as applied to various sections are complained of, it is time to ask the amateur, who is supposed to be here for the purpose of advancing himself on these very lines, to bestow upon the subjects offered for his consideration a sufficient concentration of mental effort to enable him to grasp the details presented with all possible simplicity.

I will go further and suggest that our affiliated societies take up at each meeting some one or more of the plants, shrubs, fruits, or native and ornamental trees in common use, and inform themselves as to their origin, history and possibilities ; familiarizing their members with the proper terms and classifications, if only in a rudimentary sense.

It might also not be unreasonable to suggest that our secretary, assisted by his excellent library, give something on the above indicated line that might be used as a monthly lesson, with discussion by the various societies, in part substitution for valuable time now taken up in humorous or dramatic delineation.

Taking one of my specialties, the Gladiolus, often called the people's flower, on account of the assumed general familiarity of flower-lovers with its merited reputation for value and usefulness, I undesitatingly repeat here what constantly goes from my pen to American amateur and grower alike, that the flower is practically unknown to them. The amateur has not yet advanced beyond the idea that the value of a bulb is one cent or less, which barely pays the cost of production ; and the grower in self defence must have a strain that is productive as a first quality, and in the survival of the strongest some weed rapidly predominates, and the advance is in quantity and not in value.

Exceptions has been taken to the terms Gandavensis, Lemoinei, Nanceianus, and Childsi ; and these simple classifications are only of use to the amateur, conveying no meaning to the scientific worker. The first is an invention ; the second is from the name of the originator of the section, and in perfect order ; the third, by the same originator, is taken from that of his town ; but the fourth is out of order and good taste, in being applied by the purchaser third removed from the originator, it is certainly not botanical, and it is in too common use to be considered scientific or technical.

If any hearer present fails to fully understand the ideas and meaning it is my wish and intention to convey, it will afford me both pleasure and satisfaction if the opportunity is promptly given me to make my expressions clearer, and if possible more simple.

With the view of outlining the methods under which my work has so successfully appealed to the progressive amateur, let me say that I have pursued a course directly

opposite to that of other growers claiming to advance the quality of the gladiolus. Instead of producing a strain from the seed and seedling of commerce, bred from the commonest parentage, and then urging their degenerate product upon the amateur under the exaggerated descriptions of colors hitherto unknown and indescribable by pen and painter's brush, I have tested those strains of American origin and development worth the trial, from the Atlantic to the Pacific, buying out the result of fifteen years' selection by the celebrated Luther Burbank, of California, and also the collection of that noted hybridist, Dr. Van Fleet, of New Jersey, including many new species and botanical hybrids, the product of over ten years of scientific crossing, largely upon the species, which is slow and unproductive work as compared with the results of closer selection.

In testing the best strains offered by growers in England, France, Holland and Germany, I have succeeded in locating the most advanced work on earth, and the best adapted to our soil and climate, these I have increased each year by importation as well as propagation. All this has taken years of work and thousands of dollars, but the results from the blending of this mass of unexcelled quality, has developed a foundation that will stand long after I am physically unable to continue the more refining and beautifying detail of closer selection. Each year of the past has been used to a great extent in outcrossing with the view of strengthening and perfecting some strain that has come to me lacking that degree of finish and vitality so necessary for the development of its maximum possibilities.

While it is not my intention to discontinue the importation of the most advanced hybrids of foreign origin, for the purposes of comparison and hybridation, the chief duty of my many years will be the harmonizing of the thousands of offspring from this extended assortment of such diverse constituents, each step being taken on the lines indicated in my paper on hybridizing to be presented to you in a few moments.

In addition to this effort in securing the greatest advances possible in the product of the world's scientific workers, to the limit of commercial methods as well as those of friendly interchange, I have followed the advance of exploration into Central Africa, the natural habitat of the most valuable species of the gladiolus known to the hybridist, and through the valued introduction of Prof. Medley Wood, curator of the botanical gardens at Durban, Natal, I have had the privilege of corresponding with a noted botanical explorer of Cape Town, now on his annual tour into the centre of "The Dark Continent," the outcome of which I await with confessed impatience. Of course the results of such experimental work can only be a matter of conjecture, but the experiences of the past fully warrant an entire withdrawal of restraint from the most extravagant and fantastic expectation.

It may be of interest to you to learn that the value of my hybridized seed has been recognized by the leading firms of America, and it is listed as my product by Peter Henderson & Co., New York; Henry A. Dreer, Philadelphia; D. M. Ferry & Co, Detroit, and J. C. Vaughan, Chicago; also F. C. Smith, Yalumba, Australia, so that the name of Simcoe not only vibrates musically upon the tongue of the antipode, but it is also known to the inhabitants of the neighboring republic, many of whom seem to think that our people live in perpetual cold storage.

During the past month the first of my seedling cannas, offered to the trade, having been pronounced first class by expert growers of New York and Chicago, was sold to J. C. Vaughan of the latter place, the leading canna grower of the west. The production of tropical plants for exports is further evidence of the possibilities of our unrivalled soil and climate.

Referring to our seemingly unfavorable climatic conditions, and the tempting offer recently made me by an experienced and wealthy American hybridist, to join him in the more genial State of Tennessee, for the purpose of prosecuting our favorite occupation; observations made by me during past years have assisted my coming to the conclusion, that although our season is comparatively short for the production of seed from semi-tropical plants, our clear and stimulating atmosphere is much better suited to the work, and crosses can be effected with greater certainty than in more southerly localities,

particularly those subject to period excesses of heat and humidity. After several years of experiment I have successfully ripened Gladiolus crosses made up to early September, by cutting the spike of seed capsules at first threatened, killing frost, and then maturing in water for a few weeks, until fit for the curing trays. Of course this often necessitates a night's work with artificial light, and special treatment of the immature crop so harvested; but in such operations the future success assured, is the only question of vital importance, and any special labor thereby entailed, is of no material consideration. With the artificial assistance above indicated, I have been able to mature a number of crosses unequalled by any operator within the limit of my extended correspondence, producing in 1896 fully a quarter of a million seeds, with even a still greater number in the season just past, and of a quality and parentage not obtainable in the world at any price.

Before closing my notes and passing to the more important subject of this paper, I wish to refer to the United States tariff, better known as the Dingley Bill. The chief items of my production are admitted to Canada free of duty, and although my specialties are eagerly sought for by United States growers and amateurs, on account of their high quality, the new duty is prohibitive. In the face of these facts our Canadian societies are using their Government grants in competition with my efforts to make for Canada, but in Canada, the name she deserves to bear for high standard of excellence, and the name she does win through thousands of her sons, but among a self-alienated people, and in the advancement of a self-styled alien nation. I ask for no protection beyond the equal right of free, untrammeled and friendly intercourse.

Whatever successes I am permitted to achieve as the result of my labors in the work-shop of the great Creator, are a gain to the world and to civilization; they are new creations, evolved from nothing; their original parents being simply weeds in the eyes of the refined admirer of beautiful flowers. And like the product of the miner's toil, they are drafts upon the treasure-house of Nature, wronging and robbing no one; unlike the results of speculative competition, those mere exchanges of wealth too often besprinkled with the tears of the widow and the orphan, or even the successes of legitimate commerce, seldom attained without grinding competition, and involving the very life-blood of struggling man.

You will not wish to hear from me to night of those every-day beauties of the garden which are more or less familiar to all of us, ever carrying back our thoughts to our earliest interest in the simple work of childhood. But you will expect me to speak to you of that border land of mystery, where man is permitted to join hand with the great Creator of the universe, in guiding those forces of which he knows so little, until the highest flights of human fancy picturing seeming impossibilities in exquisite beauty, and never ending variation in form and color, sink into comparative insignificance, as the veil is slowly lifted before our expectant and wondering gaze.

The three great agencies that have been at work during the past century to increase the number of cultivated plants are, the introduction of new species, the selection of sports, and the hybridization of species already secured. The term species as used by me indicates those varieties found growing wild in various parts of the world, and may be taken to include a few natural hybrids, which, however, are rare, as it is the experience of all scientific workers that crosses between different species, even of the same genera, are most difficult to secure. By sports is understood those variations of growth from root or stalk buds, showing distinct characteristics to the original plant, and which maintain this distinctiveness, admitting of increase by propagation.

Hybridization, or cross-breeding of flowers, is the most interesting way of producing new varieties, if for no other reason than the absolute uncertainty of the result, and the limitless possibilities and endless variation following the breaking down of the barriers interposed by nature; and it is to this question that I shall condense a few thoughts and facts for our consideration. It is generally conceded that hybridization is the most potent of all agencies, for the choicest garden ornaments of to-day are hybrids, resulting from such a mass of crosses that to trace of their original parentage, would be beyond the reach of possibility.

I like the way Dr. Beadle put the subject before us at our meeting last year, when he dignified the work by claiming for the operator the position of being a co-worker with the Creator. For it is here that man, already granted control over the whole animal kingdom, the fowl of the air, and the inhabitants of the great sea, reaches out in his inborn craving for the infinite, and handles things unseen. And while of no greater importance than the most insignificant insect, so far as the mechanical act is concerned, yet guided by God given power and wisdom, he stands forth in the dignity and majesty of a creator.

Comparatively few of even those interested in horticulture bear in mind the fact that there is hardly a fruit or flower, or even the cereals of commerce, that are not the result of selection in some form, either hybrid, cross-bred, or sport, and practically all are accidentals. Let me say here that I use the term "hybrid" in its broadest sense, in which it may be taken to cover cross-bred varieties, as well as true hybrids or crosses between species. Although it is well known that selection is the great force in improvement, too many professional growers are content with selecting the seed parent only, and the credit they would like to take for this care and enterprise, would make them the subjects of ridicule with those who are improving by selection, all useful forms in the animal kingdom.

While there are few who consider the source of improvement in the fruits and grains with which they come in contact, the number is equally small who understand that the production of those they do see and use, is due to the actual necessity and fact of natural fertilization. By natural fertilization, I mean direct contact of and from the anther and stigma in the perfect flower, or the transferrance of pollen by wind or insect to those that are not perfect. By perfect, it is understood that class of flowers bearing both anther for the production of pollen, and stigma with it must come in contact in order to produce seed, as reproduction is the great effort of all nature, and the pulp of the apple, strawberry, pear, and similar fruits, is in this connection of secondary importance.

Many trees and plants bear the pollen and seed flowers on different growths, or distinct individual specimens. These are called imperfect, and are dependent upon outside agencies for their fertilization; and under favorable circumstances the work is effectively done by the wind and various insects. The failure of fruit crops is frequently due to a period of rainy weather washing and decomposing the pollen, thus preventing its being carried by the wind, or a season of unusual cold interfering with the natural activity of insect life. Fortunately the cereals of commerce are protected from what might be a serious conclusion, by the bloom commencing at the bottom of the spike or head and gradually opening to the tip, making total failure practically impossible; for the unfavorable conditions would have to extend over the lengthy period so wisely provided. And further in the case of grain fields, the pollen is produced in such profusion, that the breezes distribute it freely at some favorable period during the development of the plant.

It might be in order here to note a few points in connection with the origination of new varieties of wheat, which, like all other creations, is a single kernel act; but it has been calculated that a single grain of wheat is capable of being increased to nearly eighty billions of bushels, by sixteen years of multiplication. The wheat flower is a perfect one, having all the essentials of reproduction itself. A dozen or so are left on the head to be crossed, all others being cut away; the anthers are removed from the seed parent, as in my Gladiolus work. Then at the proper time an anther from the pollen parent is broken open, and the pollen sifted upon the stigmatic surface, now in a receptive condition. The head is then wrapped in tissue paper, carefully tied to prevent the interference of outside influences. A few of such crosses would prove successful, and from this result the best and heaviest kernels only are selected, each of which is subjected to years of repeated testing, until its quality is pronounced enough to be marked, and its superiority over existing varieties proven.

In the case of my specialties I shall first take the Canna. As the flower unfolds with the rising sun, the pollen is transferred from the anther, which is simply a development of one of the inferior petals to the side of the style, the tip of which is the stigmatic

surface. The action of bees gathering the pollen for their young brood so scatters it, that a portion is deposited there; coming as they do from other flowers, the pollen is in this way mixed, and natural crossing is the result.

I wish to take this opportunity to correct the impression created by Prof. Calwell, in a recent address to the Buffalo Horticultural Society, in which he claimed that in order to cross the Canna with any degree of certainty the flower should be opened artificially, for the reason that it was fertilized naturally at this stage of its development. Now, as stated by me a moment ago, not only is this not the case, but the most careful attempt to open the flower is likely to bring about the very result the operator is endeavoring to avoid; and I wish to record here the fact, that it is the exception and a rare one, when the condition indicated by the learned professor is to be found.

With the Gladiolus it is different; the pollen matures to-day and the stigma to-morrow. At first these organs are wide apart, a provision of nature in her abhorrence of self fertilization. The bees and insects moving from flower to flower mix the pollen on the surface of the anther. As maturity approaches the anther and stigma draw closer to each other, and finally intertwine like the tendrils of a vine; the pollen being transferred during the favorable period.

Having indicated the conditions under which natural fertilization and crossing takes place, I will briefly detail the mechanical operation of cross-breeding. The canna may be effectively crossed early in the morning, before insects have disturbed the pollen; and I have found no better way than to collect and transfer the pollen with the fingers. For convenience my breeding stock is all grown in a large bed of special form.

In the case of the gladiolus, all pollen parents are protected by muslin bags, and those flowers intended for seed parents, have the anthers removed early each morning. When the time for crossing approaches, about nine o'clock, the pollen is collected by removal of the anthers with forceps and carried in a belt of original design to the seed parents, the crossing being effected by sifting the pollen upon the matured stigmas direct from the anther.

With the natural uncertainty of hybrids, some varieties of both the canna and the gladiolus produce neither seed nor pollen, while some compromise half way. Of course there is no possibility of crosses between species possessing no structural affinity, such as the apple and the pansy, which is a matter of regret, as pansy blossoms on apple trees would make a very taking novelty for the wonder department of our catalogue builders.

Where violent crosses are attempted, they usually result in fruit or seed refusing to form, or if the cross is effected, the product may bear flowers, but be wholly barren, or sometimes even refusing to produce flowers at all. These results are partially responsible for the theory, that hybridizing tends to infertility; but not only is this not the case as a rule, but a most emphatic contrary effect is often produced. Referring again to the gladiolus: It was not until after years of failure that the first cross was effected, and from this result has the whole mass of commercial hybrids been reared. For the production of this first hybrid made possible the crossing from other and distinct species that formerly could not be induced to blend with either of its parents.

Let us note at this point, "That as individuals of the same species are built up of unstable and easily decomposed chemical compounds, affected by even slight changes of soil and climate, this condition must be more true of hybrid forms, which really means an attempt to make diverse constituents balance in one, resulting in the appearance of many freaks, each with a natural and expected tendency to vibrate towards one or some of its parents." I contend, on the other hand, however, that after distinct removal by years, of selection, the effect is to minimize this natural tendency to reversion, and varieties may be sufficiently fixed so as to give them a certain and reliable value, and undoubted individuality; this quality, however, cannot safely be claimed for any variety outside the original locality where its fixity has been attained.

It must not be understood, however, that changes of soil and climate are necessarily unfavorable to the variety, on the contrary, they more frequently exert a beneficial

influence which is particularly apparent where these changes are made with a proper understanding of the principle under which improvement is possible.

The fact that self-fertilization tends to weaken the offspring, and that crosses even between different plants of the same variety give stronger and more productive offspring, to say nothing of the revitalizing effect of distinct outcrosses, must commend the latter course to our consideration and approval. Not only is this of material benefit, but the gain can be increased by effecting crosses between varieties grown in different soils and localities, "because all differences between parents carry new combinations of character, or at least new powers, and the greater the diversity between the limits of variety, the greater is the revitalization," resulting in the production of more pronounced characters, invaluable as the foundation work of new and more beautiful varieties.

In passing, let me say that there are also cases where the process of acclimitation temporarily suspends fertility, the plants refusing to produce seed until several seasons of nursing have been given. And in the same line of artificial treatment, the continued propagation from cuttings and offsets has had the effect of seed production being permanently discontinued.

Having already stated that selection is the great force in the improvement of hybrid forms, this may be carried on until a certain point is reached where perfection has its limit. This is more fully exemplified in the gandavensis section of the gladiolus, which I presume has been more in-bred than any other plant in the world of horticulture. To such an extent has this been carried, that it is considered the most uncertain plant known to the hybridist. I am not referring to every variety in the section, because there are many that show the most satisfactory stability, but on the other hand it is here that the greatest variation in vitality is found. And so finely is this quality equalized in many varieties that a change of soil or climate may unbalance the vital forces entering into their composition, with a tendency to reversion to the most potent species from which they originally descended.

Again referring to the limit of improvement in hybrid forms, this may be carried to such a point, and the vital forces so completely neutralized, that instead of the unbalancing effect induced by change of soil or climate, and resulting in reversion, a temporary period of weak growth may cause complete degeneration to ensue, leaving no vestige of former individuality, and finally the variety itself disappears entirely.

It is at this point, assuming that the variety is one of reasonable excellence, that the hybridist has his opportunity, and by the infusion of new blood from species by a judicious cross, in the product of which, not only is the vitality and strength increased, and greater size and wonderfully increased productiveness added to the bulb, but the flower breaks into limitless variation in form and beauty of coloring.

With the view of indicating the principle of improvement by cross-fertilization, let me note here, that the use of pollen from species or close hybrids on perfected hybrids gives best general results. And to use the species as seed parents gives less diversity, but results in the production of a limited quantity of more distinct and phenomenal character and pronounced racial divergence.

In conclusion let me say, that having for several years devoted myself to the improvement of my specialties with the most exhaustive and untiring energy, the thought comes to me each season, in drawing my work to a close, that the present has only been my initial year. And I am beginning to think, that so great are the possibilities yearly made more apparent by the results of past work, and the discovery of new and distinct species, as the march of exploration and civilization opens up larger fields, that after a life of endless patience and boundless research, ending in results of successful and comprehensive effort, one may only hope to feel as a child who has gathered a few pebbles upon the shore of a limitless ocean.

ANNUALS FOR THE AMATEUR'S GARDEN.

By R. B. Whyte, Ottawa.

In the preface to his delightful little work on the "Beautiful Flower Garden," Mr. F. Schuyler Mathews says, "I am sure of one thing regarding the extent of our flower gardens to-day, they do not contain half enough flowers—the crops are entirely too small. Let us have all the flowers we can possibly afford; they are the veritable smiles of nature." And he might also have said we have not half enough flower gardens. When we consider how little it costs in time or money to grow even a large collection of flowers, and how much they tend to civilize and refine those who live among them, it is much to be regretted that well-stocked flower gardens are so few and far between. Now and then in our towns and villages we come across a well kept garden, but how rarely in the country where land is so cheap and all the conditions so favorable. If our farming friends only realized how much more attractive they could make their homes for their sons and daughters with the expenditure of a dollar or two, we would not see so many bare, bleak, dreary looking homes when driving along our country roads.

It is not necessary in addressing a Horticultural Society to dwell upon the advantages of growing flowers freely. The question for our consideration is how can we plant our gardens so as to get the greatest return from the space at our disposal, in beauty of form, of color, and of perfume. Some of our garden flowers, as the Rose and Sweet Pea possess all these forms of beauty, but as a rule flowers that have great beauty of form and color, as Asters, Scabiosa, Poppies, etc., lack perfume, or even have a disagreeable odor, as in the African Marigolds, while many flowers with fine perfume are devoid of beauty of form or color, as Mignonette, Mathiola Bicornis (Nightscented Stock), etc. Why some flowers have brilliant coloring and others agreeable perfume, you will find fully explained in "Flowers—their Origin, Shape, Perfume, and Colors," by S. G. Taylor.

Flowering plants may be divided into: Perennials, including shrubs, herbaceous perennials, and bulbs, which remain in the ground indefinitely and flower every year. Biennials, which blossom the second year after planting the seed, such as Canterbury Bells, Foxglove, Sweet William, etc. And annuals, which flower and ripen their seed in one season. As very few annuals bloom before July 1st, to have flowers in May or June we have to depend upon the perennial class, the earliest flowering and most brilliant of which belong to the section known as Holland Bulbs.

The snow is hardly gone before the dainty Snowdrop opens its bells, closely followed by the many-hued *Crocus* and the charming *Scilla Sibirica*, the finest blue in nature. And how bare our gardens would be in May without the gorgeous Tulip and the exquisitely scented *Narcissus* in its many forms. The best varieties of these are now so cheap that they can be planted freely.

In early June many of the early herbaceous perennials are in bloom, as the Aquilegia, Iceland Poppy, Bleeding Heart, Forget-Me-Not, etc., followed by the Pæonies, roses, the first of the lillies, and the earliest annuals. For the best display from July to November we cannot do without some of the summer bulbs, such as Tigridias, Gladioli, Cannas, Dahlias, etc., and a selection of the herbaceous perennials, but our main dependence for the gorgeous show of color that is possible during these months is upon the annuals. There are no half-dozen perennials that could be named that will give us one-quarter the show of bloom that we can get from the Dianthus, Poppies, Sweet Peas, Pinks, Phlox Drummondi, Asters, and Scabiosa.

In making our selection from the immense variety of annuals at our command, in addition to beauty of form, brilliant coloring and agreeable perfume, we want convenient habit of growth, for cutting our flower beds would lose half their charm if they did not supply an abundance of flowers for house decoration. We also want profusion of bloom, so that we can cut freely without robbing the garden of its beauty. A long season of

blooming is also a great recommendation, but this we have to a great extent under our own control, as, with most annuals, if we cut regularly and do not allow seed to form, they go on blooming all summer till killed by frost.

Plant as large a variety each year as your space will allow. There are some old favorites that we want every year, but in addition to them it adds greatly to the interest of our gardens to try some new sorts each season, even though they do not come up to the highest standard. I would not like to be without the Carnations, Eschscholtzias, Poppies, Candytuft, Mignonette, Phlox Drummondi, Schizanthus, Stocks, Nasturtium and Pansies. If I was limited to fifteen kinds these are what I would grow. They are all quite hardy, and would give a great profusion of bloom all summer and fall from seed planted in the open air, without the assistance of hot-bed or greenhouse.

There are very many others well worth growing besides these, some of them old favorites; a few of which I will refer to after we discuss in detail the best varieties to grow of the above list.

The first to bloom last season from seed planted in the end of April was the *Dianthus*, or Pinks, which were in flower from June 20th till after hard frost, in great variety of color, from white to the deepest maroon, in single and double. In the singles, *Dianthus Heddewgi* in numerous varieties and *D. laciniatus* are the best sorts, and the same varieties double with *D. Chinensis*, Chinese Pinks, and *D. Imperialis*, Japanese Pinks, give blossoms as fine in form and color as the best Carnation. The Margaret Carnation, which is said to bloom in four months from seed planted outdoors, I have not found satisfactory. They are just coming into bloom when caught by frost.

If you are partial to yellow, plant a good sized bed of *Eschscholtzia*. Give it a good sunny situation and a rather light soil, and you will be delighted with the result. They can be bought all colors, mixed or separate. *Mantima*, golden yellow with orange centre, is the best. *Mandarin*, red outside and orange inside. "Californian," are mixed—orange, golden yellow, pink and cream. The doubles are not satisfactory; very few of them come true, and they are not as handsome as the singles. All kinds are very hardy and often grow from self-sown seed. If planted in early spring they are in constant bloom from end of June till frost.

Poppies.—For gorgeous and varied coloring no flower can equal the poppy. They are at their best in July, but if kept picked and not allowed to go to seed, they last till the end of September. The most beautiful of the family are the single Shirleys; for delicacy of texture and exquisite coloring they are unsurpassed. Other good singles are *Lævigatum*, cardinal with black centre, and the larger opium poppy, *Papaver somniferum*. The larger double Poppies, *Pœony florium* and *fimbriatum* and varieties of these all belong to the opium species. The best of the small double Poppies belong to the species Rhocas, of which the Ranunculus flowered and Japanese Pompon are examples. All the best varieties are treated of in detail in an article on Poppies in the September *Canadian Horticulturist*.

Candytuft is a very pretty, low growing annual in several colors. There are two species, *Coronaria*, always white, flowers in numerous spikes, clustered at the end of the stems, of which the "Empress" is the best known form; and *Umbellata*, lower growing, flowers in flat umbels, a much more desirable species, also in white as well as pink, lavender, purple and crimson. The white is very suitable for growing at the base of tall-growing, bright colored flowers, such as Gladioli, Dahlias, etc. The other colors look best grown separately in small clumps along the border.

Mignonette is only worth growing for its sweet and delicate perfume. It is of no value as a color factor in the garden; the flowers are so small and faint in coloring as hardly to disturb the green effect of the plant. If you want reddish green, grow "Matchet"; for yellowish green try "Golden Queen;" while so called white forms are "Miles Spiral" and "Parson's White." Matchet I find the best kind; the spikes are broader, and do not run to seed as soon as some of the others. If you want nice, stocky plants that will produce good flower spikes all season, you must use your scissors industriously, and do not allow seed to form.

Phlox Drummondi. Few flowering plants equal phlox in its variety of colors. You may grow it for years and see new shades every season,—every imaginable shade of pink, red and violet as well as white, Nankin yellow and blue. There is no true yellow or scarlet, but almost every other color can be found. The variety "Grandiflora," sometimes called "Jubilee," is very much superior to the ordinary Drummondi in size and coloring. *P. Drummondi fimbriata* is a form with the ends of the petals irregularly toothed, the colors are much the same as the type, and it makes a pleasant variety in form. In the variety "Star of Quedlinburg" the petals are nearly all teeth, giving it the appearance of a five-pointed star with a very small centre, the effect is not pleasant, some of the colors having a decidedly spidery aspect. The dwarf Drummondi are not desirable; the flowers are small and stalks too short. The double variety is not double enough to be effective, and is not nearly so handsome as the single grandiflora. All the varieties come into bloom early in July from seed sown end of April.

Schizanthus, or Butterfly Flower, is a very beautiful flower that is not as well known as it desrves to be. The plant is rather slender and should be grown in clumps so that they can support one another, leaves very finely divided, flowers in loose vacancies at the end of the branches as beautifully colored as the wings of the butterfly, the prevailing tint is lavender, mixed with white, blue, yellow, carmine and purple. They are well adapted for bouquet making, producing a very bright and graceful effect. Seed can be got in separate colors, but is usually planted mixed. Season same as phlox.

Stocks should be extensively grown for their exquisite perfume, one of the finest in nature. To grow fine flower spikes we must have moist rich soil, and not spare the water; if not well grown most of the flowers will come single, and a single stock is not handsome; buy the best seed you can get, as cheap seed is worthless. Our climate is not as suitable as the moist climate of Britain for growing fine Stock, yet, with care, we can grow very good ones, and they are well worth all the attention we can give them. For garden ornament the dwarf ten weeks are the best, but for cutting the colossal ten weeks are more suitable; the most satisfactory colors are white, pink, yellow and carmine. The best way to grow them is in rows pretty close together, and as soon as they bloom pull out the poor colors and single flowers. If transplanted it must be done early as they grow a long tap-root which is apt to break when taken up, if they are more than two or three inches high.

Sweet Peas are deservedly universal favorites, having every good point that we could look for in a flower. In beauty of form and color, from perfume, profusion of bloom, long season, and suitability for cutting, they are unsurpassed. The best varieties and how to grow them are fully described in the *Canadian Horticulturist* for January and November of 1897.

Antirrhinum, or Snapdragon, is an old flower that has been very much improved in size and color of late years. The variety "Magus" has the flower self colored in white, yellow, pink, red, etc., and variety "Picturatum" has the tube light and the lip dark colored or *vice versa*. Both grow about two feet high, with the flowers in long open spikes suitable for cutting. For bedding purposes the dwarf forms are better, variety "Nanum" is about one foot high, and "Pumilum," or Tom Thumb, about eight inches. Season from August 1st till frost.

Salpiglossis is rather a shy bloomer, but is unsurpassed for the velvety richness of its coloring, and such odd peculiar colors as you can get in no other flower, ranging from creamy white to yellow and terra cotta, crushed strawberry to the deepest purples and maroons; the lobes of the corolla and tube streaked and lined with different shades. The Grandiflora variety is the best, growing about two feet high. Season from early August till frost.

Nasturtium. Both dwarf and running varieties are profuse bearers of bright colored showy flowers; the prevailing color is yellow, which shows itself even in the darkest flowers. If you have a mound or stone-pile to cover, there is nothing better, as

they are rapid growers and early bloomers. Give the dwarf kinds plenty of room and don't overfeed them. If in very rich soil the growth of foliage is so rank as to hide the flowers.

Scabiosa. Few annuals are more graceful in habit of growth than the charming Sweet Scabious or Mourning Bride of old gardens, that name appropriate enough to the old dark maroon flower to which it was given, is not at all suitable to the varied and beautiful colors of the modern Sweet Scabious, ranging as they do from white to pale yellow, lavender to dark parple, crushed raspberry and many shades of red to a deep maroon, so dark that it appears black at a little distance. The large double flowers are nearly two and a half inches across, and borne on long thin stems wave gracefully in every passing breeze. Nothing could be better for cutting purposes, not only is the habit of growth suitable, but they can easily be kept fresh for eight or ten days in the house. The plant grows about two feet high, comes into bloom early in August and is covered with flowers till hard frost in the fall. There is a dwarf form about one foot high, that is much inferior in size and doubleness of flower and length of stalk to the tall growing kinds.

Asters. This is the great autumn flower so wonderfully varied in color and form that if we wished to grow all the shades of all the different kinds, we would have to plant over eight hundred packages of seed. Of the Chrysanthemum flowered variety alone some of the German seedsmen offer 214 different shades of color. When all are so beautiful it is very difficult to make a selection and say "these are the best." However, you won't go far astray if you try the "Giant Comet," particularly the white; the pinks and lavenders are rather harsh in shade and don't compare at all in beauty with the white, though there is a pale pink that is fine. The new "Japanese Tassel" is a quilled Aster with long wavy petals, not very double, but the pink and lavender are very beautiful shades. Another good quilled one is the "Washington," with shorter petals but more variety of color; the silver grey and pink of this variety are charming shades. The "Pæony flowered" is a large fine flower in many colors. The "Jewel," or ball Aster, is smaller than some of the others but a very handsome sort; the petals are incurved just like some of the finest Chrysanthemums. If you want to grow very large flowers try the "Emperor." Vick" and "Semple's branching" belong to the late flowering section, lengthening the season till frost comes; they are taller growing plants than the others and much more branched, the flowers borne on long stems. The white, pale pink and lavender are very beautiful shades; they are at their best if cut when fully open; if left on the plant, in two or three days they show a yellow centre, which detracts very much from the beauty of the flower. All Asters require very rich soil to do their best. Give them a liberal allowance of well decomposed stable manure, an abundance of water and plenty of room if you want fine flowers for exhibition time. Seeds of the varieties recommended, if planted in the open air in end of April, will give you flowers continuously from early in August till end of October.

Pansies. Though not properly annuals, do best if treated as such and grown from seed every year, if planted early in the spring and well cared for, they will be in good condition in September to give those large beautiful blooms that are so highly prized by all flower lovers. To have flowering plants in spring and early summer, it is necessary either to grow them in a greenhouse, or to plant the seed outdoors the previous August and protect the young plants with straw during the winter. To grow the best flowers, the soil must be rich and moist, the plants kept stocky and compact by pinching back all long straggling shoots, as the blooms are never so good when at the ends of long branches. It is also very important to buy only the best seed, "Cassier" and "Bugnot" are good sorts, "Imperial German" is a very fine strain, "Lord Beaconsfield," lavender and purple is much admired, "Gold Margined," brown and maroon with yellow edge, and "Silver Margined," lighter shades with a white edge are beautiful varieties, all these have the thick velvety petals that are so essential in a good pansy. The "Giant Trimardeau," so much grown, is one of the poorest varieties in substance and color.

Time will not permit of any more than a brief mention of a few of the other desirable flowers. As color factors in the garden a prominent place must be given to the

Calendulas or Cape Marigolds and the "African" and "French" "Marigolds"; their beautiful yellows and oranges are very effective, and the odour is not very objectionable if you do not handle them.

Though somewhat coarse and rough, the *Zinnia* has some fine shades of color that entitle it to a place in the border.

The *Balsam* has many admirers, the individual flowers, particularly the double white and pink are very handsome, but its habit of growth is against it.

Calliopsis as it is now called, the old Coreopsis is very pretty, especially the new varieties "Golden Wave," all yellow and "Coronata," yellow with small red spots near the base of the rays.

As a low bedding plant, the *Verbena* is very fine, it is a slow grower when young, and seed must be sown in a hotbed to have flowers before September.

Some of the new *Petunias* are a great advance over the old rather commonplace flowers, both in shape and color. The seeds are very small and require careful treatment to get them to germinate.

Nigella Damascena, or "Love in a Mist," is a unique flower, unlike anything else in the garden, the large pale blue flowers with their fringe of finely cut leaves have a very pretty effect.

The annual *Gaillardia*, while not equal to the perennial variety, is a very showy plant. *Gaillardia Picta Lorengiana*, a double form not unlike a Sweet Scabious in appearance, makes a brilliant show.

The *Bismarck Larkspur* is a handsome variety in white, pink, blue and lavender.

Lastly, do not leave out a few *Sunflowers*. The common variety and the double "Globosus" are very majestic plants in their proper place, at the back of the border. Among the smaller Sunflowers "Stella" is a profuse bearer of handsome yellow flowers three to four inches across.

In conclusion, to get the greatest possible pleasure and benefit from your gardens, besides being able to appreciate beauty of form and color and enjoy agreeable perfume, you should know something of the causes that produce these results, enough of the science of botany to understand the connection that exists between different plants and between the mineral and animal world on each side of them, to know how plants grow and do their work—work that has such an important bearing on our lives. With such a knowledge, it never could be said of you as the poet said of Peter Bell:

> "A primrose by the river's brim,
> A yellow primrose was to him,
> And it was nothing more."

THE CULTIVATION OF WATER LILIES.

By B. E. Wadsworth, Berlin, Ont.

This subject has been seldom written up by cultivators of the present day, and I do not propose to do so fully in a short paper such as this, but will merely touch briefly upon points of interest, and methods of cultivation, in the hope that it may draw attention to this most beautiful class of plants, which deserve and no doubt will receive more attention from growers in the near future, as they are rapidly increasing in public favor.

Aquatics were never as much appreciated as they are at present. During the past season this branch of floriculture has formed the centre of attraction in public exhibitions throughout the country. I have been very fortunate in having seen a great many of these ponds. In the public parks of the large cities the introduction of water plants has

done much to educate the public taste for water lilies. In these places they are seen and admired by thousands. The introduction of water affords one of the most effective features in landscape gardening, and when judiciously planted with aquatics it becomes doubly pleasing.

The more the healthy taste for gardening develops the more we return to the natural methods of arrangement. Our gardens are planted more according to natural rules than formerly, and as varied as space and means will permit. With the exception of a well arranged rockery, nothing is more pleasing and interesting than a water garden judiciously planted with aquatics, where both foliage and flowers charm the eye from spring until autumn. A water garden may be either natural or artificial, the former of course always being the more attractive. Where there is a slow running stream or a natural lake or pond with sufficient current to prevent stagnation is the ideal spot, as the bottom is usually muddy the deposit of years of decayed leaves, sand, loam, etc., and therefore well adapted for growing aquatics.

In an artificial water garden care has to be exercised to keep the water constantly changing, especially during hot weather. With this provision there is no difficulty in growing aquatics without either stream or pond by simply having tubs sunk in the ground with about a foot of rich loam in the bottom and water to a depth of eight inches to a foot over that. Sometimes when a piece of water is available it is unsuitable for growing water plants on account of the bottom being rocky or clayey. In such cases, if the water can be lowered, holes may be dug and filled with good meadow loam, or where this cannot be done they can be planted in tubs and sunk. Often, in planting, it is necessary to attach stones to the tubs to keep them from rising and floating away. Many are no doubt deterred from the cultivation of these beautiful plants under the impression that the possession of natural ponds or a large outlay of money to provide proper conditions is necessary, but this is not so. Many of the finest and rarest water lilies are grown in tubs in small gardeds and even in city or town lots.

The arrangement and grouping of plants in ponds is important. On no account should strong growing subjects, especially those with large shade-giving leaves, be planted near to weak growing species, or the latter will be crowded and killed. The best time to plant is in spring after the weather gets warm. The depth of water should not exceed four feet and there should be a shallow margin to allow the growing of Limnanthemum, Lacumosum, or Brasenia, which require shallow water for their development. There are plants that under ordinary circumstances grow high above the water. Others, such as Nymphaea whose leaves float on the water, and for the sake of arrangement in planting, I will divide them into erect grow in aquatics and floating plants, enumerating only the most important.

Nymphaea: This, the true water lily genus, is a most important aquatic class, all the species are beautiful in flower and distinct in foliage. The blooms range from pure white to deep crimson and royal purple, the culture of these lilies is fascinating and most of the varieties are entirely hardy.

The hardy varieties are as follows:

Nymphaea alba candidissima: A large flowering variety with broad petals of the purest white.

Nymphaea alba: The English water lily. Flowers pure white; a hardy and fine species.

Nymphaea flava: A beautiful water lily; flowers golden yellow; of free growth; fragrant.

Nymphaea Laydekeri rosea: Flowers delicate pink, with deep yellow centre, a fine grower.

Nymphaea Marliacea carnea: A magnificent flower of flesh tint, a delicate blush, vanilla scented.

Nymphaea Marliacea rosea Flowers soft rose of exquisite tint, a beautiful variety.

Nymphaea odorata: Our native white water lily, well known for its beauty and fragance.

Nymphaea odorata exquisita: Another grand variety of the Odorata type, flowers large, rosy carmine.

Nymphaea odorata rosea: This is the pink Cape Cod water lily, flowers of deep pink shade, deliciously fragrant and a free bloomer.

Nelumbium luteum: (America Lotus.) Although a native of North America it is extremely rare, it thrives under the same conditions as the preceding, flowers rich yellow.

Nelumbium speciosum: (The true Egyptian Lotus.) Flowers when first open, a beautiful rose pink; when fully expanded, creamy white and pink; quite hardy.

Tender Varieties: These should be taken inside in winter.

Nymphaea cerulea: Flowers, six inches in diameter; color, lavender blue; very fragrant.

Nymphaea Devoniensis: One of the rarest as well as one of the most beautiful water lillies. Though tender, it succeeds well outdoors in summer in tubs or ponds; color, deep rose red.

Nymphaea dentata: Flowers white, open horizontally, eight to ten inches in diameter, fragrant.

Nymphaea gigantea: One of the best in cultivation; large purplish flowers with immense petals and a deep mass of golden yellow stamens.

Nymphaea Zanzibarensis: The deepest colors, as well as the largest flowers of all blue water lillies, and one of the most beautiful; flowers, ten to twelve inches in diameter, fragrant, a magnificent species.

Without exception the Nymphaeas are all handsome, and since several new hybrids have been added the interest in the class has been increased, especially as they can be grown in an inexpensive way by sinking tubs of water in the ground where no larger piece of water is available. By growing a collection of about four or six varieties, bloom can be had from June to October.

To those having a pond I would advise trying some floating aquatics, Acorus Calamus (Sweet Flag), Calla palustris, Ouvirandra Crassipes (Lattice Leaf Plant), Pontederia cordata (Pickerel Weed), and Eichheornia crassipes major (the Water Hyacinth). This is the plant that is causing so much trouble on the St. John's river, Florida; being attractive, it was planted by settlers along the river, but its rapidity of growth is a serious matter as it is now an impediment to navigation.

The cultivator of aquatic plants when once launched will find a field of never-failing interest and enjoyment.

REPORT OF NEW FRUITS COMMITTEE.

Mr. L. Woolverton stated that Mr. John Craig, of Ottawa, was the Chairman of this Committee and had all the notes and other material in hand.

Owing to his absence this report was not at hand, and Mr. Woolverton could only present brief notes on two or three fruits which he had brought with him.

Apples.

Kean's Seedling. Grown by Josiah Kean, Fesserton, Simcoe County, Ont. Six samples received 27th Nov., 1897, with the following notes from Mr A. Paterson, of Cold Water, who sent it:

"The tree Mr. Kean thinks, or rather the seed, was planted about 1880 or 1882. It has fruited successfully for eight or nine years. Upright grower, vigorous, very hardy and very productive, carries its fruit well until ripe. The fruit is entirely free from spot or blemish, quite uniform in size, season October to January, (but has been kept till March.) I will be pleased to give any further information or forward scions if required."

The apple is remarkably fine in appearance, reminding one of the Maiden's Blush, which it exceeds in size, judging by the samples received. Form oblate, regular, skin yellow with bright red cheek, stalk one and a quarter inches long in a even russeted cavity, segments of calyx large, half open, in a large evenly formed basin; flesh white, fine grained, tender, good flavor, desirable for either desert or cooking. Well worthy of further trial.

STANHOPE. Sent by Thos. Beall, of Lindsay, Oct. 20th, 1897; seedling from Township of Stanhope, fifty or sixty miles north of Lindsay, previously reported favorably upon by Fruit Committee, and worthy of attention, especially as a fall cooking apple for October and November. Fruit large, yellowish, with splashes and stripes of bright red; flesh white, tender, subacid—desirable for cooking.

PLUMS.

SMITH'S OCTOBER. Samples from A. M. Smith, received October 20th, 1897, in good condition.

FRUIT medium in size, roundish; skin thin, dark purple with greyish brown; flesh dark yellow, tender, juicy, flavor rich, sweet and very agreeable; season end of October; quality first-class.

ORGANIZATION OF AFFILIATED SOCIETIES.

By THOS. BEALL, LINDSAY.

The project of organizing horticultural societies in many of the cities, towns and incorporated villages of this Province in strict accordance with the *several* provisions of the Agricultural and Arts Act, and thereby securing to the inhabitants of such municipalities the great advantages concisely set forth in sub-sec. 2 (of section 9) with its five sub-divisions. and of getting such societies to affiliate with this Association, was first brought to the notice of the directors of this Association at its annual session in (I think) 1892. The desirability of having such a work prosecuted was at once admitted by the whole Board; and the plan of operation as laid down by the writer of this report seemed so simple that a resolution was unanimously passed giving the directors authority to organize horticultural societies wherever necessary in the cities, towns and villages in their respective Agricultural divisions; and that the necessary expenses incurred for this work be paid by this Association. At the next annual meeting, when reports from the several directors were called for, each of them, with one exception, stated; that the plan as proposed at the last annual meeting for organizing such societies, although exceedingly simple in theory, was altogether impracticable in fact, and that nothing had or could be done in this line by any of them. The one exception was the director for the 5th division, who reported that he had succeeded in getting one other such society organized in his division; and also that he could see no insurmountable difficulty in getting one or more such society established in almost every county in the Province. After some considerable discussion the subject was placed in the hands of the Executive Committee with power to act in the best interest of this Association. The Committee after due deliberation decided to employ the writer of this report to make the attempt to organize a few such societies in such municipalities as he might be able to reach at the least expense. The work was in due time commenced, with the understanding that a constant communication be maintained between the organizer and the committee, and that the organizer might be recalled at any time at the will of the committee. The committee soon learned that the work was being successfully carried on, and at the same time found

that the expense in connection therewith was necessarily heavy, and, perhaps, might hardly be justified, but for the probability that the societies so formed might possess sufficient vitality to become practically self-sustaining after the first year, and if this should prove to be true the organization of such societies would prove to be of the utmost advantage of this Association, and should be continued from year to year until one society at least should be organized in each riding or county in the Province.

As several years have elapsed since this work was begun, and as a considerable sum of money has been expended in this work, it may be well to review what has been accomplished.

In 1895 there were eleven societies in operation, having a membership aggregating 798. The next year seventeen societies were in existence aggregating 1,197 members; and in 1897 the numbers of societies had increased to twenty-seven, aggregating 2,076 members, making a total membership for three years of 4,071.

To ascertain more clearly, however, if the expenditure referred to had been justified by results, it may by more satisfactory to take the membership of the eleven societies on which the cost of organization had been borne by this Association in 1895 and note the results for the following two years. The total membership of the eleven societies in that year was, as before stated, 798. In 1896 the membership of the same eleven societies amounted to 826, and in 1897 to 899, or a total membership for the three years of 2,923. Now, if the membership of the eleven societies which were in operation in 1895, consisting of 798 persons was sufficient to justify the expenditure on that account, for that one year, (and I understand from the committee that it was) then the success of the undertaking can be understood when it may be observed from the above that these societies during the following two years contributed 1,125 additional membership without any expenditure on the part of this Association, and there seems good reason for believing that not only the eleven but the whole twenty-seven societies will continue to contribute its membership in like proportion for many years to come.

So much may be said respecting the increase of societies and consequently of increased membership But who may estimate the amount of "encouragement to improved horticulture" in these twenty-seven communities by the monthly distributing therein of upwards of 2,000 copies of the Canadian *Horticulturist*, the same number of bound copies of the Annual Report yearly, and a lecture by an expert horticulturist once a year? And again: Who may estimate the impetus given to "improvement in horticulture" by the enormous quantities of new plants, bulbs, trees, seeds, shrubs, etc., which has been distributed among the members in each year since the organization of these societies. Some faint idea of the enormous supply of the good things distributed may be learned by observing that the Napanee Society—one of the smallest in the Province in point of members—has given to its members, equally, in equal shares, during the past three years, upwards of 15,000 of the newest and most beautiful varieties of plants, bulbs, shrubs, etc., that could be obtained, besides fifteen pounds of the choicest varieties of flower seeds, most of which were more expensive then are usually purchased by ordinary growers.

Mr. Beall, seconded by Mr. Orr, moved a resolution of thanks to the mayor and citizens of Waterloo, and to the local Horticultural Society, for assisting in making the convention a success; to the press, and to the speakers and writers of papers, which was heartily adopted.

The President: It will be impossible for me to convey thanks personally to the different parties mentioned, but I wish to say to Mr. Lockie and the members of this Society that we have enjoyed our visit to Waterloo. We hope that what we have had here will be of interest and profit to the members of your Society and your townspeople generally, and we hope that any interest which you have evinced in the past will be increased in the future.

The President invited the audience to examine the fruit and flowers, and declared the meeting formally closed.

Names.	President.	Vice-President.	Secretary.	No. of members.
Belleville	W. C. Reid	S. J. Wedden Wm Kemp.	W. J. Diamond	66
Brampton	Dr. C. Y. Moore	H. Dale J. Jeffers.	Henry Roberts	112
Burlington	George E. Fisher Freeman P. O.	J. S. Freeman Freeman P.O.	A. W. Peart Freeman P.O.	
Campbellford	J. B. Ferris	Mrs. W. E. Cooper D. Kennedy.	E. A. Bog	53
Chatham	Wm. Ross	Mrs. Coatsworth	George Massey	55
Cobourg	J. D. Hayden	John Fisher Col. H. H. Skill.	H. J. Snelgrove	94
Durham	C. Firth	Gilbert McKechnie Thomas Brown.	Wm. Gorsline	108
Grimsby	Mrs. E. J. Palmer	L. Woolverton Mrs. A. G. Pettit.	E. H. Read	74
Hagersville	Wm. Harrison	D. J. Lindsay Thomas Harris.	S. W. Howard	51
Hamilton	A. Alexander	W. F. Burton Wm. Ogilvie.	J. M. Dickson	72
Iroquois	W. A. Whitney	Mrs. Alva Brouse Dr. John Harkness.	A. E. Overell	50
Kincardine	A. C. Washburn	George Sturgeon Mathew McCreath.	Joseph Barker	59
Leamington	J. L. Hilborn	John D. Ross	E. E. Adams	37
Lindsay	Col. J. Deacon	A. Cathro R. Chambers.	F. Frampton	111
Meaford	O. Boden	Chas. Ellis	A. McK. Cameron	72
Midland	W. J. Parkhill	Mrs. P. Potvin Mrs. John Rowe.	Miss M. Tully	54
Napanee	Mrs. W. H. Wilkison	T. M. Henry	J. E. Herring	66
Niagara Falls South.	W. P. Lyon		Thos. J. Robertson	97
Oakville	George A. Jacobs	Claude C. Heaven A. D. Chisholm.	W. W. Paterson	95
Orangeville	John McLaren	W. L. Walsh Henry Gillespie.	Wm. Judge	53
Owen Sound	Archdeacon Mulholland	Thos Gordon Richard Trotter.	Jas. H. Packham	56
Paris	P. Buckley	A. G. H. McCormick	C. H. Roberts	59
Picton	Thomas Bog	J. R. Brown Mrs. H. W. Branscombe	Walter T. Ross	83
Port Colborne	W. W. Kinsley	S. J. McCoppen Mrs. D. W. Carter.	A. E. Augustine	51
Port Dover	James Symington	Peter Lawson Wm. Stamp.	W. J. Carpenter	70
Port Hope	H. H. Burnham	Wm. Craig Peter Brown.	A. W. Pringle	120
Sarnia	Hon. A. Vidal	T. C. Wheatley James Macklin.	T. G. Gordon	71
Seaforth	B. B. Gunn	Mrs. T. O. Kemp Mrs. C. W. Papst.	F. G. Neelin	69
Simcoe	H. H. Groff	J. H. Ansley W. F. Kydd.	Henry Johnson	66
Smith's Falls	Dr. J. S. McCallum	Mrs. Wm. Richey Mrs. George Steele.	R. Graham	146
Stirling	Mrs. James Boldrick	J. S. Carstairs Mrs. E. F. Parker.	James Currie	51
Thornbury	Joseph Dibbs	Mrs. W. L. Tyson Dr. Hurlburt.	Miss Helen Henman	53
Trenton	Dr. W. S. Jacques	Mrs. W. H. Berkinshaw. Mrs. J. H. Stewart.	S. J. Young	59
Waterloo	James Lockie	George Bolduc Mrs. P. Hopmeier.	J. H. Winkler	155
Woodstock	D. W. Karn	G. R. Pattullo T. H. Parker.	James S. Scarff	68
Windsor, Sandwich and Walkerville	Stephen Lusted Windsor P.O.	Elias Wills Windsor P.O. Donald Grieves, Windsor P.O.	F. P. Gavin Windsor P.O.	54

INDEX.

FOURTH 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

1897.

(PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE, TORONTO.)

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1898.

FOURTH ANNUAL REPORT

OF THE

ONTARIO FRUIT EXPERIMENT STATIONS

897.

To the Honorable John Dryden, Minister of Agriculture for Ontario:

SIR,—In submitting to you this our fourth annual report, we desire to call your attention to the large amount of work accomplished, considering the short time our stations have been in operation. In strawberries and raspberries, especially, owing to their early fruit bearing, we are able to give the public much valuable information. The illustration and description of our Canadian fruits is also included, but the progress must necessarily be slow until careful records have been completed.

We have the honor to be, Sir,

Your obedient servants,

JAMES MILLS,
Chairman.

L. WOOLVERTON,
Secretary.

BOARD OF CONTROL, 1898.

REPRESENTING THE COLLEGE.

JAMES MILLS, M.A., LL.D., Guelph ..... President.
H. L. HUTT, B.S.A., Guelph ..... Horticulturist.

REPRESENTING THE FRUIT GROWERS' ASSOCIATION FOR 1898.

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EXECUTIVE COMMITTEE.

Chairman—JAMES MILLS, M.A., LL.D.
Secretary—L. WOOLVERTON, M.A.
Official Visitor—H. L. HUTT, B.S.A.

THE ONTARIO FRUIT EXPERIMENT STATIONS.

	Name.	*Specialty.*	*Experimenter.*
1.	Southwestern	Peaches	W. W. HILBORN, Leamington, Ont.
2.	Niagara	Tender Fruits	Martin BURRELL, St. Catharines, Ont.
3.	Wentworth	Grapes	Murray PETTIT, Winona, Ont.
4.	Burlington	Blackberries and Currants	A. W. PEART, Freeman, Ont.
5.	Lake Huron	Raspberries and Commercial Apples	A. E. SHERRINGTON, Walkerton, Ont.
6.	Georgian Bay.	Plums	John G. MITCHELL, Clarksburg, Ont.
7.	Simcoe	Hardy apples and hardy cherries	G. C. CASTON, Craighurst, Ont.
8.	East Central	Pears and Commercial Apples	R. L. HUGGARD, Whitby, Ont.
9.	Bay of Quinte	Apples	W. H. DEMPSEY, Trenton, Ont.
10.	St. Lawrence	Hardy Pears, Hardy Plums.	Harold JONES, Maitland, Ont.
11.	Strawberry sub-station		E. B. STEVENSON, Guelph.
12.	Gooseberry sub-station		Stanley SPILLETT, Nantyr.
13.	Cherry Station and General collection of fruits for descriptive work.	Cherries	L. WOOLVERTON, Grimsby.

CONTENTS.

FRUITS OF ONTARIO.

Described and Illustrated by Mr. L. Woolverton, Secretary of the Ontario Fruit Experiment Stations.

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, and in particular the work of Mr. E. B. Stevenson, Freeman, Ontario, in describing strawberries. 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 fruits 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 or criticism from pomologists generally.

APPLES.

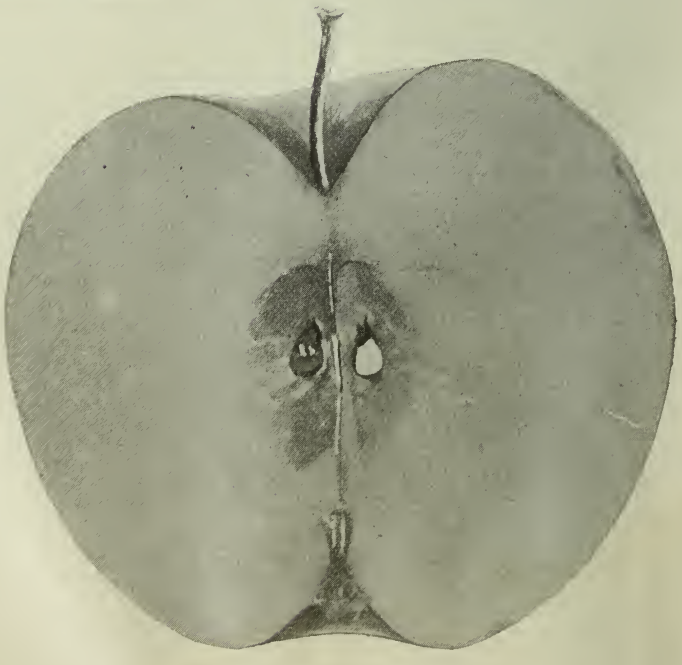
GIDEON.

A very pretty apple, of about same season as Duchess, and less desirable, because it is inclined to rot at the core; it is also less highly colored. These faults will prevent its being popular as an export apple.

ORIGIN, Peter M. Gideon, Excelsior, Minn., U.S., of same parentage as Wealthy.

TREE, vigorous, hardy, holds fruit well.

FRUIT, large, 3 inches by 3½ wide, round or slightly conical; skin white with bright red cheek shaded with deeper red splashes, dots, white, obscure; cavity, broad, deep, regular or slightly corrugated; stalk, 1 inch, slender; calyx half closed, in a small, corrugated basin.



FLESH, white, flakey, tender, almost melting, yet crisp, fine, juicy, and of good flavor.

SEASON, September to November.

QUALITY, dessert poor, cooking fair.

VALUE, for home market, first; foreign, 4th rate.

KENTISH FILLBASKET.

An old English variety of great beauty of appearance and enormous size, often exceeding four inches in diameter. It is not, however, much grown in the commercial orchards of Ontario, being a fall apple, ill adapted to export, unless by cold storage, and of very ordinary quality.

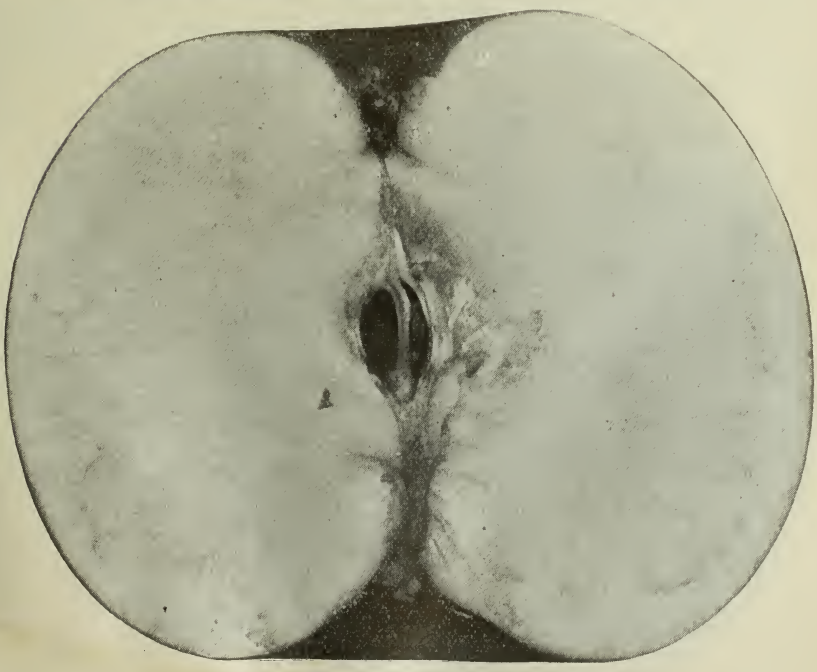
ORIGIN, England; tree vigorous, fairly productive, semi-hardy.

FRUIT, very large, three by four inches, globular, slightly ribbed; color, smooth, shiny, light green or pale yellow, sometimes almost white, and on sunny side splashed and striped with bright red; stem stout, short, ¼ inch, set in a large cavity; calyx closed, set in a large plaited basin.

FLESH, fine grained, tender and juicy; flavor, mild, sub-acid.

SEASON, October to December.

QUALITY, poor for dessert, good for cooking, good for home market, and poor for foreign market.



KENTISH FILLBASKET.

ADAPTATION, north shore lake Ontario and Erie, east shore lake Huron. The sample photographed was grown at our Bay of Quinte station in 1896.

SWEET BOUGH.

(Large Yellow Bough of Downing.)

An excellent dessert apple, ripening about the same season as the Early Harvest ; not subject to scab, and a favorite with those who prefer a sweet to a sour apple. Not profitable to grow for market, but it deserves a place in every collection for home use. Baked whole it is delicious, eaten with cream.

Sweet Bough. (Reduced.)

Origin, United States.

Tree, of medium vigor, never attaining a large size, and, therefore, even with a full crop, not very productive. Bears full every alternate year ; head compact.

Fruit, large, ovate, conical ; skin smooth, greenish yellow ; stem one inch long, in a narrow, deep, regular cavity ; calyx open, in a shallow, irregular basin.

Flesh, white, fine grained, tender and juicy ; flavor moderately sweet, rich and agreeable.

Season, July 25 to Aug. 10.

Quality, dessert very good, cooking poor, except for roasting ; home market, poor to good, foreign market, useless.

Adaptation, succeeds well in Niagara district.

YELLOW TRANSPARENT.

An apple which may prove a substitute for the well-known Early Harvest, which is so subject to apple scab. This variety seems to be proof against fusicladium, both in leaf and fruit.

YELLOW TRANSPARENT.

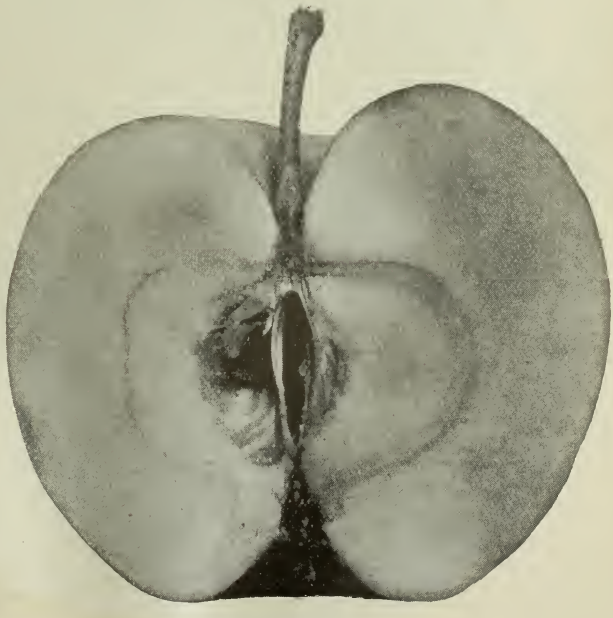
ORIGIN, St. Petersburg, Russia. Imported by the U. S. Department of Agriculture in 1870.

TREE, hardy, vigorous, upright, annual bearer, productive, began bearing at four years at Craighurst station.

FRUIT, above medium, roundish, oblate, inclined to be conical ; skin, clear white, yellowish white when very mature ; dots, light green, obscure ; stalk, medium, in large cavity ; calyx closed in medium slightly corrugated basin ; fruit hangs well on the tree.

FLESH, white ; firm till very ripe, then tender ; quality, second class.

ADAPTATION. Tested at Maplehurst, Grimsby ; at Simcoe station, and distributed widely by Ontario Fruit Growers' Association in 1886.



YELLOW TRANSPARENT. (Section.)

PEARS.

ANJOU.

(*Beurre d'Anjou, Ne Plus Meuris of Le Roy.*)

A fine market pear, succeeding admirably on the quince, but on the pear the tree is not so productive, nor the fruit so large. Its fine size, and melting buttery texture, make it a favorite market pear for the month of December, and the experience of 1897 proves it a desirable variety to export to Great Britain.

ORIGIN, Louvain, Belgium, about 1823; named Ne Plus Meuris, after Father Meuris.

TREE, a vigorous, strong grower; productiveness scarcely first rate even on the quince, third rate on the pear.

FRUIT, large, some samples in 1897 measuring $4\frac{1}{4}$ inches long by $3\frac{1}{2}$ wide; form, obovate, blunt pyriform, sides often uneven, and samples not very uniform; skin, thick, yellow at maturity, with greenish patches and brown dots, brownish red on sunny side; stem, scarcely half an inch long, stout and fleshy; calyx, open, set in a shallow basin; core small, seeds few, if any.

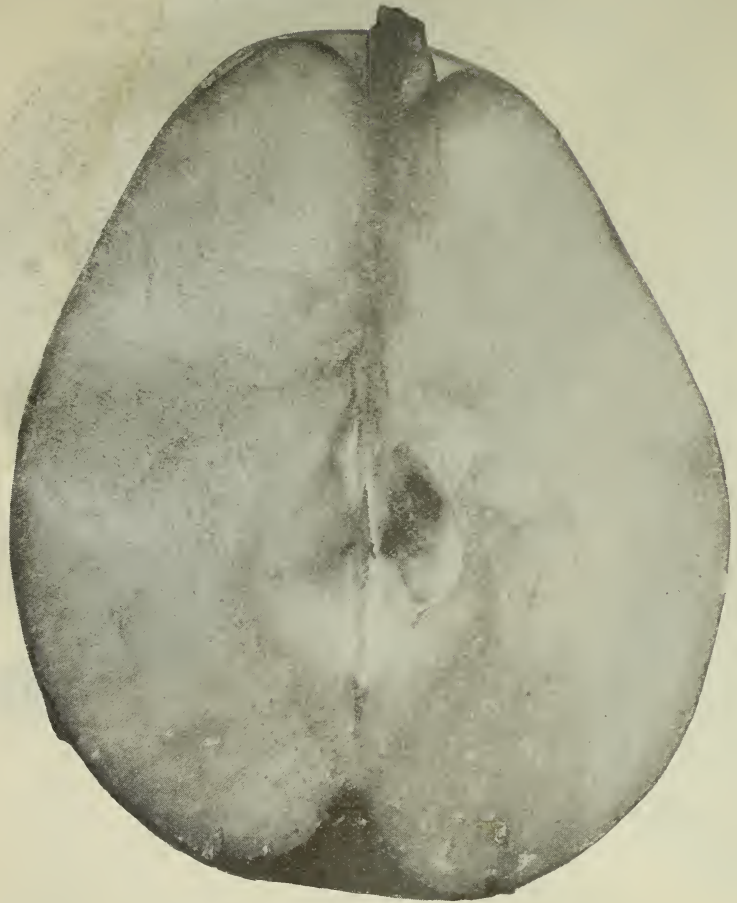
FLESH, white, fine grained, buttery, melting; flavor, pleasant, perfumed, not very sweet.

SEASON, November and December.

QUALITY, table or cooking, second rate.

VALUE, home market, first rate; foreign market, second rate.

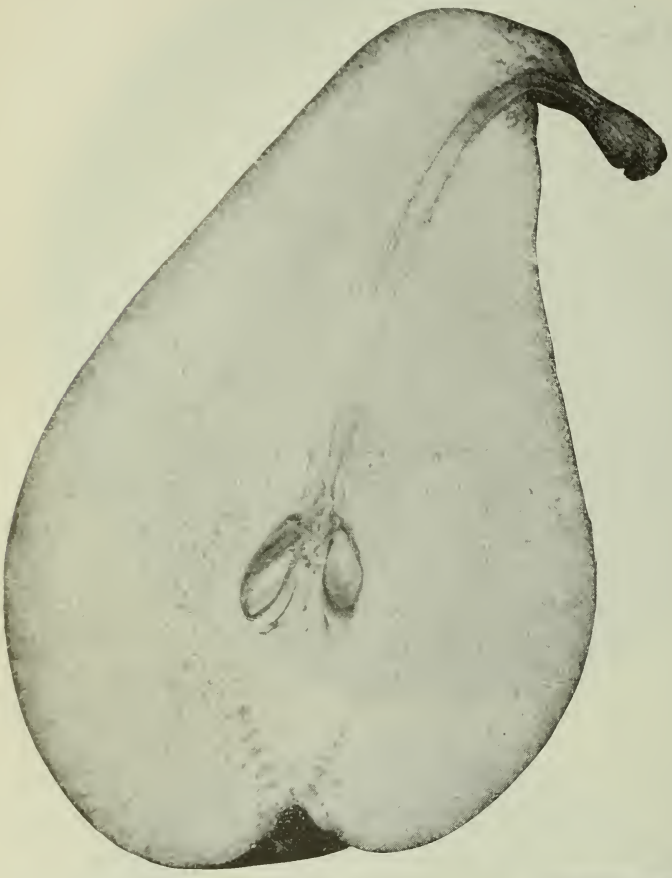
ADAPTATION, succeeds admirably south of Toronto.



Section of Anjou.

Anjou.

BEURRE CLAIRGEAU.



As a commercial pear, especially for a distant market, we know of no variety of the same season that is superior to this variety. Its large size, and the beautiful cheek which it takes on during the month of October, its excellent shipping and keeping qualities, all these combine to make it a profitable variety, and one that is easily grown, either as dwarf or standard, though usually large and fine sized as the former. The quality is variable according to the conditions of growth; in France it is counted first quality; in England, third quality; with us, when well ripened, it is second rate.

ORIGIN, Nantes, in France, with a gardener named Clairgeau, about 1834.

TREE, first class in vigor, hardiness and productiveness; wood, stout, and upright in habit of growth; branches, numerous, grown as a dwarf can be trained to make a fine pyramid; an early bearer.

FRUIT large, 4½ inches long by 3½ inches in width, one-sided, pyriform; skin, green, turning pale yellow at maturity, almost overspread with splashings and dots of russet, which completely covers it about the stalk and about the calyx; orange red on sunny side; stalk, ¾ inch long, stout, fleshy at the base, usually set at an angle with the axis; calyx, small, open, in a shallow furrowed basin.

FLESH, white, coarse grained, juicy, with sweet, aromatic and vinous flavor.

SEASON, Oct. to January.

VALUE, home or foreign market, first rate.

QUALITY, cooking, good; dessert, second rate.

ADAPTATION, succeeds admirably as far north as Thornbury; and east as far as Prescott.

BEURRE DIEL.

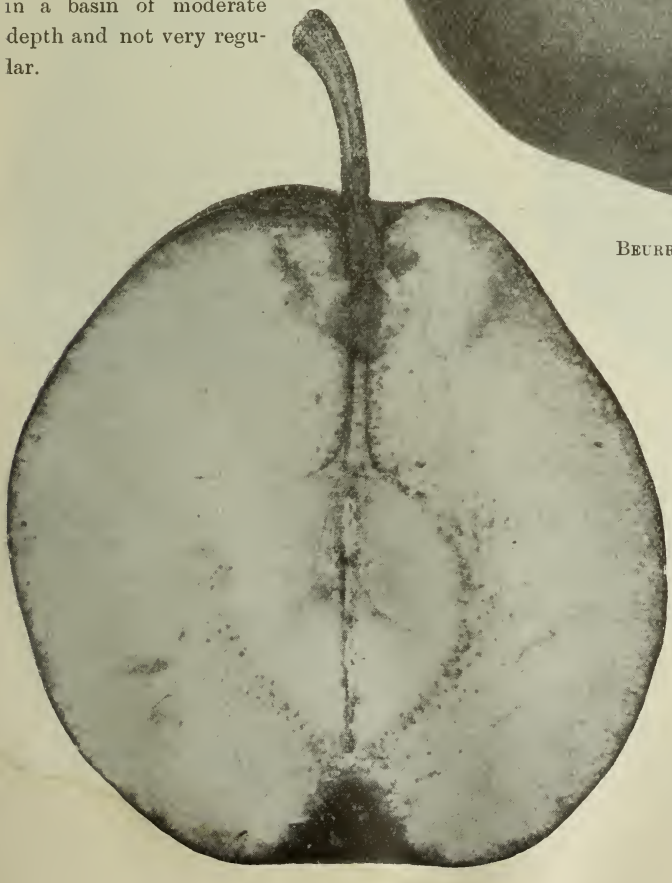
A pear of ordinary appearance as grown in Southern Ontario, but of such size and excellent quality that it deserves a place in every collection, whether for home use or market.

ORIGIN, a chance seedling near Brussels, Belgium, named in honor of Dr. Diel, a German pomologist.

TREE, very vigorous, hardy and productive.

FRUIT, large to very large; obovate; stem pale green, turning yellow at maturity, with numerous large brown dots and patches of russet; stem, curved, stout, from 1 inch to 1¼ inches long, set in an open uneven cavity; calyx, open, in a basin of moderate depth and not very regular.

BEURRE DIEL.



BEURRE DIEL. (Section.)

FLESH, cream color, moderately fine, except at the core, juicy, buttery, aromatic, sweet, and when well grown and well ripened very delicious.

SEASON OF USE, November and December, just preceding the Lawrence.

QUALITY, dessert, very good.

VALUE, home market, second rate, because lacking in color; foreign market, possibly first rate, because it carries well and has fine flavor, but not yet tested in this respect.

ADAPTATION, not yet proved (1897).

BUFFUM.

Formerly this pear was much in favor as a profitable orchard variety, because of its productiveness and the wonderful hardiness and vitality of the tree, but of late years it is much less in favor with pear growers on account of its small size and ordinary quality. Some trees of this variety at Maplehurst, forty years planted, have never shown the slightest tendency to blight, and have attained a great height, more resembling Lombardy poplars than pear trees.

ORIGIN, Rhode Island.

TREE, remarkable for its vigorous, symmetrical, erect habit of growth ; it is regularly and fairly productive, but unless gathered early the fruit drops badly ; not subject to blight.

BUFFUM. (Reduced.)

BUFFUM. (Section reduced.)

FRUIT, medium size, obovate, slightly oblong, sometimes $2\frac{3}{4}$ inches long by $2\frac{1}{2}$ inches wide ; skin, rough, yellow at maturity, with bright or dull red or russet on sunny side ; dots, small, brown ; stalk, $\frac{3}{4}$ inch long in a small cavity ; segments of calyx small, in a small basin.

FLESH, yellowish white, crisp, not fine, not juicy, sweet with pleasant flavor.

SEASON, September.

VALUE, dessert, ordinary ; cooking, ordinary.

ADAPTATION, counted hardy in Bruce and Huron Counties ; slightly tender in North Ontario County.

CHAMBERS.

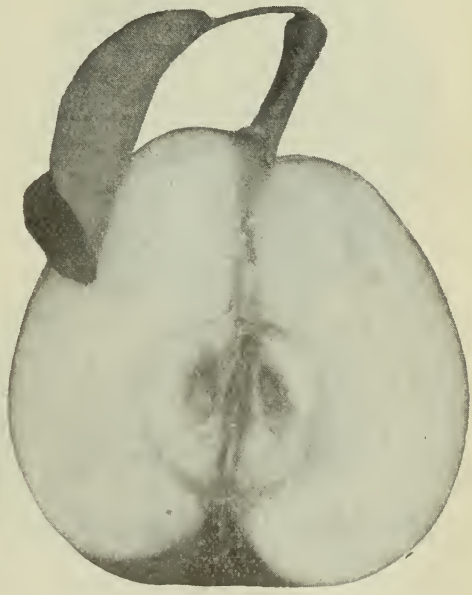
(Early Harvest.)

The Chambers pear has been grown at Grimsby and Maplehurst for about ten years on dwarf stock and commends itself as a fine market variety for the beginning of August, for it is a good quality, large, and the tree is productive. Commended in Kentucky.

ORIGIN, America.

TREE, vigorous, very hardy, productive.

CHAMBERS. (Reduced.)



CHAMBERS. (Section, full size.)

FRUIT, of medium size, $2\frac{1}{4}$ inches long by $2\frac{1}{2}$ inches in diameter ; form obtuse, obovate, pyriform ; color, pea green, turning yellow when fully mature, with numerous brown and green dots, and reddish brown cheek on sunny side ; stalk, stout, 1 inch long, set on an angle in a flat cavity, often one prominent ; calyx, small, closed ; seeds, few.

FLESH, white, fine grained, tender, fairly juicy ; flavor, aromatic, sweet and pleasant.

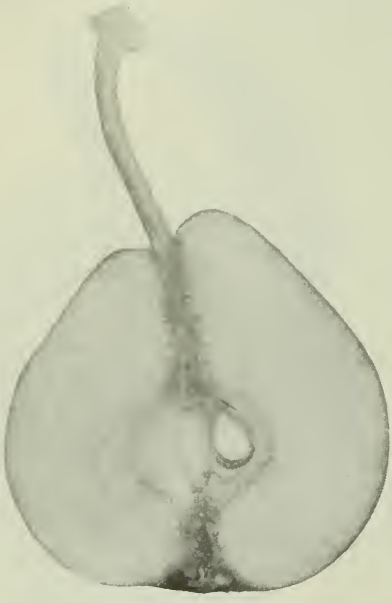
SEASON, August 1st to 10th.

QUALITY, second rate.

VALUE, for a near market, first rate.

PETITE MARGUERITE.

Among the desirable varieties of dessert pears for the home garden we would certainly include the Petite Marguerite, a pear of the highest quality for table use. At Maplehurst the tree has proved itself an abundant bearer and a good grower. The fruit is not large, but as size is not an object in a dessert pear, this is not a fault. Its season is immediately after the Giffard and just before the Clapp and the Tyson. As a market pear it is hardly to be commended, because of its small size and color ; and it will be a long time before we can convince the average dealer that size and color are not the chief considerations in a fruit.



(Section reduced.)

PETITE MARGUERITE (Reduced).

ORIGIN, Angers, France, in nurseries of Andre LeRoy.

TREE, second rate in vigor, and first rate in productiveness ; succeeds as either standard or dwarf, but more vigorous as a standard.

FRUIT, medium size, about $2\frac{3}{8}$ in either diameter ; form, oblate, obtuse pyriform ; skin, light green, often tinged and mottled with bright red on sunny side, yellowing somewhat at maturity ; stalk, $1\frac{1}{4}$ inches to $1\frac{1}{2}$ inches in length, set in a narrow cavity, of which one side is often much higher than the other ; calyx, partly open, in a shallow corrugated basin.

FLESH, white, yellowish at core ; texture, fine, melting, juicy ; flavor, sweet, vinous, agreeable.

SEASON, August 20 to 30.

QUALITY, first rate for dessert, second rate for cooking.

VALUE, home market, second rate.

PEACHES.

EARLY PURPLE.

For home use, as a dessert peach, this is one of the best of its season. Between 1860 and 1870 this variety was grown as the earliest market peach in Southern Ontario, but its extreme tenderness of flesh and rapid softening after maturity led to its giving place to other varieties.

EARLY PURPLE. (Reduced.)

TREE, thrifty, vigorous, hardy, fairly productive.

FRUIT, size $2\frac{1}{8}$x2 inches ; form, irregular, ovate, one-sided ; skin, bright red, downy ; basin, deep ; stone, almost free.

EARLY PURPLE. (Section reduced.)

FLESH, greenish white in color ; texture, very tender, very juicy, melting ; flavor, sweet, rich, very agreeable.

SEASON, August 25th to September 1st (in 1897).

QUALITY, dessert, second rate ; cooking, fourth rate.

VALUE, near market, third rate ; distant market, of no use.

ADAPTATION, Southern Ontario.

CHERRIES.

Classification.

In describing the cherries the following general classification is followed, though for convenience the varieties are arranged in alphabetical order. In some cases it is impossible to place a variety because of the crossing of one variety with another, which renders the classification almost useless.

I. Prunus Cerasus (Sour Cherry Class).

(a) *Kentish*—Pale red, with uncolored juice.
(b) *Morellos*—Dark red fruits, with dark colored juice.

II. Prunus Avium (Sweet Cherry Class).

(a) *Mazzards*—European seedling cherries, of vigorous habit.
(b) *Hearts*—With soft-fleshed, heart-shaped fruit.
(c) *Bigarreaus*—Hard-fleshed, mostly light colored skin, and heart-shaped.
(d) *Dukes*—Tree of upright, vigorous growth, leaves fastigiate, fruit mostly acid or sub-acid.

BLACK EAGLE.

A very excellent dessert cherry, well deserving a place in the home garden, but not sufficiently productive to be recommended for the commercial orchard. The average annual yield of large trees at Maplehurst is from twenty-five to thirty quarts. The fruit is usually in scattered clusters, and often borne singly, making the gathering expensive. In England this variety is more productive than in Canada.

Black Eagle. (Reduced.)

Origin, England, 1810, by Miss E. Knight, of Downton Castle, from Bigarreau and May Duke.

Tree, second rate in vigor, of a round spreading habit, third rate in productiveness ; class, Bigarreau.

Fruit, medium to large, averaging about $\frac{13}{16}$ long by $\frac{15}{16}$ of an inch wide; form, obtuse heart-shaped, almost roundish oblate ; skin, dark purple, becoming almost black ; stalk, slender, $1\frac{1}{2}$ to $1\frac{3}{4}$ inches in a medium cavity ; suture obsolete ; stone, small.

Flesh, dark purple ; texture, tender and juicy ; flavor, very sweet, rich and delicious.

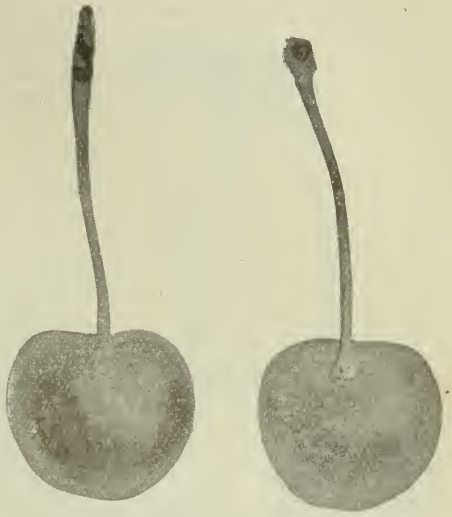
Season, July 8th to 15th (1897).

Quality, first-rate for dessert purposes and for near markets ; second rate for distant markets because it soon decays.

COE.

(*Coe's Transparent*).

A good variety for the home garden, but altogether too tender to be popular for the commercial orchard.



COE'S TRANSPARENT.

ORIGIN, in Connecticut, with Curtis Coe, of Middleton.

TREE, healthy, fairly vigorous, with round spreading head, third rate in productiveness; class, Heart.

FRUIT, medium to large, about one inch long by one inch broad, round and regular in form; skin, thin, bright shiny amber, nearly covered with rich cornelian, marked with peculiar mottled blotches; stalk one and a half to two inches long set in a medium wide cavity; suture obscure.

FLESH, very pale yellowish tint; texture very soft and tender, juicy; flavor sweet and very good if not left hanging too long.

SEASON, July 7th to 14th (1897).

QUALITY, second rate for dessert; second rate for home market; fourth rate for distant market.

ADAPTATION, south of Lake Ontario.

KOSLOV-MORELLO.

Fifty trees, small seedling trees, of this cherry were sent to the Secretary of the Ontario Fruit Growers' Association by Jaroslav Niemetz, of Winnitza, Podolie, Russia, in 1889, and by him distributed among the directors.

KOSLOV-MORELLO.

Some of these trees were planted at Maplehurst, and, although still only bushes, they bore quite freely in 1897. Mr. Niemetz claims that it will endure almost any degree of cold, and that it begins bearing at the age of four or five years from the pit, which he claims is the best method of propagating it (see C. Hort., 1869, p. 218). The fruit closely resembles that of the Morello (English).

TREE, bush form, very slow grower, slender, hardy, productive.

FRUIT, fairly large, round, pointed at apex, dark red, turning black at maturity; stalk $1\frac{1}{2}$ inches long in a slight depression; suture, barely traceable.

FLESH, red, turning dark red at maturity; texture, tender, juicy, acid, becoming milder as it hangs.

SEASON, July 20th to August 20th.

ADAPTATION, the northern limit of cherry culture.

HORTENSE.

(*Reine Hortense.*)

One of the finest flavored of cooking cherries, and one which deserves the first place in the home garden. It is not as productive as the May Duke, but from its habit of fruiting singly is less subject to rot than that excellent variety.

HORTENSE.

ORIGIN, France, in 1832, by M. Larose, Neuilly; first fruited in 1838.

TREE, of Duke habit, a vigorous and handsome grower and fairly productive; class, Duke.

FRUIT, large to very large, roundish, elongated, sides slightly compressed; skin, thin, light shining red mottled with darker red, becoming richer in color the longer it hangs; stalk slender, about two inches long.

FLESH, creamy yellow, netted, very tender, juicy; flavor, slightly sub-acid, excellent.

SEASON, July 10th to 15th in 1897.

QUALITY, first-class for cooking and second to first for market.

ADAPTATION, succeeds perfectly south of Lake Ontario.

KNIGHT.

(*Knight's Early Black.*)

A delicious early black cherry, ripening about a week in advance of Black Tartarian. It is a regular and even bearer, one tree thirty years old at Maplehurst yielded 200 quarts in 1896 and sixty quarts in 1897, but the former was an exceptional instance, the average would be from seventy-five to 100 quarts per annum. The fruit is borne singly or, occasionally, in pairs, and therefore is not gathered as rapidly as those varieties which grow in clusters. It is one of the most valuable dessert cherries, but not as productive as the Tartarian.

ORIGIN, England, by T. A. Knight, in 1810, from Bigarreau crossed with May Duke.

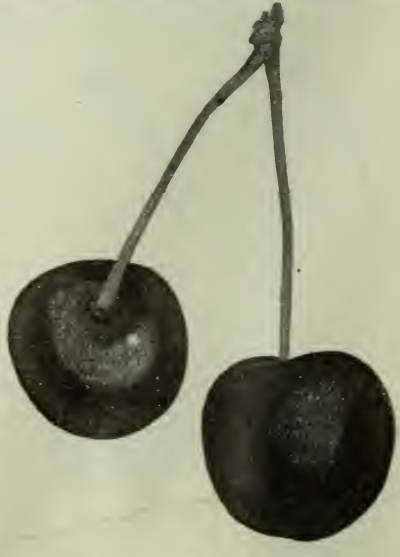
TREE, healthy, fairly vigorous, with spreading head, second rate in productiveness; class, Heart.

FRUIT, medium to large, obtuse, heart-shaded, uneven; skin, dark red or purple, becoming almost black if allowed to hang; stalk two inches long in a rather large cavity.

FLESH, dark red to purple; texture, tender and juicy, but firmer than Tartarian; flavor, sweet, rich and delicious; stone, small.

SEASON, July 1st to 6th (1897).

QUALITY, first-rate for all purposes.



KNIGHT'S EARLY BLACK.

MAZZARD.

Black Mazzard (Downing), Merisier (Leroy), Corone (Hogg),

The common English black cherry, which is indigenous to the continent of Europe, and has now become naturalized in North America, is the original species from which the excellent heart cherries have originated. Seedlings of this class of cherries are grown extensively by nurserymen as stock upon which to propagate the finer varieties, as standards.

MAZZARD.

The fruit of these seedlings varies considerably, often being small and rather bitter in flavor, and consequently of no value for market ; but occasionally we find one large enough to be worth cultivating, and of fairly good quality.

ORIGIN, Europe.

TREE, very vigorous and healthy, often reaching thirty feet in height and spreading over an area as many feet in diameter ; class, Heart.

FRUIT, small, heart-shaped, or round, a little flattened ; suture evident on one side ; skin, shiny black, thin ; stalk, inch and a half to two inches long.

FLESH, soft, melting, juicy, often somewhat bitter.

SEASON, July 10th to 25th.

QUALITY, 4th class for dessert, 3rd class for cooking.

VALUE, 4th rate for all purposes.

ADAPTATION, southern part of the Province.

MEZEL. (*Monstreuse de Mezel*, Bigarreau of Mezel.)

One of the finest of the late black cherries, of large size and great productiveness. Though a Bigarreau it has not the fault of its class of being especially subject to rot ; it is not so black in color as the Elkhorn, or even the Windsor, but dark enough a red to be classed with the black cherries. One tree thirty years of age, at Maplehurst, yielded 225 quarts in 1897.

MONS. DE MEGEL.

ORIGIN, Mezel, France ; first introduced in 1846.

TREE, upright, spreading, a very vigorous grower ; one tree at Maplehurst forty years planted was thirty feet in height in 1897, and covered an area about the same number of feet in diameter ; first rate in hardiness and in productiveness.

FRUIT, very large, fifteen-sixteenths of an inch long by one inch in width ; obtuse heart shaped, slightly flattened, with a clearly-defined suture on one side, ending in a slight nipple ; skin, dark red at first, changing to dark purple at maturity ; stalk, two inches long, slender, set in good sized cavity.

FLESH, firm, juicy breaking ; flavor, sweet good.

SEASON, July 12th to 20th (1897).

QUALITY, for dessert, first rate.

VALUE, for a distant market, first rate.

MORELLO. (*English Morello.*)

An old reliable variety for cooking purposes, known in England for nearly three hundred years, and deserving of wider cultivation in Ontario. Downing thinks the name Morello is from *Morus*, the Mulberry, from the dark purple color of its juice, which resembles that of the latter.

TREE, habit, spreading, slender ; hardy and productive ; vigor, medium.

FRUIT, fairly large, roundish, nearly heart shaped, somewhat flattened on one side, with a slightly traceable suture.

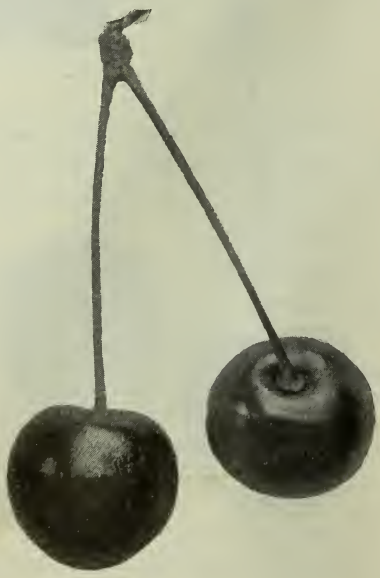
SKIN, red, turning dark red or purple towards maturity ; stalk about $1\frac{3}{4}$ inches long, inserted in a shallow cavity ; stone small, slightly cling.

FLESH, very dark red, texture, tender, juicy, acid, becoming more subacid and agreeable the more it matures.

SEASON, July 20 to Aug. 10, in 1897.

QUALITY, dessert, 4th class ; cooking 1st class.

VALUE, home market, second rate.

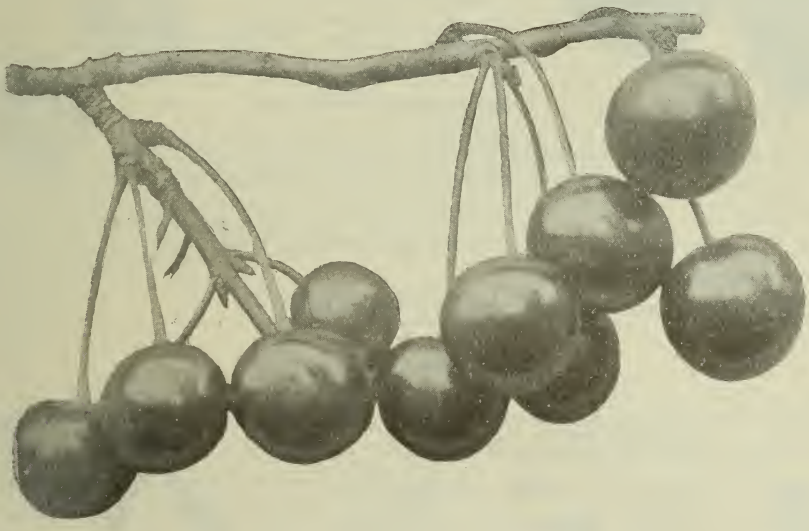


MORELLO.

OSTHEIM.

(*Griotte d'Ostheim.*)

This and the Vladimir were distributed throughout the Province of Ontario a few years ago by the Fruit Growers' Association. The Vladimir is of little or no use, but the Ostheim is a fair size, productive enough to be profitable, and good for all purposes. Its hardiness should make it a special favorite in the colder sections, to succeed the Montmorency. Possibly ours is not the true Ostheim of LeRoy.



ORIGIN, of true Ostheim, South of Spain, brought to Germany early in the 18th century, and cultivated near Ostheim, in Saxe-Weimar, whence its name.

TREE, third rate in vigor, almost a dwarf, first in hardiness, and second rate in productiveness; class, Morello.

FRUIT, medium, about $\frac{9}{16} \times \frac{13}{16}$ of an inch in length and breadth. The variety must vary, since Dr. Hogg describes it as large, and LeRoy describes the stalk two inches long set in a pronounced cavity. Round, slightly depressed at the side; color, very dark purple, almost black when ripe; stalk, one and three-eighths inches in ones and twos; suture not traceable; pit, small, cling.

FLESH, very dark purple, tender, juicy, almost sweet when ripe, agreeable.

SEASON, July 18th to 30th, or even longer, improving in flavor the longer it hangs.

QUALITY, third rate for dessert; second rate for cooking.

VALUE, for market, third rate.

ADAPTATION, quite general.

MAY DUKE.

(*Early Duke, Royal Hative.*)

The staple variety of cooking cherry in its season, both for home use and market. The great productiveness, health and vigor of the tree, the mild acid of the fruit ripening over a considerable season, all tend to make this a favorite variety in all cherry growing districts. The fruit is rather tender for distant shipments.

ORIGIN, Médoc, a Province in France, from whence the name is said to be a corruption.

TREE, upright, of fastigiate head, especially noticeable in young trees; vigorous, hardy, and productive; class Duke.

MAY DUKE.

FRUIT, roundish, obtuse, heart-shaped, with traceable suture, and distinct indentation to apex; grows in clusters; skin bright red turning darker at full maturity; stalk 1½ to 2 inches long; stone small.

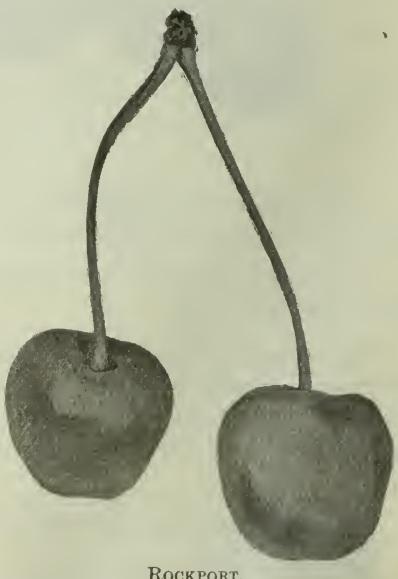
FLESH, red, tender, very jucy; flavor, sub-acid, and very good.

SEASON, June 12th to 20th (1897).

QUALITY, Second rate for dessert; first rate for cooking.

ROCKPORT.

A Bigarreau originated by Prof. Kirtland, of Cleveland, Ohio. Its season of ripening in about the same as Governor Wood, but it is a heavier bearer of fruit about the same size and less highly colored. It would be profitable were it not so subject to rot, but nearly every year we have lost a large portion of the crop of this variety at Maplehurst from this cause. In the season of 1896 there was no rot, and a tree of this variety yielded about 100 quarts. Like the other bigarreaus, it is too firm a cherry to be a favorite with the birds.



ROCKPORT.

TREE, upright, spreading, fairly vigorous and very productive.

FRUIT, large, roundish, obtuse heart-shaped; skin, amber, nearly covered with bright red.

FLESH, pale yellow; texture, firm, juicy, flavor, sweet and good.

QUALITY, dessert or cooking, medium. Home market, medium.

SEASON, June 17th to 30th.

ADAPTATION. Southern Ontario.

VLADIMIR.

A Russian variety from Vladimir district, distributed by the Ontario Fruit Growers' Association in 1887. It has been growing for these ten years at Maplehurst, and reckoned unprofitable. The fruit is very scattered, smaller than the ordinary seedling Mazzard, and very subject to curculio. It is not to be compared in value with the Osthem which is of the same season or a trifle later.

VLADIMIR.

TREE, slow, weak grower; rather a bush than a tree; unproductive; class, Morello.

FRUIT, small, round; skin dark purple, almost black at maturity; stalk $1\frac{3}{8}$ inch long, in very shallow cavity; stone very small.

FLESH, tender, purple, colored juice; texture, melting, juicey; flavor slightly sub-acid, fair.

SEASON, July 15th to 25th (1897).

QUALITY, fourth rate for either home use or market.

ADAPTATION, general.

YELLOW SPANISH.

Of all the Bigarreau cherries this is one of the finest, both on account of its great size and its delicious flavor. The tree grows to a very large size, surpassing in this respect any other cultivated variety with which we are acquainted. It does not average very productive, because the fruit often blasts and drops, or is destroyed by Monilia. When, however, it does mature a good crop, as in 1896, the yield is wonderful; indeed in 1896 one tree at Maplehurst yielded 360 quarts of beautiful fruits! This of course was an exceptional yield (See engraving of fruiting branch.)

The variety is of European origin, and was introduced into the United States in 1800.

TREE, very vigorous, of large growth, spreading, very productive.

FRUIT, very large and of a beautiful waxy lustre; form, round, obtuse, heart-shaped; skin, clear amber, nearly covered with red when exposed to the sun; stem, stout, $1\frac{1}{2}$ inches long in a wide cavity; suture, traceable.

FLESH, pale yellow; texture firm, juicy, breaking; flavor, sweet, delicious when well ripened.

YELLOW SPANISH.

SEASON, June 25th to 30th in 1896.

QUALITY, dessert very good; market very good to best.

ADAPTATION. Succeeds in peach sections, on well drained sandy soil.

GOOSEBERRIES.

DOWNING.

This has been the most popular gooseberry of American origin for some years, (1897) unless we except the Pearl, a variety of Canadian origin very similar in size and appearance. It is very widely known and planted all over the Continent of North America. It is not subject to mildew, and succeeds splendidly everywhere.

DOWNING.

ORIGIN, with Chas. Downing, Newburgh, N. Y., a seedling of Houghton.

PLANT, healthy, first rate in health and vigor and productiveness; an upright grower.

FRUIT, size, medium, $\frac{3}{4}$ inch by x$\frac{3}{4}$ broad, sometimes reaching $\frac{7}{8}$x$1\frac{3}{16}$, when allowed to hang, not too heavily loaded: form, round, often somewhat narrowed toward apex; skin, smooth, transparent green with distinct light green ribs, and a thin whitish bloom.

FLESH, light green, tender, sweet and good.

SEASON of maturity, July 18th to 25th, (1897).

VALUE, for market, third rate.

STRAWBERRIES.

AROMA.

(Perfect blossom).

AROMA.

The Aroma is a good late one, taking the place that the old Gandy occupied. The Aroma is more productive, a good pollenizer for large late pistillates. Wherever grown it is a favorite.

ORIGIN. It was produced from seed of Cumberland by E. W. Cruse, of Kansas.

PLANT. It is a good, vigorous grower, very healthy, no lust, making a good stand of large plants, quite productive.

FRUIT, is very large, bright dark red in color, fine looking berry, keeps its size well to the last picking, quite firm.

FLESH, pink, solid and good quality.

SEASON, medium to late.

ADAPTATION, does well in all soils and climates. E. B. S.

BISMARK.

(Perfect blossom.)

This is a seedling from Bubach, and in some respects an improvement, in others not as good ; it's color is not as fine as Bubach. It is a good grower and productive.

ORIGIN, it was grown from seed of Bubach crossed with Van Deman, by J. C. Bauer, of Arkansas.

PLANT, very healthy, strong, vigorous, resembles Bubach in color of leaf and style of plant ; it makes plenty of runners ; its foliage is fine ; fruit stalk is strong and medium to short ; plant quite productive.

FRUIT, large to very large, round, resembling Jersey Queen, but more conical ; gold seeds very prominent, light scarlet and bright looking, sometimes hollow.

FLESH, pink in color, medium in firmness, good flavor.

SEASON, medium to late.

ADAPTATION, good accounts come from all places where it has been tried. E. B. S.

BISMARCK.

BRANDYWINE.

(*Perfect blossom.*)

BRANDYWINE.

ORIGIN, originated in Pennsylvania, from seed of Glendale, crossed with Cumberland, grown by E. Ingram. It was introduced to the public by Mathew Crawford, of Cuyahoga Falls, Ohio, in 1894. It is a fine variety, it's only fault is, it is not as productive as we would like.

PLANT, one of the most vigorous growers, making a wide matted row if allowed to do so, in fact it makes too many plants for its own good.

FRUIT, is large, heart-shaped, fine dark scarlet in color, golden seeds quite firm.

FLESH, red, tartish, but very good quality.

SEASON, medium to late.

ADAPTATION, it does well in most soils. E. B. S.

BUBACH.

(*Imperfect blossom.*)

This is a grand stand-by and is very widely grown, is one of the largest and finest of them all. Plant is all that could be desired for fruit. Strong, deep rooted and healthy, one of the best for near-by market.

ORIGIN, it was grown by Mr. Bubach, of Illinois.

PLANT, the plant is a strong and deep rooted one, dark red foliage; no sign of disease of any kind; makes plants enough for a good fruiting row; fruit stem is short, strong and firm, productive and profitable.

FRUIT, is wonderful for its size and color; the berry is bright and showy.

FLESH, pink; medium in firmness and good quality.

SEASON, medium.

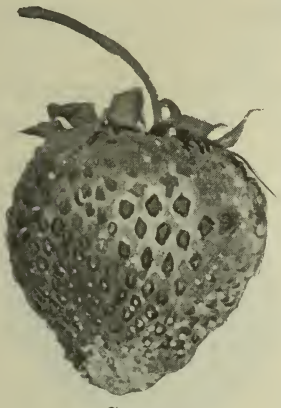
ADAPTATION, it does well in all soils. E. B. S.

BUBACH.

CARRIE.

(*Imperfect blossom.*)

The Carrie would appear to have a bright future before it. It is one of the late sorts bidding for public favor. It is a good one.



CARRIE.

ORIGINATED from seed of Haverland, by Mr. Thompson, of Virginia.

PLANT, is large, vigorous and healthy, making long and strong runners and plenty of them ; it somewhat resembles Haverland ; not as productive.

FRUIT, the fruit is not so long as Haverland, very firm, almost as firm as an apple ; the color, bright scarlet, with gold seeds.

FLESH, white and solid, good flavor.

SEASON, medium.

ADAPTATION, has done well wherever tried. E. B. S.

ELEANOR.

(*Perfect blossom.*)

The Eleanor is one of the extra early ones ; a good healthy vigorous grower ; fruit, good size, fine shape ; in wet seasons it has a kind of mildew like on the Michel's.

ORIGINATED in New Jersey, a chance seedling found by Mr. Coombe ; a good market berry.

PLANT, very healthy, vigorous grower, small and slender, dark in color, making many runners, quite productive.

FRUIT, color, dark scarlet or crimson ; medium in firmness.

FLESH, red, white center ; acid, but good flavor.

SEASON, one of the earliest.

ADAPTATION, does well in most soils.

E. B. S.

ELEANOR.

GLEN MARY.

(*Perfect blossom*).

This is a variety of great promise, it is one of the newer sorts. No doubt it will take a place among the standards on account of its size and productiveness.

GLEN MARY.

ORIGIN, a chance seedling found by J. A. Ingram of Pennsylvania.

PLANT, a very large, strong, vigorous grower, making plants freely. No sign of any disease on it. Dark, rich foliage. An ideal plant. Fruit stem, medium in length, strong enough to hold up the very large berries. Very productive.

FRUIT, very large—the largest, dark crimson in color, ribbed like the Marshall, a hard, green seedy end that does not ripen well.

FLESH, pink to white, fair quality, inclined to acid.

SEASON, medium to late.

ADAPTATION, it has done well wherever tried. E. B. S

GREENVILLE.

(*Imperfect blossom*).

The Greenville is one of the best of the Pistillate or imperfect blooming kinds, in some respects it is an improvement on the Bubach. It is a healthy, vigorous grower and quite productive, making it a good market sort.

ORIGIN, it is a chance seedling found in Ohio by Mr. Benchly.

PLANT, very heavy and vigorous grower, making plants freely, very productive.

FRUIT, dark scarlet in color, large in size, heart shaped, medium in firmness and fine looking.

FLESH, pink to white, somewhat hollow, good quality.

SEASON, medium.

ADAPTATION, Does well in all soils. E. B. S.

GREENVILLE.

JERSEY QUEEN.

(*Imperfect blossom*).

JERSEY QUEEN.

ORIGIN, unknown. This is one of the best late varieties, frequently being the highest price. The berries are large and fine looking.

PLANT is a good one, very healthy one, no sign of rust ever appearing on it, grows close to the ground, the foliage always fresh and green, when well fertilized quite productive.

FRUIT is large, round and very bright scarlet in color with gold seeds, medium in firmness, very attractive in appearance.

FLESH, white to pink, solid and fair quality.

SEASON, late to very late.

ADAPTATION, does well in most soils. E. B. S.

MARGARET.

(*Perfect blossom*).

ORIGIN, the Margaret is a good one, will be a standard. It originated in Ohio, was sown from the seed of the Crawford by Mr. Beaver.

PLANT, the plant is large and strong, sending out the largest runners of any sort, plant is very healthy and quite productive.

FRUIT is large, very regular, crimson in color, seeds golden, solid and firm.

FLESH, red, inclined to tartness but good quality.

SEASON, medium.

ADAPTATION, will suit most soils. E. B. S.

MARGARET.

MARSHALL.

(*Perfect blossom*).

MARSHALL.

This variety has perhaps received more favorable notice than most others of recent introduction. It is vigorous in growth, leaves very large and produces a quantity of very large, beautiful, dark crimson berries of fine quality.

ORIGIN, it is a chance seedling found growing on a stone heap by Mr. Ewell of Massachusetts.

PLANT, a vigorous grower, large leaves, somewhat tender both in foliage and blossom and subject to rust, medium in color, first growth being yellow, fruit stem strong and able to bear up the immense berries, medium in production.

FRUIT, is of the largest size, dark crimson, firm and fine looking, quite regular in shape, *i.e.*, each berry is of same shape but ribbed and tough seeds imbedded.

FLESH, red, with dash of white in centre, solid, fine quality, one of best for dessert.

SEASON, early to medium.

ADAPTATION, only does its best in some soils and under highest cultivation a fine one for amateurs.

E. B. S.

SAUNDERS.

(*Perfect blossom.*)

This is one of the best market sorts, producing a good crop of large fine looking berries. The better it is known the more it is grown, taking the place of the old Wilson.

ORIGIN, it was originated by John Little of Ontario.

PLANT, is a vigorous grower, making many plants and healthy. Sometimes a little rust appears when grown under unfavourable conditions. Quite productive, blooms late, thus often escapes spring frosts.

FRUIT, is large to very large and firm ; color, bright crimson.

FLESH, red, firm, and very good quality, fine for table.

SEASON, medium to late.

ADAPTATION. Has done well wherever it has been tried.

E. B. S.

SAUNDERS.

STAPLES.

(Perfect blossom.)

This is one of the extra early kinds that will make it profitable for market, having a perfect blossom. It is a good color and quite firm and good quality.

STAPLES.

Originated from seed of the Warfield by the late Mr. Staples of Ohio.

PLANT, quite healthy, making plenty of runners for a wide row if needed, quite vigorous in growth, a good early staminate to fertilize early Pistillates with.

FRUIT, dark crimson in color, firm and good flavor. Color very like Warfield. Size, medium to large; large for so early a berry.

FLESH, pink and solid, good flavor, somewhat acid yet spicy.

SEASON, extra early.

ADAPTATION, it seems to do well in most places.

E. B. S.

VAN DEMAN.

(Perfect blossom.)

This is one of the earliest; seems to do better in some places than others, some growers having discarded it while others look upon it as the best early.

ORIGIN, it comes from Arkansas, having been originated by J. C. Bauer, of Judsonia, Ark., from seed of Crescent crossed with Capt. Jack.

PLANT, is a vigorous grower, rusting somewhat in some soils; fruit stalk is medium strong, able to hold up fruit; dark in foliage; quite productive, not a heavy picking at any one time but continuing through the season.

FRUIT, bright crimson in color, gold seeds; very attractive, conical; ripens and colors all over at same time, best extra early for this.

FLESH, pink, very firm and very best quality.

SEASON, ripen with the first and continues to mid season.

ADAPTATION. Does better in some soils than others.

E. B. S.

VAN DEMAN.

WM. BELT.

(Perfect blossom.)

ORIGIN, this berry comes from Ohio, having been originated by Wm. Belt of that State. It is being grown largely as a fancy berry ; large conical berry, the first berry being sometimes very large and very irregular.

PLANT, the plant is large and strong one, but rusts sometimes very badly ; is quite productive.

WM. BELT.

FRUIT, large to very large, conical ; bright scarlet in color, medium in firmness.

FLESH, pink slashed with white, nice mild flavor, fair quality.

SEASON, medium to late.

ADAPTATION. Seems to do well in many different soils thus well suited for all sections.

E. B. S.

WM. BELT.

WOOLVERTON.

(Perfect blossom.)

Originated in Ontario by John Little, of Granton, about 1889, and sent out by him, it is now widely known as one of the best, not perhaps as productive as some, but the fruit is of the largest size and quite firm.

PLANT, a strong healthy grower ; plant is large and deep rooted ; dark in color ; makes runners freely and root easily.

FRUIT, very large, as large as Bubach ; crimson red seeds ; flesh, red and solid.

FLESH, red, milk flavor, no acid.

SEASON, late.

ADAPTATION. It seems to do well everywhere ; good accounts of it coming from all quarters.

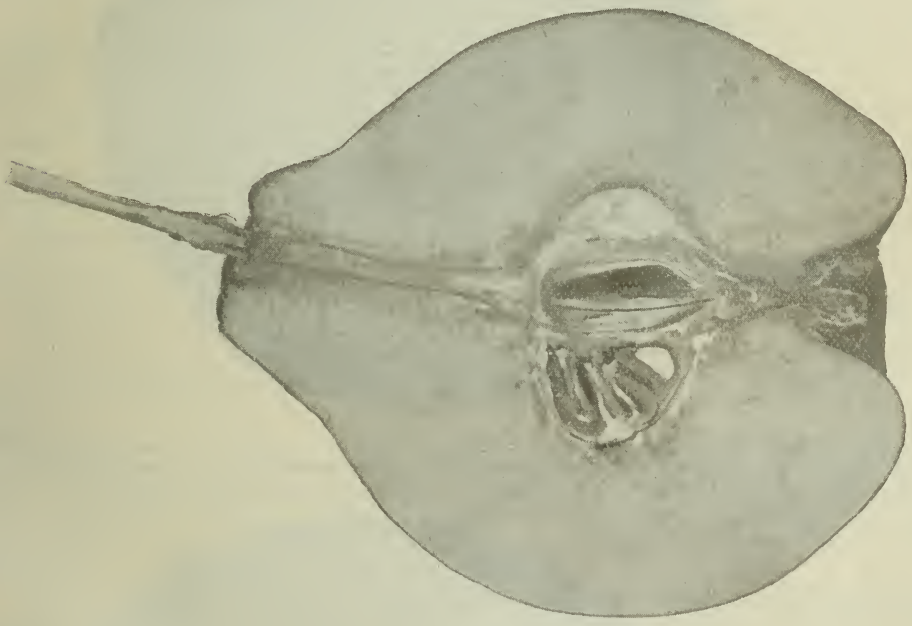
E. B. S.

WOOLVERTON.

QUINCES.

ORANGE (OR APPLE).

The leading market variety of quince in Canada. Previous to 1870, this and the Angers were the only varieties of quinces known in Ontario, the former as a stock for budding dwarf pears, and the latter as a standard market variety. The Orange quince succeeds admirably in the Niagara peninsula ripening well, taking on a beautiful rich golden color, and reaching as



fine large size, either on clay or sandy loam. In old days this variety brought $6 or $7 per barrel in Toronto market but in 1897 twenty-five and thirty cents per twelve quart basket is a common price.

ORIGIN, Southern Europe.

TREE, a slow grower, bushy, seldom attaining a height of more than 12 or 15 feet; hardy, will endure neglect but responds well to good cultivation and manure ; delights in moist land, without standing water ; fairly productive.

FRUIT, large and weighing from eight ounces to a pound ; form, somewhat like an apple, but with protuberance about the stem instead of a depression ; skin, golden yellow at maturity, with often a little greenish or russet color about the stem, which is set in a narrow cavity ; calyx, large segment, which are leaf like, in a large deep, corrugated basin.

FLESH, tender ; flavor, good.

SEASON, October 1st to 15th, sometimes end of September.

VALUE, limited demand in Canadian markets, sometimes selling at fifty cents a twelve quart basket, sometimes twenty-five cents.

CHAMPION.

A variety introduced between 1880 and 1890, probably raised from the Orange quince. It grows to a larger size than the Orange, and ripens later. Season about the 20th of October.

This variety usually ripens well in Southern Ontario, but would be too late farther north. Where it succeeds it is of more value for market than the Orange, on account of its large size, and freedom from blemishes. Not yet tested sufficiently for a full description.

FRUIT EXPERIMENT STATIONS OF ONTARIO.

MEETING OF BOARD OF CONTROL.

The Board met in the Railway Committee room, House of Parliament, on the 15th of January, 1897. There were present Dr. Mills and Mr. H. L. Hutt, of the O. A. C., Guelph, and Messrs. Pettit, Wellington, Smith and Woolverton.

A report of the expenditures in 1896 was read by the Secretary, amounting to $2,630.13.

The estimates for 1897 were then entered into, and it was computed that they would amount to about $2,855, and that it would be wise to ask for about $3,000.

The Secretary was authorized to correspond with the experimenters about their reports, and also to purchase such books as were necessary for his work.

On the 20th of March, a meeting was held at the office of Mr. W. E. Wellington at which there were present Messrs. Wellington, Hutt, Smith, Pettit and Woolverton.

At this meeting the Secretary presented an extended list of varieties of fruits which he recommended should be added to the various stations. A committee was appointed to revise these lists, which, with a few changes, were ordered to be purchased.

The subject of experiments with fertilizers for the orchard was debated, and it was ordered that a sum not exceeding five dollars per station be spent in fertilizers to be applied as directed by this Board. For the first year each station was to receive 100 pounds of ground bone, twenty-five bushels of wood ashes, and one dollar's worth of crimson or other clover.

In order to prevent danger from San Jose scale, the Secretary was instructed to purchase stock as far as possible from Canadian nurseries, and in all cases to require a certificate from an expert that the stock was free from this scale.

On the 13th of December, 1897, the Board met at the Zimmerman House, Waterloo, and all the members were present.

A Committee was appointed to consider the salaries of the experimenters, and report upon their relative merits. Communications were read from persons in Algoma asking that a fruit experiment station be placed in St. Joseph Island, and it was ordered that the official visitors, Messrs. Hutt and Woolverton, visit this island next summer and report to this Board.

The Secretary, Mr. L. Woolverton, read his work of the year in describing fruits of Ontario, and exhibited a large number of photographs taken for the purpose of illustration. After these descriptions had been read in detail and criticized by the Board, the work was adopted and ordered to be printed in the report with the accompanying illustrations. The intention is eventually to collect in one book the work of these various years, and issue one large work which shall be a complete guide to all the fruits grown in Ontario, a work which, for Canadians, will be far more useful than either the work of Downing, of the United States, Dr. Hogg, of England, or LeRoy, of France.

Mr. H. L. Hutt, Horticulturist at the O. A. C., Guelph, read his report of visits o inspection to the various stations during the past year, as follows:

REPORT OF THE INSPECTION ON THE FRUIT EXPERIMENT STATIONS.

By H. L. Hutt, Official Visitor.

It has been my pleasant duty during the summer to pay a visit of inspection to most of the Fruit Experiment Stations now established. The only two not visited were the Peach Station at Leamington and the Gooseberry Station at Nantyr. From each of these stations the experimenters wrote me that the fruit crop was an entire failure. On this account I concluded that it might be just as well to defer my visit to these stations till next year.

As I have described more or less fully in previous reports the nature of the work undertaken at each of the stations, this need not now be repeated. My report, therefore, will be brief, and will deal more particularly with the growth of the new stock, and with the attention which has been given to the work.

As nearly as possible each station was visited at the most opportune time for seeing the fruit of the varieties under test. I shall speak of each station briefly in the order in which they were visited.

The Lake Huron Station.

Experimenter—A. E. Sherrington, Walkerton.

Specialty—Raspberries and commercial apples.

Visited—July 26, 1897.

There are about sixty varieties of raspberries and blackberries under test at this station. Many of these are now nicely in bearing and were loaded with fruit at the time of my visit. For these tests six plants of each variety were set out three feet apart in the rows and were allowed to form hedge-rows. On account of some of the plants dying at the time of planting, the rows are not now all of an even thickness. For this reason Mr. Sherrington did not think it would be a fair test to record the yields from the different varieties. I advised him to take plants from these rows and set out a new plantation, with the bushes about five feet apart each way, so that they might be confined to hills. The yields could then be averaged per bush or hill, and a fair comparison made, even if one or two hills failed.

The varieties apparently the most heavily loaded were the Hilborn and Gregg, among the blacks, and the Cuthbert, Superlative and Zetler among the reds. The latter is a local variety of great promise, and named after the man who raised it.

The young trees of apple, plum and cherry, set out for trial, have been well cared for and have made a good growth. The old apple trees here, as in many other places this year, were badly affected with apple scab, and bore a very light crop of fruit. Spraying had been done with the Bordeaux mixture early in the season, but it had not been continued late enough to prevent the scab, which came on this season much later than usual.

The Bay of Quinte Station.

Experimenter—W. H. Dempsey, Trenton.

Specialty—Apples.

Visited, Sept. 1, 1897.

Many of the young trees sent to this station for planting last spring were very poor specimens, but as they were planted on excellent soil, and given good care and cultivation, they have made a very fair growth.

The additional planting this year consisted of six varieties of apples, three of pears, six of plums and seven of raspberries. Scions of fifteen varieties of apples, received from C. H. Shinn, California, were grafted upon bearing trees. Most of these scions have lived, and the young trees planted have made a fair growth.

The crop of apples in Mr. Dempsey's large orchard, although not so heavy as last year, was an excellent one for this year. Spraying had been done, but had not been continued long enough to prevent the attack of apple scab.

During my visit we collected about 150 varieties of apples and pears for exhibition at the Industrial Exhibition, Toronto. The fruit was nearly two weeks later this year than last year in coloring, and at the time of the exhibition had not attained its full color.

The fertilizer experiment, as outlined by this board, is being carried out according to the instructions of the Secretary.

The St. Lawrence Station.

Experimenter—Harold Jones, Maitland.

Specialty—Hardy pears and plums.

Visited—Sept. 3, 1897.

The young trees set out at this station during the past two years have been well cared for, and have made a good growth. So far all varieties have stood the winter without injury.

The additional planting this year consisted of twenty-three varieties of apples, nineteen of plums, three of pears, four of raspberries and ten of strawberries. Mr. Jones does not wish any trees sent next year, as he wants to clear up a suitable piece of land before planting any more.

The bearing orchard here is made up mostly of Fameuse and Scarlet Pippin, and notwithstanding the heavy crop last year, the trees were loaded again this year almost as heavily. As at the other stations, the apple scab had made its appearance late in the season, after spraying had been discontinued, and was alike bad on both varieties.

The fertilizer experiment has been undertaken, and the crimson clover was coming on well.

Mr. Jones is conducting an interesting experiment in his orchard for the eradication of a patch of bindweed (*Convolvulus arvensis*), which is probably the most difficult of all weeds to destroy. He is fighting it with salt and thorough cultivation. The results will be watched with interest.

The East Central Station.

Experimenter—R. L. Huggard, Whitby.

Specialty—Pears and commercial apples.

Visited—September 4, 1897.

The block of young trees set out at this station last year has done well. The spaces between the trees was cropped with corn and root crops, and kept well cultivated, although in some cases the corn encroached upon the trees rather more than should have been allowed.

A number of young plum and pear trees set out two years ago are beginning to bear. The Japanese plums, Abundance, were loaded with fine large fruit.

The new trees planted this year were twelve varieties of plums, eleven of apples, four of pears and three of cherries.

Part of the orchard of bearing trees is cultivated, the rest being in sod.

The fertilizer experiment has not yet been begun.

The Georgian Bay Station.

Experimenter—John Mitchell, Clarksburg.

Specialty—Plums.

Visited—September 6, 1897.

This station has been well stocked with a choice collection of varieties of plums. There are now about 125 varieties under test. Eighteen of these have been in bearing for some time, thirty-five were set out two years ago, fifty-five last year, and eighteen this year.

The trees are on excellent soil, have been given first-class care, and have done well. Some of those planted two years ago bore a little fruit this year. All of the Japanese varieties have so far come through the winter uninjured.

On the bearing trees there was a very heavy crop this year, the Lombards particularly being overloaded. I assisted Mr. Mitchell in gathering a collection of about twenty varieties for exhibition at the Industrial. The fruit ripened this year much later than usual, and many of the later varieties were at that time not well colored.

An excellent catch of crimson clover has been obtained for the fertilizer experiment.

The Simcoe Station.

Experimenter—G. C. Caston, Craighurst.

Specialty—Hardy apples and cherries.

Visited—September 7, 1897.

This being the most northern of all the stations, a number of other fruits besides the specialties are under test here. Among these are plums, pears, apricots and a general collection of the small fruits, such as raspberries, blackberries, currants, gooseberries and strawberries.

All of the trees and plants are well cared for and have had every chance to make a good growth. Many of the cherries and small fruits bore an excellent crop this season, and will be reported on in Mr. Caston's report. There was a light crop upon all varieties of apples, with the exception of the Duchess, which was well loaded.

The additional planting this year consisted of thirteen varieties of apples, eleven of cherries, nine of plums and three of pears.

The fertilizer experiment is well under way, a good catch of clover has been obtained, and the ashes has been applied.

The Burlington Station.

Experimenter—A. W. Peart, Burlington.

Specialty—Blackberries and currants.

Visited—September 16, 1897.

This station is one of the finest fruit farms in the Burlington district, and besides the fruits specially under test there are fine collections of apples, plums, pears, peaches and grapes, from which reports might be made at any time. These are all given the best of care and all bore heavy crops of fruit this year.

Most of the bushes sent for experimental purposes have done well. Careful records were made during the season of the yields of different varieties of raspberries and blackberries. These will be given in Mr. Peart's report.

A good catch of clover has been obtained for the fertilizer experiment and the fertilizers will be applied later on in the season.

The Niagara Station.

Experimenter—M. Burrell, St. Catharines.

Specialty—Tender fruits.

Visited—September 24, 1897.

A great variety of the more tender fruits have been planted at this station, principally peaches, plums, cherries, apricots, nectarines, and a few of the nut trees such as Japanese chestnuts and filberts.

About 200 new trees were set out this spring. Most of those planted last spring have lived and made a good growth. There are also but few failures among the trees of this year's planting.

The abundant crop of choice fruit on all bearing trees and vines was good evidence of the care and attention bestowed upon them. All of the orchards were thoroughly cultivated till late in the summer, when they were seeded down with crimson clover, which will be left till next spring as a cover crop. The excellent catch of clover obtained was remarkable.

Experiments are being carried on with different methods of treatment to prevent the attacks of the peach borer. The results of these experiments will appear in Mr. Burrell's report.

The Wentworth Station.

Experimenter—Murray Pettit, Winona.

Specialty—Grapes.

Visited—September 25, 1897.

When this station was established there were about eighty varieties of grapes already in bearing. Over forty new varieties have since been added, and most of them have made a good growth. The young vines were put upon trellises last year, and many of them this year bore a fair crop of fruit. From the appearance of the fruit it was evident that many of them are inferior to the good varieties already in cultivation, although some of them will no doubt prove valuable.

Some valuable reports on the grapes should now be looked for from this station.

The Strawberry Sub-Station.

Experimenter—E. B. Stevenson, Freeman.

Specialty—Strawberries.

I have taken the opportunity of visiting Mr. Stevenson's strawberry plantations several times during the season. They are stocked with all the new and leading varieties.

While he has not been able to make records of comparative yields from the different varieties, yet his reports are based upon careful observation, and are always full of information of great value to strawberry growers.

The Cherry Station.

Experimenter—L. Woolverton, Grimsby.

Specialty—Cherries.

Visited—September 25, 1897.

In addition to the great collection of all kinds of fruit which Mr. Woolverton has made and is using for reference in his descriptive work on the "Fruits of Ontario," he has an extensive collection of varieties of cherries set out two years ago. These trees have made a fine growth and will no doubt soon begin to bear. Careful notes were taken during the summer as to the growth of the different varieties, which will appear in Mr. Woolverton's report.

STRAWBERRIES.

Halton Sub-Station.—Report for 1897.

The season of 1897 was on the whole a favorable one for the strawberry (although we had a week of the hottest weather I ever remember ; it came right in the fruiting season). Full crops and fair prices, not quite as good prices as the year previous, but for good fruit good prices were obtained.

The fall before was favorable for a good stand of plants, some of the varieties making too many plants. I desire again to emphasize the necessity of narrow rows. From my experience and somewhat extended observation, I feel fully assured that if the growers for market would follow the following method they would reap more money from their strawberry beds.

After the ground is thoroughly prepared, choose good strong, healthy plants that have never fruited; plant carefully, never allowing the roots to become dry ; do not expose the roots to the sun or wind for one moment.

The plants, well planted, as early as the ground can be worked (this is another prime necessity) begin the work of cultivation. I notice that a great many growers and nurserymen advocate the removing the runners until the middle of the summer, this they say strengthens the parent plant, enabling it to send out strong runners later on. Now I will confess if I remove the runners for two or three months after setting the plants this removing does strengthen the parent plant and is all right in the method practised in the hill system ; and each time you take away the runners you increase the capacity of the mother, but you give less time for the fresh new runners to take root and become strong. Take a strong, healthy, well-rooted plant of any variety, it will in a short time throw out several strong runners that will in turn send out other strong runners, these well rooted, should be sufficient, and would make a row plenty wide enough for fruiting ; keep all other runners cut off, let these new made plants spend all their time in making fruit crowns and storing up strength to mature the crop of next season.

I am now dealing with a row to obtain the best marketable crop of the finest berries that will bring the highest price. I am convinced the above is the method to pursue.

There are so many who allow all the plants to grow that will, or they keep the runners cut off the first part of the season, then let the runners grow. After a very dry time comes on in August and September, as in the past season, the ground is so dry that the runners will not take root, and they are blown about in great wads and rolls, the roots curl up and become dry, and it is almost impossible to get such runners to take root ; the result is a poor stand of plants, and the plants that do root have done so so recently that they have had no time to form fruit crowns. This is the reason that often in the late fall plants will make a good growth of young plants that just take root and no more ; no fruit crown is formed ; that the grower is disappointed when fruiting time comes, these young and late set plants have no fruit crowns and so cannot produce fruit ; whereas if the early runners had been rooted, an abundance of crowns would have been formed and the result would be a good crop of fruit of best size, as all the plants had been in the most favorable position to do its best, has had all the time necessary for its work.

Among those that have done the best this season I must place the Clyde as by far the best here, and the very best reports come from all quarters show it has done as well in other places.

One of the most extensive growers of fruit in Connecticut, U. S., calls the Clyde the best berry in America, and in his writing he puts it as "the great business money catcher, debt destroyer, basket filler, and family provider." This is high praise ; the Clyde well deserves it ; it is a grand berry. I believe when well known it will take the place of all others as a market berry ; I predicted this last year that the Clyde would take a first place.

Bubach, Haverland, Saunders, Grenville have held their place among the standards; Bismarck, Ruby, Staples, Eleanor, Glen Mary, Wm. Belt have made a good showing as well as Satisfaction, Ridgeway and Brandywine.

Anery's Seedling—(P). A seedling of Wilson by E. C. Anery, Pa., a strong grower, healthy plant, quite productive. Blossom May 15; ripe June 18. Good sized berry; it is worthy of a trial. Bright scarlet color, round, conical in shape; flesh pink to white; quality fair.

Apache—(S). A seedling of Stayman's No. 1, by Dr. Stayman of Kansas. A rampant grower, healthy plant, medium in productiveness and size of fruit. Blossom May 15; ripe June 18; another trial.

Anna Kennedy—(P). Seedling from Jersey Queen and unknown, by J. T. Lovet. A beautiful looking berry, glossy scarlet with gold seeds; good quality and firm, but not productive enough to be profitable for market. Bloom May 18; ripe June 16.

Aroma—(S). One of the best late; plant moderately vigorous and healthy; fairly productive of very large fine looking berries; a good fertilizer. Bloom May 15; 1st ripe June 16.

Annie Laurie—(S). Seedling by John Bauer, Ohio. Plant healthy and vigorous; very late in fruiting; fruit round, very bright scarlet, glossy, bright golden seeds; of very finest quality, the finest table berry; only moderately productive. Bloom May 22; 1st ripe June 21.

Beauty—(S). Parentage unknown. Plant healthy, moderately vigorous; fruit the finest looking, very large and attractive; roundly conical, only medium in productiveness. Bloom May 18; 1st ripe June 16. Firm and good quality; a fancy berry; a box of Beauty's being one of the most beautiful sights one could imagine,

Bismarck—(S). A seedling of Bubach and Van Deman, by Mr. Bauer, originator of Van Deman. The plant is a strong, healthy grower, much like the Bubach; makes more plants but very like it in appearance. The fruit is very large, bright scarlet; plant very productive; fruit is mild flavored and sweet; roundly conical. Bloom May 19; ripe June 19; worth a trial by all.

Bubach—(P). Originated in Illinois. The old reliable one, hard to beat it; the only weakness it has shown is it does not make quite enough plants; the plants it does make are perfect ones, strong and healthy. The fruit is all that can be desired. This variety is very productive and profitable. It succeeds everywhere; in bloom May 17; ripe June 19.

Brandywine—(S). From Pennsylvania; found by chance by Mr. Ingram. A very vigorous grower; plant healthy, only a trace of rust sometimes; the fruit is large, heart shaped, dark in color, quite firm and very good quality. Succeeds in most places, not quite productive enough, but is widely grown; it is firm and a good shipper. Bloom May 18; ripe June 22.

Beder Wood—(S). A good grower, making plants freely; some seasons rusts badly; plant is very productive, fruit good size; it is a profitable one for the market when you keep it free from rust; the fruit is only medium in firmness, a good early one. Bloom May 12; ripe June 14.

Belle, or No Name or Crawford's No. 51 (S). Plant, healthy and vigorous in growth, making good row; quite productive; fruit is very irregular, in fact, all shapes being found; flesh is firm and good quality; it would not be a good one to grow for market on account of its very irregular shape. Bloom May 12, ripe June 14.

Champion of England (S) A large, s rong plant, making runners freely; quite healthy; the fruit is very large; quite irregular in shape, often like two berries together; medium in firmness; good quality; fairly productive; not valuable on account of irregular shape; it is what we would call a late one; it resembles the Erie very much; some would value it on account of its large size. Bloom May 19, ripe June 21.

Carrie (P). A seedling of Haverland from Virginia. The plant is a good grower, resembling its parent; healthy and vigorous; fruit, medium to large in size; much the same shape in general; others more conical, not as productive, but firmer in flesh than the Haverland; a good one, worth a trial. Bloom, May 18, ripe, June 19.

Crawford's No. 1,000 (P). From M. Crawford (Ohio). A good grower, healthy, making plenty of plants. From one season's fruiting am favorably impressed with it; fruit is crimson in color; flesh, red; seeds imbedded; firm, good flavor; bright, glossy berry, and quite productive; large in size; worth trying. Bloom, May 18, ripe, June 18.

Columbia (S). A vigorous grower, making many plants; healthy. It made a very poor showing in fruit; few blossoms, less fruit, not of the least value as it grew with me; would not advise anyone to plant it. I wonder why it was ever sent out. I have thrown scores of seedlings far more valuable.

Clyde (S). A seedling of Cyclone, by Dr. Stayman of Kansas. Here we have the king of strawberries. I cannot say too much in its favor, for as it has grown with me the past four seasons, it is easily at the head of the list. The plant is most vigorous and healty, a perfect plant. Fruit stalk is strong ; the plant makes many runners ; fruit is as large as Bubach ; quite regular in shape, round, conical ; bright scarlet and firm ; good quality ; a good shipper ; a second early. It was shipped this year along with Mitchell's Early and brought fifteen cents per box on the same day and in same market in same shipment that Mitchell's Early brought eight cents per box, on June 7th, in Toronto. In bloom May 11, ripe June 12.

Cyclone (S). From Kansas. Seedling of Crescent. The plant is a vigorous grower, and healthy, but it does not stand dry weather ; the fruit is only medium in size, but very productive when the plant has enough moisture ; it is not as good in any way as the Clyde ; it is rich in pollen, and one of the first bloomers ; in hot weather it wilts as badly as Warfield. Bloom May 12, ripe June 14.

Della K.—(S). Seedling of Sharpless. A most vigorous grower ; plant, healthy ; medium in productiveness ; the fruit is very fine ; very regular in shape, conical ; firm and fine quality, and large in size. It is among the late ones. Bloom May 18, ripe June 26. Worth a trial.

Erie (S). From Erie, Penn. A good healthy grower, vigorous ; fruit, large. There were two varieties sent me in the one package. As they blossomed and fruited at different times, must separate and give further trial. The true Erie was in bloom May 19, ripe June 24.

Evans (S). This was not in a favorable place ; it got drowned out with water ; water stood during winter ; must have another trial. Bloom May 17, ripe June 21.

Edith (P). A chance seedling from Ohio. Plant, healthy, small and stocky ; fruit of the largest, though irregular ; it is a late one ; quite productive ; berries too irregular for profit, I fear. Bloom May 20, ripe June 24.

Eleanor (S). Chance seedling from N. J. by Mr. Coombe. No rust on plant and very healthy ; small and slender ; good runner ; quite vigorous ; an extra early variety ; fruit is round ; dark scarlet in color, flesh red, white centre ; acid, but good flavor ; a good early market sort. Bloom May 11, ripe June 15.

Fountain (S). Parentage unknown. Came from Ohio to me ; plant, strong grower, with traces of rust ; makes plenty of runners ; quite productive ; the berry resembles Belle or No Name : is large and somewhat rough ; sour, but good quality ; medium in firmness ; crimson in color ; flesh red ; worth a trial. Bloom May 17, ripe June 18.

Greenville (P) Chance seedling from Ohio. This one has done well again this year and is among the best ones. I can say about it all I said last year ; plant, healthy ; vigorous grower ; a second Bubach, if anything more productive but not quite as large berries as Bubach ; a good one. Bloom May 13, ripe June 18. A standard.

Gertrude (S). Chance seedling by Mr. Stone, of Illinois. Plant, strong grower ; some rust on it ; fruit, some very large berries of good quality ; light crimson in color ; flesh, pink ; inclined to be hollow, but firm ; only medium in productiveness ; an early one. Bloom May 12, ripe June 16. Worth trying.

Glen Mary (S). A chance seedling from Peru by Mr. Ingram. Plant, very strong ; dark rich foliage making plants freely ; quite healthy ; fruit, very large ; color crimson ; flesh, pink to white ; inclined to be hollow, but the berry firm and good quality ; inclined to acid ; the nose sometimes hard, green and sour ; the berry large ; ribbed rough with hard green seedy end ; plant, quite productive ; well worth trying ; is considered a late one. It has not come up to my expectation after what I heard about it. Bloom May 17, ripe June 19.

Hayden (S). Seedling by Dr. Stayman, of Kansas. The plant is a good grower and plant maker ; fruit, scarlet in color ; flesh, pink, solid and firm ; acid flavor ; good quality ; quite productive. Worth a trial. Bloom, May 15; ripe, June 18.

Holland (P). Chance seedling by Mr. Holland, of Arkansas. Plant, large and strong ; quite healthy, making runners freely ; the fruit is large in size ; scarlet color ; seeds deeply imbedded ; flesh, pink, softish, fair in quality ; round, conical in shape ; not very productive. Further trial. Bloom, May 16 ; ripe, June 14.

Hunn (P). A seedling of Johnston's Late and Sharpless, by C. E. Hunn, New York Experimental Station ; the plant is a good grower, rusts some ; fruit stems long and strong ; fruit, dark scarlet, medium in firmness ; somewhat sour, but fair in quality ; very late ; further trial for productiveness ; one of the latest. Bloom, May 26 ; ripe, July 1.

Hull's No. 9 (S). A seedling sent me by E. J. Hull, Esq., of Pa. Plant is healthy, large and strong ; a good grower, making plants freely ; the plant resembles Woolverton very much ; the fruit, dark bright scarlet, very large, good quality, mild flavor, and quite productive

medium in firmness; will be grown as a fancy berry, and for its attractiveness and size, and being productive will be profitable; the whole plant and fruit is a second Woolverton, as I had Woolverton growing right close but on earlier land, it was easy to compare them. It must be a seedling of the Woolverton; do not think it is any improvement on the Woolverton. Bloom, May 12; ripe, June 18.

Hull's No. 10 (S). Seedling from Mr. Hull of Pa. Plant, a good grower, makes wide row, healthy; fruit, bright, light crimson; flesh, red, firm and very good quality. A sprightly tasting berry; quite productive; medium to large in size; a good one and worth a trial. Bloom, May 11th; ripe, June 10th.

Haverland (P) The old reliable pistillate. This variety is now so well known that it is not necessary to describe it, save to say it keeps up its reputation as the most productive of all, the Clyde is contesting this point with it as the most productive berry in existence. Bloom, May 15th; ripe, June 19th.

Huntsman (S.P). From Mr. Huntsman of Mo. Plant, a strong flower making, plants freely, but some rust sometimes; fruit is large, dark, scarlet color, round; flesh, red; medium in firmness; good quality; berry, solid; an attractive looking berry, only fails in productiveness; a good one for the amateur or fancy grower. Bloom, May 15th; ripe, June 14th.

Hull's No. 3 (S). From Mr. Hull, Olyphant, Pa. Plant of healthy, vigorous growth, full blossomed, but small percentage set in fruit; fruit, large, light scarlet; flesh, light pink, inclined to be hollow, fairly firm and good quality; not valuable; it is quite late and not productive. Bloom, May 22nd; ripe, June 26th.

Ideal (S). A seedling of Bubach crossed with Hoffman, by Mr. Kell of Maryland. Plant, a good grower, vigorous, slight trace of rust; fruit, very regular in shape, conical, a beautiful looking berry, crimson in color, gold seeds; flesh, pink; berry, solid, not best quality, quite sour, medium to large in size; plant quite productive; worth a trial as fancy berry. Bloom, May 8th; ripe, June 19th.

Jersey Queen (P). Has done well again, been described so often not necessary to do so gain, it is one of the best very late sorts; a beautiful looking berry. Bloom, May 22nd; ripe, June 21st.

Lincoln (P). Plant, a good grower; makes plants freely; resembles Watfield in plant growth; a good early sort; plant is quite productive, I should say a profitable, early kind; fruit, light crimson in color; flesh, pink and solid, medium in firmness, good flavor; worth a trial. Bloom, May 10th; ripe, June 14th.

Lady Thompson (S). Plant, medium in vigor, makes enough plants for fruit; fruit, medium in size, roundish, scarlet in color, seeds imbedded; flesh, pink and firm; berry sometimes hollow, medium in quality, inclined to sour; not valuable here. Bloom, May 17th; ripe, June 19th.

Lord Sheffield (S). An English variety. Plant, vigorous; good plant maker; rusts sometimes; fruit, dark crimson, gold seeds, very bright, fine looking, roundish in shape; flesh, pink and firm and very best quality; berry, solid; one of the best extra earlies; well worth trying as an attractive and profitable berry. Bloom, May 12th; ripe, June 12th.

Leader (S). Has some fine points, produces some magnificent berries but is not productive enough. Bloom, May 10th; ripe, June 14th.

Longfield (P). Seedling of Warfield, by Dr. Stayman. A fine, vigorous growing plant; berry, medium to large in size and firm, very regular in shape, dark rich color, quite productive and fine quality; a good market sort. Bloom, May 18th; ripe, June 14th.

Mitchell's Early (S). So well known now; a rampant grower, makes millions of plants; sometimes on some soils sets very little fruit; an extra early; did not do well here last year; the first picking brought good prices. Bloom, May 10th; ripe, June 8th.

Margaret (S). Seedling of the Crawford, by Mr. Beaver of Ohio. Plant is strong and a vigorous grower, making plants freely; only a trace of rust sometimes; the fruit is crimson in color; seeds, golden; flesh, red and firm; berry, solid; good quality, inclined to tartness; medium to large in size; plant, quite productive; a good one. Bloom, May 15th; ripe, June 19th.

Marshall (S). Chance seedling. Plant is large, does not make many runners, unless on very rich and suitable soil; rusts badly sometimes; fruit is of the largest size, somewhat irregular, but fine quality; not productive; a fine, fancy show berry. Bloom, May 15th; ripe, June 18th.

Meriedan (P). Seedling by Dr. Stayman. Plant, vigorous and quite strong ; fruit, dark red, somewhat dull ; seeds imbedded in flesh ; flesh, pink and good flavor ; berry solid, roundly, conical in shape, of large size ; bulk of crop late ; has some good points. Bloom, May 15th ; ripe, 18th June.

Manwell (S). A supposed cross of Crescent and Sharpless, by Mr. Manwell of Ia. (report from spring set plants). Plant, good grower, makes plants freely ; fruit, bright crimson ; red seeds imbedded in flesh ; flesh, white in centre to pink ; berry, very firm, fine quality, with acid enough to make pleasant ; is promising.

Michigan (S). From Michigan. I cannot recommend this, it did no good with me ; little or no fruit and very late ; did not mature ; I should call it worthless.

Naomi (P). Seedling by Dr. Stayman. Plant strong, stools out, does not make many runners, one plant would fill half bushel measure ; fruit, light crimson ; flesh, red ; berry solid, medium in quality, quite acid, large in size, roundish in shape ; plant, very productive ; worth a trial. Bloom, May 17th ; ripe, June 18th.

Oriole (P). Seedling of Bubach and Hoffman, by J. W. Kerr of Md. This is not a very valuable one, as it fruited with me this year ; fruit, crimson ; flesh, dark red ; berry, hollow ; flesh, firm and good flavor ; only medium in size ; another trial. Bloom, May 13th ; ripe, June 16th.

Ocean City (S). Seedling from Sharpless by Harrison & Sons of Ma. Plant, strong and vigorous grower ; fruit, light scarlet ; gold seeds ; flesh, pink ; berry, hollow, soft and mild flavor, large in size, medium in productiveness, quite irregular in shape. Bloom, May 18th ; ripe, June 22nd. There are other varieties much better than this.

Plow City (S). Seedling of Atlantic or Sharpless by Mr. Stone of Ill. Plant, fairly vigorous ; generally free from rust ; fruit, crimson in color ; seeds imbedded in flesh ; flesh, red ; berry, very irregular in shape but firm and very good quality, quite productive ; not desirable, so rough and irregular. Bloom, May 15th ; ripe, June 21st. A late one.

Noble (S). Plant, large and strong, fairly vigorous ; fruit, bright scarlet ; gold seeds ; flesh, pink to white, inclined to be hollow, medium in firmness ; good to best quality ; sweet, with enough acid for pleasant taste ; very large, but irregular and rough. Bloom, May 24th ; ripe, June 22nd.

Premium (P). Plant, small and not vigorous ; as it grew with me it has no value at all ; plant made little growth ; bore no fruit, quite worthless.

Pet (S). Seedling of Wilton from Pa. ; this has not done much with me. Bloom May 18th, ripe June 19th. Not valuable, might do better elsewhere.

Ridgeway (S). A seedling of Jersey Queen and Parker Early by Mr. Ridgeway of Ind. I was disappointed in this ; I was expecting great things from it. The plant is a vigorous and good grower, stooling out somewhat ; healthy ; very late. My plants were not in the best position ; will try again ; it was not productive with me. Bloom, May 20 ; ripe, June 14.

Rio (S). A seedling of Sharpless ; plant, a good grower, quite vigorous ; fruit, medium to large, This is a good early variety ; bright scarlet ; flesh, pink and firm ; berry, solid and pretty good quality and quite productive ; conical in shape ; worth a trial. Bloom, May 11th ; ripe, June 14th.

Ruby (S). This is thought to be a seedling of Crescent and Sharpless, by Mr. Richl of Illinois. Plant, little or no rust ; good grower, making plenty of plants ; fruit large and lots of it ; crimson in color ; flesh red, firm and best quality ; not as regular this year as last ; quite productive ; a good one. Bloom, May 15th ; ripe, June 22nd.

Roser (S). Seedling by Mr, Roser of Ohio ; plant rusts some but a strong vigorous grower ; plenty of plants ; fruit, conical and medium in size ; red in color ; seeds deeply imbedded ; flesh, red, softish ; quality, fair ; not with me very desirable ; an early one and fairly productive. Bloom, May 12 ; ripe, June 16.

Staples (S). Seedling of Warfield, by the late Mr. Staples of Ohio ; plant, vigorous and healthy, making plants freely ; fruit, dark crimson ; flesh, white to pink ; berry, solid and flesh firm and good quality ; medium to large in size ; shape, conical. Very much resembles Warfield No. 2 : can be picked in same basket. A good fertilizer for early pistillates. Bloom, May 12th ; ripe, June 13th.

Smith's Seedling (S). A vigorous grower and healthy ; makes plants very freely. Somewhat resembles Mitchel's Early in plant, also in fruit. Fruit, scarlet in color ; conical in shape and medium in size ; flesh, white, mild, pleasant, sweetish taste, soft ; quite productive ; strongly staminate ; an extra early. Bloom, May 10th ; ripe, June 8th.

Saunders (S). A seedling by the late John Little of Ontario; plant, very vigorous, sometimes rusts somewhat, but quite healthy; makes plants very freely; fruit, crimson, conical; flesh, red, firm and best quality; berry, large and fine appearance; plant quite productive; one of best market sorts; medium to late. Bloom, May 21st; ripe, June 19th. A good one for market,

Sunnyside (P). A seedling by Mr. Pratt of Massachusetts: plant, a vigorous good grower and plant maker; fruit, scarlet in color; seeds, imbedded; flesh, pink, quite acid; medium in firmness; late and productive, but berry roughish and round in shape; not very desirable as it fruited with me. Bloom, May 19th; ripe, June 18th.

Snowball (S). From Mr. Cowl of Wisconsin. A vigorous grower, sometimes rusts very badly; the plant is very productive; the fruit is conical in shape; crimson in color; not valuable on account of rusting so badly. Bloom, May 15th; ripe, June 18th.

Splendid (S). Seedling by Mr. Sumner of Illinois; plant is very vigorous and healthy bright foliage; fruit is large, round, scarlet in color; flesh, pink; quite early for so large a berry; quite productive; a good market berry; was somewhat rough this season but large and lots of them. Bloom, May 11th; ripe, June 19th.

Stones' Early (P). By Mr. Stone of Illinois, from Crescent and Piper; plant, not large but a vigorous grower and healthy, making plants freely; the fruit is a bright, attractive scarlet, true conical in shape; flesh, pink; seeds, golden; quality, good; quite productive: one of the best very early sorts this season with me; would be profitable if it was always as good as it was this year. Bloom, May 11th; ripe, June 8th.

Shawnee (SP). Seedling of Cyclone by Dr. Stayman of Kansas; plant, a healthy, vigorous grower; fruit, large, conical, dark crimson; seeds, deeply imbedded; flesh, pink; berry, solid and flesh firm and good quality; very productive. A good one and worth a trial by all. Bloom, May 12th; ripe, June 18th.

Sunrise (S). A seedling of Crescent and Sharpless from Massachusetts; plant, quite a vigorous grower, making plenty of plants; quite healthy; fruit, scarlet; round, conical gold seeds; flesh, white; berry, solid; flesh, medium to soft; acid and fair quality; somewhat late in ripening; berries of good size; not productive enough, many other better kinds. Bloom, May 17th; ripe, June 18th.

Sawlog (P). Chance seedling from Alabama, by Mr. Tate; plant, fairly vigorous and healthy; fruit, dull scarlet in color, only medium in size; flesh, red: long conical; berry, solid; flesh, softish and sour, but good flavor; not desirable; quite productive. Bloom, May 15th; ripe, June 17th.

Satisfaction (S). Seedling from Wilson by Mr. Howard of Michigan; plant, a strong, vigorous grower, quite healthy and productive: fruit, bright scarlet, with golden seeds; flesh, red; berry, solid; flesh, firm and very good quality; size, from medium to large. A good one worth a trial. Very like a Saunders in both plant and color. Bloom, May 12th; ripe, June 16th

Sparta (S). Seedling of Warfield and Jessie, by Mr. Thayer of Wisconsin. Not very vigorous, but was not in best place; fruit, red, gold seeds imbedded in flesh; berry, solid and pink to red; very good quality; size, medium to large, with a neck. Not productive with me; should have another trial before deciding its productiveness. Bloom, May 15th; ripe, June 21st. Fair only.

Seedling Superb (S). Chance plant, good strong grower; fruit, large, crimson in color; seeds, deeply imbedded; flesh, pink; berry, solid, fair in quality; some large berries, but not enough; not valuable. Bloom, May 17th; ripe, June 22nd.

Seedlings—A—Cooper (S) Shy bearer, not valuable. Bloom, May 18th; ripe, June 19th.

Seedlings—B—Cooper (S) Not much good. Bloom, May 18th; ripe, June 22nd.

The above two were not in a good place and so did not have the best show. They should have another trial under more favorable conditions—even then I have not much hope of them.

Seedlings—C—Cooper (S). Plant, good grower; fruit, good, scarlet and very early. Might be valuable as an extra early; it is worth a trial. Bloom, May 11th; ripe, June 10th.

Tubbs (S). A seedling by John Tubbs of Maryland; plant, quite healthy, not showing much rust; quite vigorous grower; fruit, large and heart shaped, bright scarlet, with gold seeds deeply pitted; flesh, pink all through; medium to soft in firmness; quality only fair; shy bearer; some very fine berries but not enough of them. Bloom, May 15th; ripe, June 17th.

Timbrell (P). Chance seedling; plant is strong and healthy; quite productive; size, medium to large and very finest quality; a standard for quality; its poor color is against it for market. Bloom, May 15th; ripe, June 18th.

Tennessee Prolific (S). Seedling of Crescent and Sharpless from Tennessee. The plant is a healthy, vigorous grower and very productive; fruit, crimson in color, bright looking; flesh, red, firm and very good quality. Sometimes the berry is double at the point. A good market berry. Bloom, May 12th; ripe, June 14.

Vera or Seedling A (P). Chance seedling by Mr. Stevenson, Ontario; plant, very vigorous and healthy grower, and very productive; fruit, crimson, gold seeds, conical and regular in shape; flesh, pink; berry, solid; medium in firmness; good quality and worth a trial. Bloom, May 12th; ripe, June 18th.

Van Deman (S). Seedling of Crescent and Capt. Jack by Mr. J. Bauer, Arkansas; plant, a good, vigorous grower; some rust at times; fruit, bright crimson, roundly conical; medium to large in size; very firm and best quality; it is an extra early; it pick through a long season; not a very heavy picking at one time, but can pick every day. Bloom, May 12th; ripe, June 12th.

Warfield No. 2 (P). Supposed to be a cross of Crescent and Wilson, by Mr. Warfield, of Illinois; plant a vigorous grower, has some rust; the plant cannot stand hot dry weather, burns up and does not mature its crop; it is very productive, in fact one of the most productive; fruit crimson, very dark when fully ripe, very firm, medium to large in size, conical, very regular in shape, good shipper, acid, but good quality, flesh red. Its only fault is it does not stand a hot dry time. Bloom May 12, ripe June 14.

Warfield No. 4 (P). This resembles No. 2 somewhat; a vigorous grower, making many plants; healthy foliage, very productive; fruit dark crimson, gold seeds, flesh red, berry solid and very firm, fair quality, inclined to acid, a good early one; the plant stands the heat better than No. 2, a good one. Bloom May 10, ripe June 10.

Wm. Belt (S). Seedling by Wm. Belt, of Ohio; the plant is strong and vigorous, but rusts with me badly sometimes; makes plants freely; fruit is very large and the first berries quite irregular and cockscomba, the others are of a more regular and conical shape; fruit is scarlet with gold seeds, flesh pink and white, berry solid, flesh softish and fair quality, plant quite productive; it is worth a trial. Bloom May 12, ripe June 14.

Williams (S). A seedling from Sharpless, of Canadian origin; plant vigorous grower, making many plants, but shows rust badly sometimes; the plant is quite productive; fruit large, but has a seedy green end, crimson in color where fully ripe, and firm and fair quality; it is medium to late season. Bloom May 21, ripe June 20.

Woolverton (S). Seedling by the late John Little, of Granton, Ont.; the plant is large and strong, stands dry, hot weather with the best, moderately vigorous; fruit is very large and fine looking, crimson with red seeds, the berry is firm for so large a berry, mild flavor, good quality. This variety will be grown for a fancy market and will be profitable as it is productive; worth a trial by all. Bloom May 21, ripe June 21.

World's Champion (S). Parentage unknown; the plant is a strong, healthy grower, makes plants freely. It did not have a fair show, will have to let it have another year's trial before decide as to its value. Bright scarlet gold seeds, good quality, flesh pink, shape of Bubach.

Yahoo (S). Seedling of Crusis No. 9, by Dr. Staymen, of Kansas; will have to give this also another trial.

Zula (S). Seedling of Cyclone, by Dr. Staymen; the plant is a rampant grower, very healthy, makes as many plants as Mitchel's early; the plant is very productive; fruit light crimson, medium in size, but a perfect mass of it. Give another trial. Bloom May 12, ripe June 19.

Report of seedlings, by E. B. Stevenson, from crosses made by hand under glass.

Seedlings from Timbrell seed, crossed with Marshall and Brandywine. Second year of fruiting.

Timbrell No. 15 (S). The plant is strong and vigorous, resembling the Timbrell good plant maker; the plant is crimson conical, with gold seeds and very large, of very good quality. Not decided yet as to its productiveness. Bloom May 17, ripe June 18.

Timbrell No. 16 (P). The plant is strong, vigorous and healthy, the fruit is large, conical, bright scarlet, gold seeds, flesh white, fine quality, firm and productive; a good one. Bloom May 17, ripe June 15.

Timbrell No. 10 (P). The plant is a strong, healthy grower and vigorous ; fruit is medium to large, dark crimson, flesh red ; plant quite productive, berry solid, flesh quite firm and good quality. Bloom May 17, ripe June 16.

Timbrell No. 18 (P). The plant is a strong, healthy grower, dark in color, resembling its parent the Timbrell ; the fruit is large, round, dark crimson, flesh red, firm and very best quality, fruit very large and good. Bloom May 17, ripe June 18.

Timbrell No. 22 (P). The plant is a fine, strong, vigorous, healthy grower ; this is a late sort ; the fruit is large, dark crimson, with gold seeds, round, conical in shape, flesh pink to white, quite firm and spicy, high flavor ; best quality flavor like Timbrell, colors better, very rich flavor. Bloom May 22, ripe June 20.

Seedlings from seed of Howard's No. 41, crossed with Marshall and Brandywine. Second year of fruiting.

Howard's 41, No. 25 (S). The plant is a healthy, vigorous grower, making plants freely ; fruit is bright dark scarlet, round, conical with neck ; medium to large in size, flesh pink, berry solid, flesh firm and first quality, medium in productiveness ; best table berry, fine flavor. Bloom May 22, ripe June 19.

Howard's 41, No. 22 (P). The plant is strong and healthy, a good grower ; the fruit is crimson with gold seeds, flesh pink and white, conical, large and handsome , berry solid and flesh firm, and best quality ; quite productive ; a good one, worth a trial. Bloom May 27, ripe June 22 ; a late one.

Seedlings from seed of the Marshall. Second year's fruiting.

Marshall No. 40 (S). The plant is of the strongest and is healthy ; foliage is very large and the runners the strongest of any variety I am acquainted with ; fruit a bright red and the largest and of delicious flavor, very firm, very red centre, a fine berry. Bloom May 12, ripe June 12.

Marshall No. 41 (S). Plant a good grower, strong and healthy, making runners in plenty ; fruit medium in size, a bright scarlet, flesh white in centre, berry solid, very good quality and quite productive. Bloom May 17, ripe June 18.

Marshall No. 42 (S). The plant is large, strong and healthy ; the fruit is a beautiful scarlet, roundly, conical in shape and very large ; the flesh is firm, solid to center and very fine quality; a beautiful berry, medium in productiveness. Bloom May 12, ripe June 16.

Marshall No. 43 (S). Plant a good, healthy, vigorous grower ; fruit dark crimson and bright gold seeds, long, conical, flesh pink, berry solid, medium in firmness and fair to good in quality, large size and quite productive. Bloom May 13, ripe June 14.

Marshall No. 49 (S). The plant is a good growing one, quite healthy and strong ; fruit very dark bright crimson with gold seeds, conical in shape, flesh dark red, berry solid, medium to large in size, medium in firmness and fair quality, medium in productiveness. Bloom May 17, ripe June 15.

Seedlings from mixed seed. Second year's fruiting.

Stevenson No. 2 (S). The plant is very healthy, a strong grower ; the fruit resembles Bubach very much, crimson in color and glossy, flesh red, gold seeds, very large in size and firm, good quality and quite productive, a good one. Bloom May 16, ripe June 17.

Stevenson No. 10 (P). The plant is a good one, a fine grower and vigorous ; the fruit is a bright dark red with gold seeds, firm and good quality ; a fine berry ; it is large, roundish and somewhat square shaped and productive. Bloom May 16, ripe June 18.

Stevenson No. 65 (S). The plant is very healthy, strong and vigorous, a good grower ; plant light in color, one of the lightest yellow I know of ; the fruit is a glossy dark scarlet, flesh pink, firm and very good quality, oblong, conical in shape, large in size and quite productive ; a fine looking and very attractive berry ; a very late variety but a good one. Bloom May 29, ripe June 27.

Cuts of all the above seedlings were given in the report last year.

The following is the first report on the following kinds :

Seedlings from seed fertilized by hand under glass. From Timbrell seed, crossed with Marshall and Brandywine.

Timbrell No. 11 (P). The plant is a good, healthy grower, quite vigorous ; fruit is dark red, gold seeds imbedded deeply ; flesh red and firm, of good quality; berry solid, of large size, obtuse round. Bloom may 20, ripe June 19 ; a good one.

Timbrell No. 26 (S). Plant a good one, healthy and vigorous; fruit large, roundly conical, scarlet in color; flesh red, firm and good quality; berry solid, plant productive, a very late one. Bloom May 30. ripe June 25.

Timbrell No. 28 (P). The plant resembles its parent the Timbrell, is strong and healthy; fruit is a bright scarlet, gold seeds, flesh pink, firm and fair quality, inclined to acid; berry is solid, large, conical, very regular in shape, a late one. Bloom May 27, ripe June 25.

From seed of Marshall. First report.

Marshall No. 45 (S). Plant a fairly vigorous and healthy one; fruit dark bright crimson, gold seeds, flesh white and pink, berry solid, flesh firm, berry large, fine looking and good quality, round, conical. Bloom May 22, ripe June 20.

Marshall No. 55 (S). Plant strong and good grower, healthy; fruit a bright dark crimson, gold seeds, flesh pink and firm, good quality, berry very solid, large, conical and fine looking, of best flavor. Bloom May 18, ripe June 17.

From seed of Howard's 41, crossed with Marshall and Brandywine. First report of following:

Howard's No. 41, No. 23 (P). Plant, a healthy, strong grower; fruit, scarlet in color; seeds imbedded, conical; flesh, white and firm; berry, solid and very fine quality, large in size; Bloom May 27, ripe June 20.

Howard's No. 41, No. 26 (S). Plant healthy and strong, good grower; fruit scarlet, red scales; flesh, white and firm; berry solid, sweet, mild and pleasant flavor; large, conical shape and productive. Bloom May 20, ripe June 19.

Howard's No. 41, No. 30 (P). Plant a good one, vigorous and healthy; fruit crimson, with red and gold seeds; flesh, pink and very firm and best quality fine table variety; berry solid, large conical with neck, colors well and quite productive. Bloom May 18, ripe June 20.

Seedlings of Crescent crossed with Marshall:

Crescent No. 400 (P). Plant, healthy and vigorous; fruit large, round, bright scarlet, gold seeds, flesh red, good quality, medium in firmness and productive, judging from one plant. Bloom May 18, ripe June 19.

Crescent No. 401. Plant, good grower and healthy; fruit, scarlet and bright; seeds, red and imbedded; flesh, pink; berry hollow; flesh, medium in firmness, conical in shape; fair quality; large size. Bloom May 18, ripe June 20.

Crescent No. 402. Plant, good runner and healthy; fruit, bright scarlet; gold seeds; flesh, bright pink and firm; fair quality; a little acid; berry, solid; conical; medium to large in size. Bloom May 18, ripe June 20.

Crescent No. 403. A good, large strong plant; vigorous; fruit, scarlet: size, medium to large; round; flesh, pink and white; berry inclined to be hollow; flesh, softish but good quality. Bloom May 20, ripe June 19.

Seedling of Bubach crossed with Clyde; first year report:

Clyde No. 500 (S). Plant, strong, healthy grower and vigorous, making plants freely; fruit dark scarlet; red seeds: round, conical, with neck very regular in shape; very large and fine looking; flesh, white, firm and good quality. fine eating. Bloom May 22, ripe June 21.

Seedlings of Haverland, crossed with Clyde; first year's report:

Clyde No. 600 (P). Plant, a good, healthy, vigorous grower; fruit, bright scarlet; red seeds; flesh, white, very firm, rich, mellow, fine taste; berry, large, conical and fine looking. Bloom May 27, ripe June 22.

Clyde No. 601 (P). Plant, good grower and healthy, making plants freely; fruit, bright scarlet, gold seeds; flesh, white and pink, very firm and good quality; very large, roundish, obtuse; a good berry. Bloom May 26, ripe June 22.

B No. 3 (S). Seedling of Bubach & Jessie; fine, healthy, vigorous plant; fruit, scarlet, gold seeds; flesh, pink; berry, large, round and firm, and good quality; quite productive; a good one. Bloom May 19, ripe June 19.

All the cuts of the above strawberries are the exact size of actual berries grown during the season of 1897.

The following list, I could say some good things about each of them, as all have some very good points, and some of them do as well or better than some I have described. Some of those do splendidly in some soils and are grown very largely in some parts, but they all have some defect as they have grown with me.

Allan's Nos. 6 and 13, Beede's Nos. 1 and 2, Berlin, Bouncer, Bisel, Beverley, Enormous, Edgar Queen, Epping, Enhance, Fremont, Glenfield, Giant, Governor Hoard, Gandy, Gardner, Howard's Nos. 41 and 501, Hatch Experiment Station No. 24, Hunt's No 3, Irene, Iowa Beauty, Jarabold, Jucunda (imported), Jessie, Kansas Prolific, Lovett, Leviathan, Maple Bank, Martha, Mary, Nebring's Gem, Oberholtzer's Nos. 112, 3 and 4, Ohio Centennial, Primate, Paris King, Phillips, Pawnee, Princess, Prize, Richmond, Slaymaker's No. 8 and 10, Thompson's Nos. 40 and 104, Weston, Westlawn.

The following list are of no value, at least they have not shown anything worthy while growing with me, and some of them I have tried for years. I cannot make anything of them :

America, Banquet, Brunette, Dew, Dr. Arp, Eureka, Hiawatha, Homestead, Ivanhoe, H. W. Beecher, Judsonia, Northern, Leroy, Hersey, Murray, Pine Hill No. 20, Princeton Chief, Lady Franklin, Mrs. Cleveland, Wentzel, Effie May. These I shall discard as not worth growing.

Among the new ones I planted last spring and that will fruit for the first time with me in 1898, are the following :

Cobden Queen, Kyle No. 1, Mayflower, Manwell, Bird, Hall's Favorite Seek-No-Further, Perfection, Mastodon, Ponderosa, Earliest, King's Worthy, Lehigh, Left Seedling, Edgar, Geisler, Benoy, Jerry Rusk, Shire, Seaford, Jersey Market.

The past season was not a good one for plant-making, it was very hot and very dry until late in September, so the season for plant growing was short, and as the plants after rooting had not much time to make fruit buds, I do not look for a large crop the coming season unless we have a very favorable spring. Those who got their plants set out early in the spring have secured by far the best stand and will no doubt have the best crop next summer.

In addition to the above, I have a number of seedlings that show signs of promise. I will close with giving a list of the varieties that did the best with me the past season.

Clyde, Bubach, Haverland, Greenville, Saunders, Tennesse, Prolific, Woolverton, Hull's No. 9, Eleanor, Lord Sheffield, Margaret, Van Deman, Staples. Coming close after these we have Brandywine, Rio, Bisel, Beder Wood, Glen Mary, Longfield, Williams, Warfield No. 4 and Splendid, Stone's Early, Bismarck, and Ideal.

Planters cannot go astray in planting any of the above varieties.

E. B. Stevenson, Freeman, Ontario.

TENDER FRUITS.

Report of the Niagara District Station.—M. Burrell, Experimenter.

I have the honor to submit a report of the work carried on at this station during the past season. The list of varieties described here is necessarily very limited as none of the experimental fruits are yet in bearing. In addition to the matter dealing with thinning and spraying experiments, I have included notes on some of our most injurious insects. Two of these insects, the "peach borer" and the San José scale, are of great importance in relation to the horticultural interests of this district, and I have, therefore, felt justified in dealing somewhat fully with them. In my notes on the San José scale I have not referred to the life-history of this insect as this part of the subject has been fully placed before the fruit growers already. The notes embody the results of a careful study of the scale in infested orchards, and include a brief account of its operations, and of some experimental work in connection therewith.

In addition to the list of last year there have been planted at the station this year nineteen varieties of peaches, eighteen of plums, eight of pears, nine of cherries, besides a few tender varieties of grapes and berries. The season has not been especially favorable for young trees. The latter part of June and the first part of July were intensely hot and dry, this was followed by a month of cool weather and almost incessant rains. In spite of these unfavorable climatic conditions most of the trees have made a satisfac- growth. Of the trees planted in 1896 the following peaches have made a growth of three and a half feet and upwards: Bokhara, Conkling, Champion, Crosby, Fitzgerald, Early

Richmond, Early York, Early Barnard, Golden Drop, Honest John, Hale's Early, Hortense Rivers, Large Early York, Morris White, Lord Palmerston, Late Crawford, Oldmixon Free, Oldmixon Cling, Ostrander's Late, Red Cheek Melocoton, Stump, Shumaker, Susquehanna, Thurbert, Troth's Early, Tyehurst, Wonderful.

Two to three feet of new wood: Globe, Yellow Rareripe, Steadly, Garfield, Wager Hill's Chili, Elberta, Salway, Jacques' Rareripe.

The three varieties of nectarines have all made over three and a half feet of wood, as also have the apricots.

Plums planted in 1896. Three and a half feet and over: Gueü, Abundance, Burbank, Ogon, Japan, Peter's Yellow Gage, Hudson River Purple Egg.

Two to three and a half: Willard, Saunders, Czar, Spaulding, Satsuma.

Mulberries have all made from four to eight feet of new wood.

The English Filberts from two to three feet.

CHERRIES. Governor Wood has grown most vigorously of the sweet varieties, though the others have put out from two to three and a half feet of new wood.

NUTS. This season has shown an improvement in the growth and appearance of many of the nut trees, but on the whole they are hardly satisfactory. The percentage of losses has been greater with these trees than any in the experimental blocks, and partly, I think, because the trees were too old when planted. The English Walnuts and two Paragon chestnuts received this spring were especially open to this objection, the Paragons having been grafted five feet from the ground. As a consequence they did not survive transplanting. I would suggest the purchase of younger and smaller trees. One of the "Early Reliance" trees ripened one chestnut, the nut being two or three times the size of the common chestnut of commerce.

Most of the stock planted this season has done fairly well. With hardly an exception the peaches have made one and a half to three feet of new growth. Pears and plums do not, as a rule, make much new wood during the first season. The Japanese varieties, however, are exceptional in this respect.

The grapes and berries have done well with the exception of Columbia and Gault.

PEACHES. The past season has seen an unusually heavy crop in the Niagara District. The financial results have emphasized the necessity of greater attention being paid to the selection of varieties, to thinning and to grading. There has been too great a tendency to plant heavily of midsummer varieties, such as the Crawfords, and markets were hopelessly glutted at such times. Among the more profitable varieties this season were the following:

Hynes' Surprise. This is one of the best of white-fleshed earlier varieties, ripening a little later than Early Rivers. It is as free in the stone as Early Richmond or Hale's Early, or more so, and has not proved so subject to rot as those varieties. The tree is hardy, vigorous and productive. Fruit about two and a quarter each way, pale yellow with a fine deep red cheek.

Yellow St. John. This now well-known variety, one of the earliest yellow-fleshed, free-stone peaches, is a good grower and cropper, and proved far more profitable than the Early Crawford.

Elberta. This large, yellow fleshed freestone peach originated in Georgia. It is the product of a cross between Chinese Cling and Early Crawford, ripening just after the latter. Although not fruited very extensively in Canada yet, it has so far fully sustained the reputation it has achieved in the United States, and from the quality of the fruit, and time of ripening is likely to be one of our most profitable varieties.

Jacques Rareripe. An old variety, originating in Massachusetts, ripening from middle to the end of September. Fairly vigorous and quite productive. Fruit medium to large, yellow, slightly shaded with red. Flesh yellow, freestone.

Late Crawford. This well known peach needs no description. While the flesh is somewhat less juicy in texture than the Early Crawford, its size, good canning qualities, and season of ripening—September 20th—must make it a desirable and profitable variety for some years to come. The only objection to it is, that sometimes, it is slow in coming into bearing.

Stevens Rareripe. Mr. S. D. Willard writes me that he thinks this variety had its origin near the Hudson River a great many years ago. It is one of the best late white-fleshed free-stone varieties. The tree is hardy and a fine, strong grower, a good cropper ripening its fruit about October 1st this year. Fruit when ready to pick is pale greenish yellow with more or less of a red blush. Fruit will keep good some time after being picked and becomes much yellower and more attractive. Quality good.

PLUMS. There has been an abnormally large crop of this fruit also in the Niagara District this season. Lombards, owing to the great crop and the inferior quality brought practically nothing to the grower. There appear to be two types of the Lombard in existence, one much smaller than the other. It would be well to graft all trees of the smaller type of fruit with better varieties of the Domestica class or else with the Japanese varieties.

Japanese Plums. Abundance bade well this season ripening about August 15th, and though somewhat attacked by Monilia rot, proved itself to be a fine, showy fruit 2 in. by $1\frac{3}{4}$, although Burbank is supposed to be choicer in quality, my experience this year points the other way, Abundance having a distinctly vinous sprightly quality about it. Burbank is larger, later in season, and not quite so early a bearer.

Satsuma is a showy plum, a little smaller than Burbank. A heavy bearer flesh blood red. Quality very inferior, but said to be fine later in the season. I have not tried keeping them any length of time but picked off the tree in the first week of September, they are almost worthless for dessert purposes. Of plums of the Domestica class that were profitable this year I may mention Bradshaw, Imperial Gage, Washington, Yellow Egg, General Hand, Reine Claude and Coe's Golden Drop.

General Hand has the reputation of being a very shy bearer. This year the trees were loaded. The fruit is large, in general shape somewhat like the Washington, but squarer in the shoulder and with a more distinct suture. In quality decidedly good.

Huling's Superb. Though not a showy plum this is one of the very best quality ranking with Lawrence's Favorite and McLaughlin. It is of the same gage type. When ripe, of a greenish yellow colour with pinkish red mottlings. Fruit medium to large, stalk very long, and slender. Tree a moderately vigorous grower, and a regular and heavy bearer. Season August 20 to 26th.

CHERRIES. The same cherries this season were not quite up to the standard of last year. At the same time Early Richmond bore well, and the fruit obtained good prices. Montmorency also cropped heavily. On light sandy soils growers should look for the peach borer in these varieties. I have taken as many as eight out of one tree. Sweet cherries suffered both from 'rot' and from the attacks of cherry aphis. Varieties that did as well as any were Black Tartarian, Knight's Early Black, Gov. Wood and Napoleon Bigarreau.

THINNING.

The season of 1897 has demonstrated in a forcible manner the necessity of a closer attention being given to this phase of horticultural work. The peach orchards of the peninsula have been especially overloaded, and as a consequence small fruit, low prices and broken trees have been a general rule throughout the district. Many growers practiced thinning to a greater or less degree and realized the benefit of the process. By far the greater number of growers however, did nothing along this line, being deterred by

lack of time or from fear of the expense. The process is not so expensive as is generally imagined ; and when the increased size of the fruit is considered, the lessened drain on the vitality of the tree, the reducing of the danger of 'rot' and of broken limbs; when these these facts are carefully weighed, more growers will practice thinning. A good deal of work of the kind was done at the station, and the results amply justified the outlay of time and money. In the case of plums the good results were not so strikingly apparent, but there was a marked increase in size and quality and less rot. With peaches the process was particularly remunerative. About 300 trees of all ages were thinned. Trees of average size, from four to seven or eight years of age, cost about 12 cents each to thin, big trees somewhat more.

At the request of the Dominion Horticulturist, thinning experiments were conducted by me on an early variety of peach, 'Hyne's Surprise,' and with the permission of the Department I quote the figures below. Three trees, six years old, were selected, two being thinned and the other left for a 'check' tree. The trees were vigorous, all as nearly as possible the same size, and all promising a heavy crop of fruit.

Thinned.	No. of peaches off.	Quarts.	Time in thinning.	Fruit in lbs.			
				Firsts.	Seconds.	Thirds.	Total.
			hrs.				
No. 1 tree, June 22	1,500	11	1¼	107	75½	2	184½
No. 2 tree, July 2	800	16	1	85½	73	.....	158½
Check tree	.....	.....	.....	20	93½	21	134½

A careful perusal of these figures will be found interesting and suggestive. 'Firsts' were composed of peaches seven inches in circumference or more. 'Thirds' were so small as to be unmarketable. The immense gain from the extra number of 'firsts' on the thinned trees is particularly noticeable. It should be stated too, that the 93½ pounds of 'seconds' from the 'check' tree were decidedly smaller than the 'seconds' on the two thinned trees. About 25 per cent. more 'rot' obtained on the 'check' tree than on the others. There was a sufficient number of peaches in the 21 pounds of 'thirds' to have filled three baskets if they had filled out to the size of the 'firsts' and the exhaustive effect on the tree would have been little, if any, greater in one case than in the other. It will be noticed that the tree which was thinned first gave the best results, and my belief is that work of this kind should be commenced immediately the fruit is set. In most cases I had about half of the fruit removed but more might have been taken off profitably. About two-thirds would not be too much when a heavy crop of fruit is set.

Spraying for Fungous Diseases.

The past season has been charactised by an unusual prevalence of 'rot,' mildews, etc., affording a striking contrast to the condition of the previous season. Owing, doubtless, to the scarcity of fungous diseases in '95 and '96 comparatively little attention was given to spraying this season, and severe injury was done to cherries and plums by the 'rot,' and to grapes by both mildew and 'rot.' Some spraying experiments carried out on a row of eight year old 'May Duke' cherries will serve to illustrate the general results to be expected from systematic and thorough spraying. The first application (copper sulphate 1 to 25) was made on April 22nd before the buds had burst. Bordeaux mixture with the addition of four ounces of Paris green was applied on May 22nd, and again on June 5th and 15th, and the ammoniacal solution of copper carbonate on June 26th when the fruit was colouring. The last tree was left as a 'check' tree ; the next was sprayed with the exception of the June 26th application, and the next tree sprayed all five times. Very little difference will be observed between the results from the tree which received the

ammoniacal solution of copper carbonate and those from the tree which did not, but the weather was extremely favorable during that period, and 'rot' had small chance to develop. The following are the statistics :

——	Lbs. of good fruit.	No. of cherries.	No. of rotten and unmarketable cherries.
Tree No. 1, unsprayed	23	1,656	274
Tree No. 2, no carbonate of copper	42	3,024	107
Tree No. 3, sprayed throughout	43	3,096	165

It should be stated that these trees were as nearly as possible alike. The smaller amount of fruit, good and bad, on No. 1 is largely accounted for, of course, by the constant falling of rotten and poor fruit.

I might add that the fruit on the unsprayed tree was neither so advanced nor so fine as on the other trees.

Spraying for Curculio and Rot of the Plum.

With the object of proving whether spraying or jarring is the most satisfactory method of dealing with the Plum Curculio, nine young Ponds Seedling plum trees were experimented upon. Three were left as check trees; three were jarred, and three sprayed with the Bordeaux mixture and Paris Green. This variety is very subject to rot and the season was extremely conducive to its development. A late spraying should have been given. As it was, only three applications were made, so that a considerable amount of rot had developed by the time the fruit was ready to pick.

A comparatively small amount of fruit set on all nine trees. The total quantity yielded by all the trees was distributed as follows :

3 Check trees (untreated) ..... 17 per cent.
3 Jarred trees ..... 34 "
3 Sprayed trees ..... 49 "

The following figures show the relative proportions of sound and rotten or partially rotten fruit on each lot of trees at time of picking.

——	Good.	Rooten.
3 Untreated trees	14%	86%
3 Jarred trees	25%	75%
3 Sprayed trees	45%	55%

I hope to be able to carry out this experiment next year on trees with a heavier crop of fruit on and compare each season's results.

The effect of the Bordeaux mixture on the foliage of the sprayed trees was particularly noticeable. By October 10th the foliage was still remarkably green and thick, while on the jarred and check trees scarcely a leaf was to be seen.

Observations and Experiments in connection with Insects especially Injurious to Fruits.

The San José Scale.—(*Aspidiotus Perniciosus*).

It is a matter of great regret that this exceedingly dangerous pest has effected an entrance into Canada. Two cases have occurred in the district represented by this station. The one—consisting of about 100 infested trees—was made known to me by Mr. Slingerland of Cornell. The second case was discovered near St. Catharines. Mr. A. M. Smith and myself investigated this on an intimation that a suspicious scale was infesting a block of Abundance plum trees. We came to the conclusion that it was a genuine case of San Jose Scale, and Dr. Howard of Washington subsequently confirmed the conclusion.

The owner was advised to cut out the affected trees, but neglected doing so. With his permission I have been enabled to study the insect somewhat closely, and append the following notes bearing on its breeding, spread and control.

The San José Scale in this latitude commences breeding between June 5th and 15th. The length of a full generation is about thirty-eight days, and as the females are still giving birth to young as late as the end of October four broods are easily possible in Canada.

In the case of favorable autumn weather a large percentage of the females of this fourth brood would winter over.

The infested trees in question were planted in the spring of 1895 and undoubtedly had scales though possibly very few when planted. About thirteen trees were probably infested at that time. During the season of 1895 the spread of the insect was confined to the trunks of the trees. During the season of 1896 it extended over almost the entire surface of the trunks, and over the lower part of the main limbs, and was carried on to two or three other trees. By the middle of July, 1897 the larvæ and young scales were to be found all over the original trees including leaves and fruit, as many as two thousand to a single leaf, and as high as five hundred on an individual plum. The branches and twigs of these trees being at one time fairly alive with larvæ, we might naturally expect them to be freely carried to other trees by the agency of birds and insects, and by the horse or harness during cultivation. The expectation was realized; a recent examination showing that about forty additional trees were attacked.

At the time I am now writing (Nov. 10, 1897) most of those newly-infested trees have a sufficient number of scales on to completely cover them by the middle of the next season, and it would be safe to assume that double the number of cases would occur during 1898. From these facts it will be seen that, though the increase of the scale may not be very marked for two or three years, every subsequent year will witness a terribly rapid spread. I may add that the originally infested trees are now looking extremely sickly and I should say that the presence of a single female scale would certainly kill a tree by the fourth year and possibly during the third.

Parasites.—The "twice-stabbed" lady bird (*Chilocorus Bivulnerus*) which is so useful in destroying the San José scale in California, is comparatively common in Canada. Most of the scale-infested trees are visited by these beetles, but I have never yet seen them in sufficient numbers to be of any real assistance in checking the scale. Another enemy of the scale, which is still more beneficial in its work in California, is the minute black lady bird (*Pentilia Misella*). This beetle is hardly as big as an adult female scale. Both in the mature and the larval form it devours large numbers of the scale. Until October of this year none of these beetles had been found on the trees, but during the month I detected their presence on several of the infested trees. In some cases more than thirty beetles on a single tree. It is possible, therefore, that this small lady bird may yet be a distinct assistance in ridding us of the scale.

Remedies.—Fruit growers generally are aware that whale-oil soap emulsion has been recommended as the most effectual remedy. Professor J. B. Smith has adopted the practice of spraying infested trees with *pure kerosene.* In the experiments conducted at Washington, peach trees were reported to be killed by the pure kerosene. Prof. Smith, however, writes me, under date October 21, 1897: "I have tried the pure coal oil on young peach trees, and in fact on almost every other kind of nursery tree. It harms peach less than it does cherry or plum. Cherry and plum are most susceptible to the kerosene, and the plum more than the cherry. It is well to say that the Japanese plum is the most resistant of all in that group." Prof. Smith is here speaking of trees in the nursery row, and the effect on old trees may be slightly different. As I have always been dubious as to the effect of pure coal oil on fruit trees, I sprayed a vigorous four-year old peach tree with about a quart of kerosene on August 31st. No ill effect was observed for a few days, but by September 11th the foliage appeared slightly burnt and the leaves dropped somewhat earlier than in the case of the other trees. Otherwise the tree is apparently unhurt. The coal oil is, however, unquestionably fatal to the San José scale. On October 13th a badly infested "Abundance" plum tree was selected in the orchards spoken of, and a thorough drenching of coal oil administered with a "knapsack" sprayer. Five days later the tree appeared to be in a perfectly normal condition, the foliage showing no difference from that of the adjoining trees. Specimens of bark were cut from four different parts of the tree and examined carefully under the microscope. Not a single live scale was found. The coal oil treatment had apparently been absolutely effective. A sunny day should be chosen for spraying as evaporation takes place quickly, and the danger of scorching foliage is minimized. While the result of the above experiment is very gratifying, it would be wise to urge caution in the use of this severe remedy. I believe, however, that it may prove a valuable factor in the solution of the San José scale problem.

The Peach Borer (*Sannina Exitiosa*).

The peach borer is so universally injurious, and the damage accomplished by it when unchecked is so great, that a vigorous effort has been made this season to determine the most effective way of fighting this insect, and a good deal of time given to the study of its life history. The common, and often the most effective method adopted against it is the "digging out" process. Many growers, however, have tried "washes" of various kinds for the purpose of preventing the moth laying its eggs on the tree. The experiments conducted here have not given very definite or marked results, inasmuch as the season has been unfavorable for the insect and comparatively few borers were hatched out. The results have been useful, however, in determining the period of duration of the different washes, and I feel justified in giving somewhat full details. Ten rows of peach trees were selected containing nineteen trees in each row. The first seven trees in each row were in their fourth year, the remaining twelve in their second. Between June 7th and 16th all the trees were carefully examined for "borers," fifty-eight of which varying from a quarter to three-quarters of an inch long being found.

No. 1 row was then left as a "check" row, and the following treatment adopted with the remaining rows.

No. 2. A heavy wrapping paper put round each tree, reaching about a foot or fifteen inches up the trunk.

No. 3. Ordinary newspapers wrapped round in the same manner as in No. 2.

No. 4. "Tarred" paper. Same as above.

No. 5. A wash (about eighteen inches up the trunk) composed of equal parts of lime and ashes, enough water to make a thick mixture, and the addition of a small portion of crude carbolic acid.

No. 6. "Hilled up" with air slaked lime, two good shovelfuls to each tree.

No. 7. Bordeaux mixture with half the usual quantity of copper sulphate and twice the usual amount of lime.

No. 8. A wash composed of ordinary cement or water lime and enough skim-milk to make a thick wash.

No. 9. The same as above with water instead of milk.

No. 10. The "Saunders" wash. Soft soap reduced to the consistency of thick paint by the addition of a saturated solution of washing soda in water.

The paper wrappings and the cement washes were tried at the suggestion of Prof. J. B. Smith, the entomologist of the New Jersey Experiment Station. The comparatively new substances, German caterpillar lime or "Ranpenleim," and "Dendrolene," were not tried, as Mr. Slingerland, the assistant entomologist of Cornell, assured me that he had killed several young peach trees with these preparations.

At the end of September an examination was made of the ten rows, with the result that only two borers were found, both of which were in the check row. Through these results were negative as far as any clear proof of the efficiency of any special wash goes; yet, in a season when the peach borer is abundant, a very different showing might be made and I propose to repeat some of the experiments next season.

As to the Durability of the Washes, Etc.

The heavy rains of late July and early August provided a thoroughly testing condition of things. On August 9th the washes from rows Nos. 5, 7 and 10 were largely gone; the cement and water wash (No. 9) was in fairly good condition, while No. 10, cement and milk, was as good as when first applied. The paper wrappings were all in fairly good order, but the strings and wires with which they had been fastened were showing a tendency to girdle the trees and were accordingly loosened. At the end of September when the trees were examined full notes of all conditions were taken, of which the following summary will be sufficient.

No. 2 (wrapping paper) 25 per cent. off or loose; bark somewhat tender.
No. 3 (newspapers) 60 " " "
No. 4 (tarred paper) 10 " " "
No. 5 (lime and ashes) a bare trace left.
No. 6 (hilled with lime) unsatisfactory owing to heavy rains.
No. 7 (Bordeaux) a trace only left.
No. 8 (cement and milk) in good condition.
No. 9 (cement and water) a considerable portion washed off.
No. 10 (Saunder's wash) entirely gone.

While tree protectors and paper wrappings may prove useful and effective in gardens, or on a small scale, I would not recommend this plan to the commercial grower for the following reasons. First, it is too expensive; not so much from the original cost, which is small, but from the fact that the fastenings would all have to be examined during the season and most of them loosened; Second, a considerable percentage of them would become torn or untied before the danger time had passed; and Third the bark of young trees is liable to become too tender if the wrappings are left on very late in the season.

Of the various washes it will be seen that the cement and milk mixture proved far the most durable and adhensive. Next came the cement and water; and then the lime and ashes; and then Bordeaux.

If these washes, when in good condition, are equally deterrant as far as the ovipositing of the moth is concerned, then unquestionably the most valuable wash is the one which will last longest, and the cement and milk mixture is far ahead of any of the others. The expense of making a second application during the season forbids the use of any

wash which requires it, and the life history of the peach borer proves, beyond doubt, that a wash to be really protective must be on the tree in good condition until the end of September at least.

It has been frequently supposed that the borers live through the winter is an almost full grown state; spend a few days in the pupal condition in the spring, and emerge as moths about the middle of June. The facts, however, do not support those suppositions. The following conclusions have been arrived at after periodical examinations of about one thousand peach trees, and embody the results of these observations and others made by the help of the breeding cage.

The pupal period extends from 26 to 30 days, roughly speaking, 28 days.

By far the greater number of the borers pass the winter in the trees in a less than half grown state.

From July 15 to July 31 may be looked upon as the date of the appearance of the *earliest* moths in Canada.

The largest number of moths appear between the middle of August and the middle of September, and finally some moths appear as late as the end of October.

From the foregoing conclusions it will be readily seen that a wash which will not remain on the trees more than a few weeks cannot possibly be really effective. It will be also seen, and this is highly important, that the very best and most satisfactory time for hunting the borers is from June 20th to July 10th. At an earlier date than this many very small ones can be easily missed, and later than this there is a danger of some of the moths emerging from the cocoon. I may add that peach growers should not under-rate the possible injury from this insect.

Where orchards have been neglected I have known of 14 borers being taken from a single tree, and have, in one case, found a hole 3 by 1½ inches eaten in the bark of a young peach tree by one half-grown larvæ.

Mr. Slingerland writes me that he has taken 244 eggs from the body of one moth, Professor S. B. Smith tells me that he has even counted 600 eggs in the body of a single female. We can see thesefore that when climatic conditions are favorable and parasitic enemies scarce, this insect will certainly be a formidable enemy to the peach tree.

Of other injurious insects a brief mention only can be made. The *Pear Slug* was as usual very destructive especially the first brood. The egg commenced to hatch about June 24th in this locality, and the first slug observed of the second brood was on August 27th. Owing to climatic reasons on the presence of parasites, very few slugs appeared in the second brood and little harm was done then. A Paris green solution of the usual strength is effective as is also hellebore at the rate of 1oz. to 3 gals. On low trees a dusting of air-slaked lime is often effectual.

The Peach-bark borer was referred to in my last season's report. I have not heard of any severe injury from this beetle in the immediate vicinity, but it is one of those insects which needs close watching, and is an exceedingly difficult pest to fight successfully.

Plant Lice.—Broadly speaking, the various species of aphids, or plant lice, have been by far the most injurious insect pests this season. The black cherry-aphis did incalculable harm to the sweet cherry crop, while the green species infested plums to such an extent that the growth of young trees was almost checked, and the fruit on older trees was in hundreds of cases unable to color or mature, owing to the severe injury to the foliage by the myriads of lice. The larvæ and adult beetles of two lady birds, the "fifteen-spotted" (anatis 15-punctata), and the "nine-spotted" (coccinella 9-notata). did excellent work in keeping down the black aphis in my orchard of E. Richmond cherries, but as a matter of fact we dare not rely on friendly predaceous insects, but must adopt aggressive measures on the first appearance of the lice. The fact should be emphasized that the black species are more resistant to insecticides than the green; one part of standard kerosene emulsion to six or seven parts of water is

necessary to kill the adult forms of the former, while one to twelve is usually an effective proportion against the latter. Tobacco is equally satisfactory, but a strong dark solution is necessary, at the rate of about one pound to four gallons.

Peach Yellows.—The remarks under this head in my report for 1896 still hold good. This disease is, I believe, still gaining ground in the Niagara district. On the scientific side we are no nearer a solution of the problem than we were five years ago, and horticulturists would do well to be more emphatic and vigorous in their speech and action on the matter. The introduction of new varieties and the extermination of injurious insects will accomplish very little for peach growers if the ravages of this disease are allowed to continue unchecked.

MARTIN BURRELL,
St. Catharines.

REPORT OF LAKE HURON STATION.

There were planted for experimental purposes at this station this spring, thirteen varieties of apples, as follows:—Canada Baldwin, Baldwin, Spitzenberg, Salome, Peter, Wine Sap, Bismarck, Barry, Northwestern Greening, Newtown Pippin, Cranberry Pippin, Hurlbut, Ontario, making a total of fifty varieties under cultivation. Five varieties of plums:—Hale, Wickson, Satsuma, Niagara and Lincoln, making a total of twenty-six varieties. Six varieties of cherries:—Black Tartarian, Ortheim, Late Duke, Wragg, Early Richmond and English Morello, making a total of eleven varieties. I also planted seventeen varieties of blackberries and seven varieties of raspberries, besides a number of duplicates, making a grand total of sixty-seven varieties of berries under cultivation. All trees and plants planted this spring have made a good growth, with the exception of one or two cherry trees. All trees and plants labelled and a map of varieties kept in case of label being removed or lost.

APPLES.

American Golden Russet.—Tree hardy, of spreading habit, fairly productive, of medium size, quality good, responds to good cultivation.

Ben Davis.—This is a vigorous, hardy and productive variety, fruit of good color and long-keeping quality.

Duchess.—Tree hardy and productive, a first class cooking apple. Much sought after for canning purposes.

Fameuse.—Tree vigorous, hardy and productive, of good quality as a dessert apple, but foliage and fruit subject to spot.

King.—Tree of spreading habit, rather shy bearing, fruit of good quality, ranks high in the European markets.

Mann.—Tree very hardy and vigorous, productive, fruit large, green in color, keeps well into the spring, quality medium.

Northern Spy.—Tree vigorous, fairly hardy, of upright growth, rather long coming into bearing, but bears well after bearing has started. This is a standard variety both in the local and foreign markets.

Pewaukee.—Of recent introduction, tree vigorous and hardy, productive, fruit of good quality, but has a fault of drooping upon maturity.

R. I. Greening.—This variety is a vigorous grower of spreading habit, productive, and of good quality, subject to spot.

Ontario.—This is a comparatively new apple in this district. A few trees are bearing that were sent out by the Ontario Fruit Growers' Association some years ago. I have fruited it for the first time this year on top grafted trees. Fruit large, free from spot, quality good, but more acid than the Spy.

Plums.

Plums were an abundant crop but owing to the prevalence of the rot it somewhat lessened the yield, still prices were very low, running from 15c to 40c per basket of the Japan plums.

I have five varieties. The Abundance is a very vigorous grower and seems to be hardy—has stood the last two winters without damage. I fruited a few specimens this year of fine appearance and good quality, but needs further trial.

Raspberries.

Of the forty-one varieties planted in the spring of 1896 all came through last winter in excellent condition, none of them being damaged by the frost, but they all need further trial before reporting on the yield. I will just mention a few varieties that give promise of being profitable in the order named.

Kansas.—Black cap, vigorous grower, fruit of large size and good quality.

Smith Giant.—Black cap, strong grower, fruit grown in clusters, size large, firm, of fair quality.

Gault.—Black cap, canes of very stout growth, fruit large, firm, quality very good.

Hilborn.—Black cap, vigorous, hardy and productive, fruit medium in size and of fair quality.

Columbia.—A good grower, very productive, fruit purple in color, firm, very good quality, better than Shapper.

Shafer.—Rank grower, productive, fruit purple, firm, a good canning berry.

Red Raspberries.

Cuthbert.—Vigorous grower, fairly hard, free from disease, productive, berry large, firm and of good quality, season late.

Superlative.—This variety has not made a very strong growth, fruit very large, quality good.

Zettler.—This variety was found growing in a neighbour's garden two or three years ago, origin unknown, plant vigorous and hardy, very productive, berry above medium size, firm, bright red, but only medium quality. It is the first and last berry on the market.

White Champlain.—Strong plant with a beautiful foliage, berry good size, color nearly white, quality good.

Caroline.—Strong grower, healthy, productive, color orange, a little soft, fair quality.

Molutta.—This is a seedling of my own production of the cap variety, vigorous, hardy, and appears to be productive, and pronounced of good quality by Prof. Hutt, fruited one year.

Japan Varieties.—Japan Golden Mayberry.—Poor grower and no berries.

Strawberry Raspberry.

This variety is supposed to be a cross between the strawberry and raspberry of dwarf habit, suckles freely, canes all die down in the fall, coming up with increased numbers in the spring, fruiting throughout the season until killed by frost, fruit large, bright red, poor quality, but very good when preserved, but will never make a market berry.

Gooseberries.

There are about three hundred bushes composed of Crown Bob, Downing, Houghton, Pearl and White Smith, Downing being the most profitable.

Cultivation.

The orchard is all under cultivation, plowed in the spring, cultivated and harrowed throughout the summer. Fertilizers chiefly used in bearing orchard are hardwood ashes of about fifty bushels per acre annually, and all small fruit and young orchard ashes and barnyard manure. Insects were not numerous this season except the tent caterpillar, there being an abundant crop of them, so much so that some of the smaller orchards were nearly defoliaged, but as they were mostly local, which made it easy to control them. The leaf-folder that Mr. A. H. Pettit mentioned in his report on spraying in this district two years ago has, I am pleased to say, entirely disappeared.

Fungi.

Of this disease the apple scab was the most troublesome, this season being the worst I have ever seen, some varieties, such as the Famuse, being entirely destroyed and causing most of the trees to lose two-thirds of their foliage. Spraying seemed to have no effect owing to the continued wet weather.

Pruning.

This work is all done during the winter months, but must be completed before the sap becomes active in the spring.

A. E. Sherrington,
Walkerton.

NOTES FROM EAST CENTRAL STATION.

Almost all the young trees wintered well and came out, and I think you will admit, made a favorable growth for the second year, the only loss this year so far is one grape and the Giant chestnut; it started to leaf out in spring, but all the nursing I could give it I could not pull it through. I think it was too sick when I got it, as it never grew with any heart or vigor. The Early Alice grape never showed growth as yet, but may do so next season as the roots are all sound. The other two vines made good growth, about eight feet each, which I have cut back to a few buds. Our pear trees never did better than this season as nearly everything in the pear line has lessened, the prices, however, ruled rather low to leave much profit. We are trying or experimenting on the benefit of spraying twice after the leaf dropped. As I found numerous little nests of different kinds of insects, and many were in their nests when I tried the emulsion. I also propose to spray with Bordeaux and kerosene emulsion before the buds start in spring, as I am satisfied from last spring's experience that one thorough application then is worth two later on, besides all the buds can be sprayed more effectually.

Small fruit were very abundant this season in this district, and plums were something immense the trees being crowded to their utmost capacity, and the sample in most cases were fine in this district. October and November were favorable for the ripening up the wood and buds, and the prospects for next year are quite favorable. I have not totaled up all the receipts for the different varieties, but will have it ready ere long as most of our stock is disposed of. I am endeavoring to invigorate our local society, and hope to get additions to our numbers, as people in this district are paying more attention to fruit growing than ever before.

R. L. Huggard, Whitby.

NOTES FROM BURLINGTON STATION.

Thirty-six varieties of different fruits were added this year to the 169 varieties already under cultivation. Most of the stock received in the spring has lived and made a good growth. With the exception of apples and black currants there was a very heavy crop of fruit and prices ruled low.

Raspberries and Blackberries.—Upon the whole the season has been favorable for these, the young canes having made a good growth. No rust has appeared as yet, although some varieties are slightly affected with anthracnose. Among the raspberries, the Cuthbert, Marlboro, Columbia and Kansas rank the highest, though the colour of the two latter varieties is a detriment to their market value.

The Reliance, Smith's Giant and Loudon promise well. The Japan wineberry is quite a curiosity, is very handsome, and has some interesting habits, but I question whether it will have much commercial value.

Among the blackberries the Gainor takes a first place with the Kittatinny. It is behind in quality but makes up in size and productiveness and is probably more hardy. The Taylor also did well this year. The Snyder and Western Triumph, however, still hold their own for commercial purposes.

Currants.—The season was suitable for red currants, but unfavorable for black. Growth was very rapid and rank, mildew and leaf spot cutting a considerable figure, especially with the Champion and Naples. They lost quite a percentage of leaves in midsummer, some of the fruit being also affected. The currant worm too was exceptionally troublesome.

Pears.—The season was favorable for this fruit. They were a good crop, the quality being above the average. The Bartlett, Anjou and Duchess were prime. The Flemish Beauty alone suffered badly, as usual, from the scab. With the exception of the Duchess there was very little blight.

Apples were a very light crop and poor in quality. Three hundred trees of bearing age only gave me 150 barrels. The exceptionally high prices are, however, a partial compensation. The Cranberry Pippins were particularly rough, while the Greening, Rox, Russett, and Baldwin were below the mark. The Northern Spy gave the best crop of the best fruit. There was very little spot but the Codling moth was plentiful.

Plums.—The crop was an enormous one and the quality good, save on those trees that were overloaded. Six hundred trees planted in 1889 and 1892 (chiefly in the latter year) gave 1,500 twelve quart baskets. Of these, 250 Lombards yielded about 1,000 baskets. These trees were thinned of one-third of their fruit in the summer. Sixty Reine Claude trees planted in 1892, gave 206 twelve quart baskets. Smith's Orleans, Ireland's Seedling, Bradshaw and Niagara also gave heavy crops. Among the newest varieties were, the Japan plums, Ogon (1892), and Burbank (1896), fruited this year. The Ogon gave five baskets of fine plums. They were picked the 17th of August, and sold at 50c. per basket. The Burbank gave six quarts, picked August 24th. These plums are handsome and snowy, crimson-yellow in color, and rather inferior in quality, they are very rapid growers. A tree of the H. R. Purple egg (1892) gave eighteen quarts of plums. They are a dark purple, very large, and somewhat egg-shaped. The quality is first-class, but they show a strong tendency to rot as they ripen. The Marianna (1892), is notable only for its heavy growth of wood. The few plums it gave were very small reddish-yellow and poor in quality. The Gueii (1892), gave six quarts of medium sized plums, purple and of good quality. The German Prune (1889) gave a good crop of medium-sized fruit of excellent quality. The tree is very spreading and straggling in growth. Of the twenty-five varieties that fruited, the Reine Claude, Lombard, Yellow Egg, H. R. Purple Egg, Pond's Seedling, and Ireland's Seedling showed the greatest tendency to rot.

Peaches were a heavy crop of good quality, the Crawfords being especially fine.

Grapes were also a fine crop. Apart from the mildew the quality was first class. Three acres gave twelve tons, of which three-quarters of a ton of Brighton, Lindley and Agawam were unfit for sale on account of the mildew. The season was a remarkable late one, the grapes not being in full bloom until the 1st of July—three weeks later than the average. A few of the Vergennes and the Catawba failed to ripen. The Delaware was very fine both in bunch and quality. The Moore's Diamond and Wyoming Red were but a light crop, not maintaining their previous good record. The Eaton did very well, the grape is very large, black, and fair in quality. In prices the red grape brought one-half more per pound than the white or black, most of the Delawares selling at 3c. Little or no damage was done by insects.

Report on Fertilizing Orchard, 1897.

This report is necessarily a very brief one this year.

On the 31st July, 1897, I sowed fourteen pounds of crimson clover seed on half an acre of apple orchard. The soil was in good condition and the seed was carefully harrowed in. The orchard is thirty-five years old and consists of a gravelly loam. There was a fair catch of seeds, but the season since has not been favorable for growth, so that at the present time the plants are only about four inches high. I think, perhaps, that the clover will stand the winter here, so that I propose to leave it this fall, and plow it under with the fertilizer, late next spring, after the clover has made some growth. Crimson clover wintered well in this district last season.

A. W. Peart, Freeman.

REPORT OF SIMCOE SUB-STATION.

Gooseberries.

The spring here was so awfully wet that no spraying could be done. When it was not pouring rain the soil was too wet to get on to. When the rain ceased it was too late.

All my bushes—young plants, too—were mulched with broken pea vines early in the season. Sheep had run over this straw all winter, so it had a value as manure. This was of service during the dry time, but during the wet period was of no value if not harmful. That put on in the fall was most satisfactory, as no weeds came through, and it was as level and clean as a carpet. I shall try it again to a more limited extent.

It will be noted that I have not reported the English varieties received from England in the spring of 1896. So many died that it was necessary to replant this spring, and they have only kept alive. As noted, Green Chisel is an exception, and bore a few green berries, which were only spotted with mildew.

Red Jacket still maintains its character for vigor, the fruit being larger than either Pearl or Champion, but so far not as good a cropper.

All the English varieties, including Crown Bob, Whitesmith, Lancashire Lad, Mrs. Whittaker, Triumph, Keepsake, mildewed so badly that the foliage rotted.

The following, in my opinion, are either foreign or foreign seedlings: Queen, Chautauqua, Columbus, Dominion, Large Golden Prolific and Triumph.

Crosby's seedling bore a few berries very fine, but they mildewed badly. The bush sprawls badly, as does "Carnie's Golden."

Autocrat did better than any of the other English seedlings in resisting mildew and in producing berries.

Oregon, Jumbo and Success are evidently American varieties. The latter bore a dozen or more berries, having all the characteristics of Downing, but smaller. I have decided to thin out more severely all foreign varieties. Champion needs cutting back at least one-third. I think this will improve size of berry. It bore an enormous load this year and did not mildew so badly as in 1896.

S. Spillett, Nantyr.

NOTES FROM SIMCOE STATION.

There has been added to the Experimental Station here this year sixteen varieties of apples, six of pears, nine of plums, four of raspberries, two of blackberries, two of currants, three plants of Early Ohio grape and twelve varieties of cherries. Of the tree fruits nothing new has fruited this year except the Botan plum and three varieties of cherries. Of the former I may say that if it will stand the severity of our winters it will certainly be an acquisition. It was one of several scions sent me by Prof. Craig two years ago. It was top-grafted on common red stock, and having grown rapidly, fruited this year. It began to blossom on May 1st and was in full bloom on May 8th. The fruit was ripe on August 10th. It is a freestone of medium size (the stone being exceedingly small in proportion to the size of the plum); color, pink, and covered with a delicate bloom. It has a peculiar peachy flavor, unsurpassed by any plum I have ever tasted. Prof. Craig says he thinks it is not a true Botan, but is akin to the Willard, and that it is a little tender, and recommends grafting it on hardy stock. Certainly that is the best way to grow it. If it is tender, then it has three faults. It is scarcely large enough, and is inclined to drop from the tree before it is perfectly ripe. But apart from all that, its high quality and extreme earliness would make it a highly profitable variety to grow. I believe it will be a prolific variety, judging from the fruit produced on scions of two years growth. This plum would be in the market far ahead of any other that I know of. I am going to watch its performance very closely, believing that in this variety (if it only proves hardy enough) we have got something very valuable for the northern districts. It is a strong, vigorous grower, with healthy foliage. Of the Russian cherries three years planted, the "Dye House" seems the earliest bearer. It began to bear at two years, and this year one of these little trees was fairly red with fruit, so that we were able to test their canning quality and found it excellent. Though a rather sour cherry to the taste, yet, when canned, it has a rich vinous flavor that cannot fail to please. No doubt it will be in high favor for canning when it comes into full bearing and is better known. It is also a very handsome fruit, dark red, nearly black when ripe, and has the merit of hanging well to the tree.

The English Morello, two years planted, bore a few cherries this year. They are very sour, but evidently the tree is an early bearer. Bessarabian and Ostheim also bore a few. These latter two were large, fine looking, dark, red cherries, not so sour, and rather a pleasant flavor. The Ostheim, however, seemed inclined to rot. We will get a better idea of the merits of all these varieties when they get older and come into full bearing.

All the cherries planted in the experimental plot are growing vigorously. They are very healthy and have as yet no signs of black knot. The only thing that troubles them is a kind of slug that attacks the leaves. Bordeaux, with Paris green, is quite effective for these.

Apples.

Apples are almost a total failure in this locality this year, and with the exception of Duchess (which always or nearly always produce a crop) and a few Wealthys and Alexanders, I had scarcely apples enough for my own use. The trees blossomed profusely and the

fruit set fairly well, but a sort of blight seemed to strike the trees, and the leaves turned black and the fruit dropped. It is the worst failure we have ever had here in apples. The young trees in the experimental grounds, however, made a healthy growth.

The Duchess of Oldenburg has proved to be far and away the most profitable apple I have tested. Even if sold at fifty cents per barrel, they would pay better than any winter variety at $1.25. They bear so early and such large crops. They scarcely ever fail of a full crop. The only culls are the windfalls and wormy ones, no scab on either leaf or fruit, and they are not equalled as a cooking apple by any variety that I know of. The only trouble is to get a market for them and get them marketed at the right time. I have always found a market for all I could grow, and never sold for less than $1 per barrel. Yet in a plentiful year large quantities of them go to waste in many orchards. We want an outside market for this apple, and suitable transportation to land it in good condition.

If I were to confine my choice of autumn apples to three varieties I would take the Alexander, Wealthy and St. Lawrence. Given good cultivation and care through spraying, etc., there is more money in these three than any others in my experience. I often wish I had planted more of them. In some of the reports of British markets I received this year, Alexander was quoted at nineteen shillings per barrel in London in the month of October.

The season's growth of new wood on the young trees will give a fair idea of their health and vigor. The apples three years planted have made an average growth on the leading limbs of about eighteen inches, some of the Russians of over twenty inches; Beremianka and Bergamot pears, twenty-two inches; Flemish Beauty, eighteen inches; Japan plums, two years, thirty inches; other varieties of plums, three years, twenty inches; Russian cherries, three years, seventeen inches.

Will it pay to spray young growing trees with Bordeaux mixture and Paris green, even though there it no apparent necessity for it, trees not being of bearing age and apparently healthy? My experience goes to prove that it will pay in the increased health and vigor of the trees, and more especially does this apply to the stone fruits. The young trees were all sprayed once during the summer. The mixture was carefully prepared, made just right, and the whole surface of both bark and leaves thoroughly wet with it. Though the trees appeared and were perfectly healthy, yet later on in the season the new growth on the plums were attacked with shot hole fungus. But only the leaves on the new wood that came out after spraying were affected. These dropped off early in the season, while the leaves on the old wood that had been covered with Bordeaux were still green and bright. I intend making some further experiments along this line next year. I would strongly advise anyone who is buying a spraying outfit to get the best, as the extra cost is very soon repaid. Many people are discouraged and disgusted because of a poor outfit.

NOTE.—The three varieties of apples mentioned in Station Record are the only ones I had in bearing this year, the Duchess given the product of three of the oldest trees, the Alexander the product of two trees, top grafts on Talman sweets. The price given is exclusive of the barrel.

MEMO. OF BLOOMING OF RUSSIAN AND OTHER CHERRIES.

Vladimir	May 18 to May 25
English Morello	" 20 to June 1
Ostheim	" 14 to " 27
Dye House	" 18 to " 30

Early Botan plum, opening May 1st, full bloom May 8, fallen May 13.

G. C. CASTON, Craighurst.

REPORT FROM ST. LAWRENCE STATION.

Apples. The trees planted in 1896 passed through the winter without injury from frost and made a good growth, except Sultan's Beauty and Late Strawberry which only made a feeble growth of five or six inches, but they may do better later on. The ground was cultivated and manured with barnyard manure and planted to strawberries, corn and potatoes. The new wood on all varieties is in a well ripened condition, except "Downing's Winter Maiden's Blush," which is green and tender at the tips which leaves it liable to kill back.

Pears. *Beurre Clairgeau* wintered without injury and made a feeble growth of fifteen inches.

Beurre Hardy wintered well and made a strong growth of twenty-six inches. The slug remained on the foliage until frost.

Bergamot. Two of these trees wintered well and made a growth of twenty-seven inches, and one tree made a growth of two inches in June and in July the foliage dropped, probably root killed.

Bessemianka wintered well and made a healthy growth of twenty-six inches; foliage tender and easily injured by the wind.

Clapp's Favorite wintered well and made a healthy growth of twenty-four inches; healthy, strong foliage.

Dempsey wintered well, made a fairly healthy growth of twenty-six inches.

Flemish Beauty wintered well; healthy growth of twenty-four inches; some slug late in the fall; some fungi on the foliage.

Goodale wintered well; thick, sturdy growth of fourteen inches.

Howell wintered well; the most vigorous growth I have, making thirty-four inches; foliage large and healthy.

Idaho wintered well; feeble to fair growth of fifteen inches; some fungi of the foliage.

Kiefer's Hybrid wintered well; vigorous, healthy growth of thirty inches; clean, healty foliage.

Lincoln. One tree shows sun scald or blight on the south-east side; slender growth of thirty-one inches; some slug on the foliage.

Lincoln Coreless. Of the three trees one is winter-killed, one is feeble and dying and one is healthy and made a growth of twenty-four inches.

Ritson wintered well; healthy growth of twenty-eight inches; foliage tender; some slug until frost.

Sudduth wintered well, made a healthy growth of twelve inches; foliage small, but healthy.

Vermont Beauty wintered well, made a fair growth of twenty-two inches.

Some of these varieties have developed fruit buds, so I am in hopes I will be able after this year to give a full report of some of the early bearing varieties. The ground was cultivated and manured with barnyard manure and planted to strawberries and root crops.

Plums. The plums have done remarkably well, none of the varieties being injured by winter killing and they made a wonderful growth this summer and many varieties have formed fruit buds, so I will have an interesting report to make for 1898. The following gives the growth of the varieties:

Chas. Downing. Killed back two or three inches on the tips last winter; healthy, strong foliage and a growth of twenty-four inches; slightly injured by aphis.

Communia wintered well; slender growth of twenty-four inches; foliage affected by shothole fungi.

Geuii wintered well; strong growth of thirty-six inches; foliage clean and healthy.

Hughes' Seedling wintered well; strong growth of thirty-two inches: foliage clean; some aphis.

Hammer wintered well; made a growth of forty-eight inches; foliage clean and healthy.

Lombard wintered well; growth thirty-five inches; foliage dark green; affected with shothole fungi and black rot on one tree.

Milton. A strong grower; new wood fifty inches; foliage healthy; tips liable to kill back two or three inches.

Moore's Arctic wintered well; growth twenty-nine inches; trees infested with aphis until frost which retarded growth.

Montreal wintered well; growth twenty-two inches; foliage clean and healthy.

Pond's Seedling wintered well; growth thirty-three inches; traces of shothole fungi and some aphis.

Saunders wintered well; growth twenty-two inches; foliage clean of fungi, some aphis.

Tatge wintered well; growth vigorous, thirty-five inches; foliage clean of aphis, but traces of fungi.

Whitaker, slightly injured at the tips for two or three inches; growth vigorous, forty inches; foliage clean and bright.

Weaver. Some injury to one or two twigs by blight or frost; growth forty-three inches; foliage effected by fungi, aphis and pear slug,

CHERRIES. *Vladimir and Ostheim* were planted this spring (1897) and made fair growth; one Ostheim made a feeble growth but may recover next year.

RASPBERRIES. *Columbia* made the strongest growth of the four varieties I have on test; some of the canes running seven feet.

Conrath comes next in vigor and older, and Turner in the order named. I cannot report on the hardiness of these varieties until next spring.

STRAWBERRIES (twelve plants each). I had fruiting this year, Aroma, Bubach, Brandywine, Beauty, Belle, Greenville, Haverland, Saunders, Wm. Belt, Woolverton. The cold, wet, backward spring, followed by an extremely hot and dry time during the picking season was ruinous to the berry crop in this section which will explain for the peculiar results as stated below.

Aroma (S). Fresh and healthy when mulch was removed; bloomed May 24; first picking June 26; last picking July 8; total crop 43 oz.

Bubach (P). Bloomed May 24; first picking June 24; last picking July 2; total crop 45 oz.

Brandywine (S). Bloom May 21; first picking June 24; last picking July 8; total crop 87 oz.

Beauty (S). Bloom May 18, and the fruit set nicely for a good crop when the dry, hot weather came and completely cooked the plants and green fruit.

Belle (S). Bloom May 20; first picking June 26; last picking July 8; total crop 56 oz.

Greenville (P). Bloom May 20; first picking June 22; last picking July 2; total crop 74 oz.

Haverland (P). Bloom May 24; first picking June 24; last picking July 2; total crop 19 oz.

Saunders (S). Bloom May 30 ; first picking June 26 ; last picking July 8 ; total crop 68 oz

Wm Belt (S). Bloom May 20 ; first picking June 24 ; last picking July 8 ; total crop 104 oz

Woolverton (S). Bloom May 20 ; first picking June 24 ; last picking July 8 ; total crop 156 oz.

The results as shown above indicate that Woolverton, Wm. Belt, Brandywine, and Greenville proved the best berries to withstand the drought and heat in the order named.

The plants received this year, viz : Bederwood, Clyde, Marshall, Margaret, Maple Bank, Tennessee Prolific, VanDeman, Warfield and Williams have made a good stand for fruiting next season and are all in a healthy condition for winter.

On one-half acre of my commercial orchard, composed principally of Fameuse apples, I have adopted the plan of giving clean and frequent cultivation until the 15th or 20th of July, applying twenty-five bushels of ashes early in the spring and when I gave the last cultivation, applying 100 pounds pure bone meal and sowing ten pounds clover seed, and the balance of the block will be cultivated through the season up to the early part of August and have barnyard manure applied at the rate of four or six tons to the acre annually and the results on the two plots will be carefully noted, both as to the vigor and condition of the tree and size, color and quality of the fruit. The clover this year has made a good stand of four or five inches and completely covers the ground, making an excellent cover crop for the protection of the roots. In the early spring I will plough this under and repeat.

The spraying with Bordeaux mixture and Paris green kept all leaf-eating insects in check, and the spot fungi was under control until about the 15th July when the damp, warm weather of that week gave it a start that proved a serious damage to the fruit crop before fall in all orchards that were not sprayed on or about that date. This year's experience proves the necessity of carefully examining our orchards for "spot" every week or ten days during June, July and August, for under favorable conditions the spot will injure apples even when nearly full grown, and every fruit grower should be prepared to take out his pump and go to work at the first signs of "spot" if he wishes a clean crop. I have two cases of black knot to report, one on a seedling of the Blue Damson and one on a Lombard plum. I removed them from the limb by cutting about a quarter of an inch of wood away with the bark and knot and painting the wound with a paste of bluestone and lime, and now there is a fresh, healthy growth of new wood growing over the wounds

HAROLD JONES, Maitland.

BAY OF QUINTE STATION.

I desire to acknowledge receipts of the following Scions from C. H. Shinn, University of California in April, 1897.

American Beauty, Yellow Arcade, White Zurdel, Russian Gravenstein, Cool River Beauty, Mammoth Pippin, Bayard, Modoc, Skruschapfel, Green Swintovka, Marion County Red, Brightwater, Roberts' No. 2, Green Crimean, Barcelona Pearmain.

W. H. DEMPSEY, Trenton.

GEORGIAN BAY STATION.

My report this season will consist more of notes than of descriptive work on varieties. Although we have a few new varieties which fruited this year, I did not think the information gained was sufficient to justify a full report on them.

There are now in test at this station 133 varieties of plums. They are nearly all doing well, and in a short time will make a very interesting plot of over 1,000 trees.

The experience of the past two years seems to have most fully demonstrated the fact that there is no longer any use in growing anything inferior or common, and I am sorry to say that even quality will not compete against size and appearance.

The best selling plums the past season were; Bradshaw and Washington, for early; Glass, Quackenbos, Gueii and well grown Lombards, for mid-season, and Pond's Seedling, Coe's G. D, Yellow Egg, Reine Claude and German Prune, for late varieties. Even these choice varieties would sell for little more than would pay expenses. Thousands of baskets were sold here (Thornbury), at twelve to twenty cents per basket. Now, in the face of these facts, is it not time to either call a halt in planting or to get larger markets?

Arch Duke.—A large, black plum, apparently prolific variety; valuable addition to late varieties. Will be more fully described after further test.

Burbank.—A very strong grower with large leaves and long spreading and somewhat crooked branches. The fruit is irregular in size; all the way from small to large; cherry red in color, with a thin lilac bloom; sweet and peculiar flavor. Will be described again in a future report.

Bradshaw.—Large, dark red. One of the most profitable early market plums. August.

New Goderich.—A strong, spreading grower; large leaves and prominent buds. Fruit, medium to large. Bears very heavy crop every second year.

Pond Seedling.—Too well known to need much description. Rather light bearer. Best selling plum the past two seasons. Should be judiciously headed in while young.

Reine Claude.—Said to be tender. We find it perfectly hardy here. One of our most productive and profitable late plums. A regular annual bearer. Flavor and quality, best.

Japan Plums.—We have quite a number here, one to two years old. They are mostly all vigorous growers and have wintered well. Abundance, Burbank and Willard blossomed profusely, Burbank only setting fruit. I had abundance before the station was in existence. Also other growers of my acquaintance have tried them here and at Meaford, and it has been a failure with us all, as far as I can find out, but I expect better results from some of the other Japans, as they appear to have much better wood.

Apples.—We have about forty varieties in test. The most profitable are the best varieties of commercial winter fruit.

The following varieties pay best here: Baldwin, Ben Davis and Northern Spy. King is a regular but rather light bearer, and I would not recommend planting it for profit.

High colored apples of good quality are the stock the buyers want.

Usually there is very little money in summer or fall apples here on account of the limited markets.

Pears.—We have not fruited many yet. Flemish Beauty, Belle Lucrative, Beauty, Claregeau and Bartlett succeed well and grow clean.

Cherries.—Common red and black do remarkably well nearly every year.

Windsor.—A fine large liver-colored cherry, of the Biggereau class; not prolific here.

Ostheme.—A Russian variety of good size; very hardy; sets fruit thickly but drops until sometimes there are very few left. Color, dark red.

Montmorency Ordinaire.—Trees two years old were loaded full. A beautiful, large, red, acid cherry.

So far we have found nothing as profitable as the common red and black.

PEACHES.—Thirteen varieties now in test, two three years old. None fruited yet. Fruit buds froze last winter, but the wood was not hurt. They are looking well now, and some of them filled with fruit buds.

SMALL FRUITS.—*Raspberries.*—Cuthbert, most hardy and productive; London follows Cuthbert closely; prolific; fruit, dark crimson color, good quality; perfectly hard to the tips.

Marlborough.—Earlier than Cuthbert; large and fine; requires richer soil than Cuthbert, and not so prolific.

Black Caps.—Tyler, perfectly hardy here without protection; fruit, good size, jet black; sweet and pleasant flavor.

Gregg.—A fine, late, black cap of strong and vigorous growth; productive; berries very large and covered with heavy bloom; should have winter protection, but we gave it none; only froze a little at tips.

INSECTS.—We had very little trouble with insects the past season. The spring was so wet and cold the curculio did very little harm. Those who did not spray for it were about as well off as those who did.

About the last of July the pear tree slug made its appearance in considerable numbers, and would have soon caused serious injury to young pear, cherry and plum trees. Spraying with hellebore and water, three ounces to five gallons, destroyed them easily.

J. G. MITCHELL.

CLARKBURG, Nov. 12, 1897.

REPORT OF SOUTHWESTERN STATION.

Peaches.

The season of 1897 has been on the whole a favorable one for the growth and ripening of the wood of the peach. Early in the spring the conditions were not so favorable. Long continued cold and wet weather favored the growth of the "*curl leaf.*" This has not been so prevalent for years. Some trees were nearly defoliated from this cause. As soon as warm weather came they recovered very quickly and made a good growth. The wood is now ripened perfectly and goes into winter quarters in good condition, with the exception that the fruit buds are swollen more than is desirable.

Some varieties are more susceptible to *curl leaf* than others. Among those kinds most affected may be named Champion, Elberta, Shangae, and many seedlings. Seedling as a rule, are injured more than trees that have been grown by budding on other stocks Seedlings of the Tyhurst are injured as much, and perhaps more, than any other sorts we have. This variety budded on other stock has not been injured more than most other named varieties. I have noticed this for years and am at a loss to know why it should occur thus. I have been experimenting by spraying the trees with Bordeaux mixture, also Lysol, to prevent *curl leaf.* Thus far I have not been satisfied with the results. I fear I did not begin early enough in spring; I gave the first spraying when the buds began to swell. I shall continue my work in this direction with the hope that success may finally be attained.

The season of 1896 was conducive to a very heavy growth of wood. Although the wood appeared to be well ripened up in autumn the fruit buds were killed. Not one basket of the fruit was gathered in this locality this season. During the month of December, 1896, we had a long continued period of warm weather which caused the fruit buds to develop considerably. Early in January (1897) the thermometer dopped to 17° below zero. This was sufficient to kill all fruit buds on the peach, hence the loss of the crop this season. It will therefore be impossible for me to report on the fruit this year.

I give a table of varieties planted, together with the date of planting and length of wood growth made this season. My trees are all young and planted on soil quite similar. The vigor of each sort can therefore be judged by the length of wood growth made this season. This will not apply to those planted in 1897. The variation in growth of wood on trees planted the past spring is largely due to the condition of the trees when received from the nursery.

We give clean cultivation from early spring until the last of July; then sow to crimson clover and plow under in early spring. Trimming is done in early spring. While the trees are young we cut back about one-third to one-half and then cut considerably. As the trees grow older and bear heavy crops of fruit we do not cut back very much but keep the heads of the trees well thinned out to admit of free circulation of air.

I am making some experiments with fertilizers which I hope to be able to report later on.

W. W. HILBORN, Leamington.

WENTWORTH STATION.

There was added this year to previous planting at Wentworth Station six varieties of grapes, seven of peaches, seven plum, four pear, and a few other fruits, all of which have made a good growth.

The grapes planted in 1894-5 bore their first crop, an average of from one to four pounds to the vine; a description of them is given in this report. Early Ohio is one of the most promising as a valuable market grape. It is earlier than Champion, black, medium size, much better shaped bunch and a better flavor. Of the newer varieties of peaches that fruited, Mich No. 1 is very promising, a beautiful, large, yellow peach of Crawford type, a little later, handsomer and of finer flavor. Carlisle is a very fine flavored peach of Crawford type. Jersey Queen, a new highly recommended variety, resembles the Crawford, but is inferior in quality, and the tree is a slow grower. Pratt is a white flesh peach, good size, productive, later than Smock, medium quality and a long keeper—may prove valuable for foreign markets.

Burbank was the first and only plum that fruited.

M. PETTIT, Winona.

ESTIMATE OF VARIETIES TREES AND PLANTS UNDER TEST AT ALL THE STATIONS.

—	Apples.	Pears.	Plums.	Peaches.	Grapes.	Cherries.	Quinces.	Raspberries and Blackberries.	Currants.	Apricots.	Nectarines.	Mulberries.	Gooseberries.	Nuts.	Strawberries.	Total.
M. Pettit	....	20	54	37	160	24	3	14	13	....	....	....	5	....	....	330
W. H. Dempsey	198	59	21	....	....	....	....	8	....	....	....	....	....	1	....	287
W. W. Hilborn	....	....	....	119	....	....	....	....	1	....	....	....	....	....	....	120
M. Burrell	....	8	27	62	3	20	1	6	1	12	3	3	....	13	....	159
G. C. Caston	195	16	24	....	24	13	....	28	17	6	....	....	7	....	....	330
J. G. Mitchell	7	15	115	11	....	7	....	7	....	....	....	....	6	....	....	168
R. L. Huggard	51	67	6	....	1	1	....	1	....	....	....	....	1	....	....	128
H. Jones	56	23	30	....	....	2	....	5	....	....	....	....	....	....	....	116
A. W. Peart	25	30	39	11	32	....	1	63	17	....	....	....	....	1	....	219
S. Spillett	....	....	....	....	....	....	....	....	....	....	....	....	*66	....	....	66
E. B. Stevenson	....	....	....	....	....	....	....	....	....	....	....	....	....	....	136	136
A. E. Sherrington	22	....	9	....	....	8	....	62	....	....	....	....	....	....	....	103
L. Woolverton	76	96	91	64	112	70	5	23	7	17	....	2	11	5	....	579

*48 English.

COMPARATIVE VIGOR OF TREE GROWTH IN 1897.

Showing comparative VIGOR of certain varieties of APPLES and PEARS as obtained by average growth in inches of three trees of each kind.

REPORTED BY R. L. HUGGARD, EXPERIMENTER, EAST CENTRAL STATION.

APPLE TREES.

Varieties.	Inches of growth in 1897.	Vigor. Scale 1-10.	Varieties.	Inches of growth in 1897.	Vigor. Scale 1-10.
American Pippin	16	5	Red Bietigheimer	23	8
Alexander	22	7	Russian Transparent	23½	8
Arkansas Black	18	6	Russian No. 161	19	6
Baldwin	25	8	Stump	18	6
Bethel	14½	5	Sutton Beauty	17	6
Belle De Boskoop	20½	7	Salome	21½	7
Ben Davis	22	7	Shackleford	27	9
Baxter	26	9	Stark	28½	9
Chenango Strawberry	20	7	Tetofsky	14	5
Downing's Maiden Blush	27	9	Twenty Ounce	25	8
Duchess of Oldenburg	19	6	Utter's Red	24	8
Fameuse	23	8	Western Beauty	19	6
Gideon	20	7	Winter Maiden Blush	19	6
Gravenstein	22	7	Winesap	25	8
King of Tompkins	31	10	Wolf River	19	6
Mann	18	6	Walbridge	20	7
McIntosh Red	14½	5	Wealthy	24	8
Ontario	20	7			

PEAR TREES.

Bartlett	23	8	Howell	33	10
Belle Lucrative	25	8	Idaho	24	8
Bartlett Seckel	24	8	Josephine de Malines	31	10
Beurre Hardy	28	9	Louise Ponne de Jersey	34	10
Beurre Bosc	40	10	Lawson	27	9
Dempsey	30	10	Osband's Summer	32	10
Doyenne Boussock	26	9	President	32	10
Doyenne d'Ete	21	7	Petite Marguerite	28	9
Duchess de Bordeaux	16	5	President Druard	28	9
Duchess d'Angeuleme	20	7	Ritson	27	9
Easter Beurre	20	7	Tyson	26	9
Eastern Belle	32	10	Worden Seckel	18	6
Goodale	16	5	Winter Nelis	17	6

REPORTED BY BAY OF QUINTE STATION, 1897.

APPLE TREES.

Planted May, 1896.

Variety.	Growth in inches.	Vigor, scale 1 to 10.
Downing's Winter Maiden's Blush	12	6
Shackleford	12	6
Barry	16	7
Western Beauty	21	8
Walbridge	26	9
Sutton's Beauty	17	7
Star	12	6
Walter Pease	21	8
Beauty of Bath	24	9
Dudley's Winter	20	8
Talman Sweet	12	6
Bismarck	12	6

Planted May, 1897

Boiken	11	8
Peter	4	4
Yellow Newton Pippin	11	8
Lankford	15	9
Aiken's Red	14	9
Milding	16	9
Yates' Red	10	8

Pear Trees.

Planted 1895.

Variety.	Growth in inches.	Vigor, scale 1 to 10.
White Doyenne	10	7
Giffard	20	9
Duchess (d' Angouleme)	7	7
Louise	8	7
Dorset	10	8
Ansault	4	5
Pound	12	8
Fred Clapp	8	7
Souvenir d'Esperen	12	8
A. Desportes	7	8
Summer Doyenne	12	8
Kieffer	18	10
Easter Beurre	8	7
Manning's Elizabeth	12	8
Brandywine	14	8
Dr. Jules Guyot	8	7
Barry	14	8
Fred Beaudy	10	8
Lady Clapp	8	7
Winter Nelis	16	9
Duchess Precoce	14	8
Lincoln	20	9

Planted 1897.

Wilder	9	7
Koonce	6	7
Seneca	4	6
Margaret	15	8

Plum Trees.

Planted May, 1895.

Variety.	Growth in inches.	Vigor, scale 1 to 10.
Imperial Gage	14	7
Jefferson	15	7
Italian Prune	12	7
Victoria	16	8
Orange Prune	16	8
Yellow Gage	14	7
Smith's Orleans	16	8
Burbank	80	10
McLaughlin	18	8
Willard	18	8
Reine Claude	14	7
Wild Goose	36	10
De Soto	16	8
Huling's Superb	20	8
Reine Claude Violette	20	8

Planted 1897.

Wickson	14	7
Lincoln	4	6
Chabot	8	7
Spaulding	4	6
Grand Duke	5	6
Abundance	8	7

PEACHES, REPORT ON VIGOR, 1897.

Scale: 10–20 inches of growth=1 to 3; 20 to 30 inches=4 to 6; 30 to 40 inches=7 to 10.

Name of variety.	Growth in inches, 1897.	When planted, spring.	Vigor, scale 1 to 10.	Name of variety.	Growth in inches, 1897.	When planted, spring.	Vigor, scale 1 to 10.
Alace Haupt	30	1895	6	Carlisle	12	1897	2
Adrian	28	1896	5	Crane's Yellow	18	1897	3
Alexander	36	1894	8	Chair's Choice	24	1897	5
				Crosby	36	1894	8
Banner	36	1894	8				
Barnard's Ea	24	1890	5	Davidson	12	1897	2
Bowslaugh	36	1895	8				
Bouquett Free	36	1895	8	Elberta	30	1895	6
Bishop	30	1895	6	Ellison	40	1895	10
Bokara No. 2	24	1896	5	Early Silver	30	1896	6
Bronson	18	1897	3	Emperor	30	1896	6
Blood	36	1894	8	Engold Mammoth	15	1892	2
				Early Golden, Reed's	30	1896	6
Canada, Ea	36	1890	8				
Champion	30	1895	6	Family Favorite	36	1895	8
Columbia	42	1895	10	Fitzgerald	30	1895	6
Crothers	42	1895	10	Ford's Early	36	1895	8
California seedling	36	1895	8	Foster	12	1897	2
Crawford, Ea	30	1890	6	Freehold	30	1896	5
Crawford, late	30	1890	6				
Conkling	24	1896	5	Great Northern	30	1895	5
Connecticut	26	1896	5	Great Western	30	1895	5

PEACHES.—*Concluded.*

Name of variety.	Growth in inches, 1897.	When planted, spring.	Vigor, scale 1 to 10.
Golden Drop	36	1896	8
Garfield	36	1895	8
Goshawk	20	1896	4
Gold	24	1896	5
Gibson's Late	30	1896	6
Good	30	1896	6
Greensboro	15	1897	2
Golden Acme	36	1894	8
Hyne's Surprise	42	1895	10
Hortense Rivers	36	1895	8
Husted's Ea	36	1895	8
Hales Ea	42	1894	10
Haines Ea	24	1896	5
Hysop	34	1896	7
Hance's Golden	24	1896	5
Heath Cling	30	1896	6
Hill's Chili	24	1896	5
Hill's Home Chief	15	1897	2
June Rose	36	1895	8
Jennie Worthen	36	1895	8
Japan Dwarf Blood	24	1896	5
Jersey Pride	30	1896	6
Jacques Rareripe	36	1896	8
Kinrick's Heath	24	1896	5
Key Port White	30	1896	6
Kalamazoo	24	1897	5
Lorentz	36	1895	6
Levy's Late	36	1896	6
Lovett's White	36	1896	6
Longhurst	24	1896	5
Lady Ingold	30	1896	6
LaGrange	24	1897	5
Lee's Seedling	15	1897	2
Large Ea. York	30	1896	6
Mamie Ross	36	1895	8
Miss Lolo	42	1895	10
Mrs. Brette	36	1895	8
Mary's Choice	30	1895	6
Mountain Rareripe	30	1895	6
Magdala	24	1896	5
Miller's Cling	30	1896	6
Marshall	24	1897	5
Michigan Ea	36	1895	8
North American Apricot	30	1895	6
Namaper	32	1895	7
New Prolific	18	1897	2
Ostrander, Early	30	1895	6
Ostrander, Late	36	1895	8
Old Mixon	30	1890	6
Orange Tree	30	1896	6
Orleans	30	1896	6
Oscar's Black Prince	18	1897	2
Piquet, Late	36	1895	8
Peninsular Yellow	30	1897	6
Pearce's Yellow	12	1897	2
Pool's Large Yellow	36	1895	8
Prince of Wales	24	1896	5
Red River	36	1895	8
Roser	12	1897	2
River's Ea	42	1894	10
Reeve's Favorite	30	1896	6
Red Cheek	15	1897	2
Smith's Late	24	1895	5
St. John, Yellow	42	1895	10
Scruggs	42	1895	10
Snead	30	1895	6
Salway	34	1894	8
Stump	36	1890	8
Surpasse Melocoton	24	1896	5
Shangae	14	1896	2
	badly injured with *curl leaf*.		
St. John Red	28	1896	5
Summer Snow	36	1896	8
Snow's Orange	28	1896	5
Stephen's Rareripe	33	1896	6
Smith's n	30	1896	6
Smock Free	36	1896	8
Smock, Beer's	30	1896	6
Steadley	30	1896	6
Tyhurst	36	1896	8
Thurber	24	1896	5
Triumph	36	1896	8
Toledo Early	42	1894	10
Utah Free	36	1895	8
Utah Cling	dead		
Washington	30	1895	5
Wheatland	30	1890	5
Wager	30	1890	5
Ward's Late	30	1896	5
Wheeler's Late	36	1894	8
Walker's	42	1895	10
Yenshi Hardy	24	1896	5
Yellow Rareripe	30	1895	6
Zane	36	1896	8

W. W. Hilborn, Leamington.

GROWTH OF VINES.

T.—Thick. Sl.—Slender. S.—Short. M.—Medium.

Variety.	Length.	Size.	Form of joint.	Vigor, scale 1 to 10.
Planted in 1894.	Feet.			
America	10-15	T	L	10
August Giant	10-12	T	S	9
Amenia	6-10	M	S	6
Amber Queen	8-12	M	M	8
Arnold's	8-12	T	S	8
Bell	8-12	T		8
Beacon	Very weak and tender.			
Berkman's	10-12	T	L	9
Bacchus	10-15	T	S	10
Black Eagle	10-12	T	S	9
Croton	3- 5	Sl	M	3
Colerain	5- 7	Sl	S	5
Concord Muscat	8-10	T	S	8
Cottage	5- 7	Sl	S	5
Cynthiana	10-12	T	S	9
Carman	6- 8	Sl	L	6
Cambridge	6- 8	Sl	S	6
DeCollier	4- 5	T	S	4
Elvira	8-10	Sl	S	8
Early Victor	4- 6	Sl	M	4
Elmicand	8-10	T	M	8
Early Ohio	3- 5	M	L	3
Early Golden	Very weak.			
Eumelan	3- 4	T	L	3
Eldorado	5- 7			5
Eaton	3- 5	Sl	S	3
Esther	2- 4	Very weak.		2
Etta	6- 8	Very Sl	S	6
Green Mountain	4- 6	Sl	L	4
Grein's Golden	8-12	T	L	8
Gaertner	8-10	T	S	8
Golden Drop	2- 3	Weak.		2
Geneva	3- 4	T	S	3
Grayson	2- 3	Weak.		2
Hermann	Very weak.			
Hayes	3- 4	Sl	M	3
Ives	8-10	Sl	L	8
Janesville	4- 6	Sl	L	4
Lutie	4- 6	Sl	S	4
Mo. Rieseling	5- 7	M	L	5
Mills	6- 8	Sl	M	6
Moore's Diamond	3- 5	T	S	3
Maxatawney	10-15	Very T	S	10
Montgomery	6-10	Sl	M	6
Marion	8-10	Sl	S	8
Montefiore	8-10	Sl	M	8
Mason Seedling	3- 5	Sl	S	3
New Haven	4- 6	M	S	4
Olitie	3- 5	M	S	3
Oriental	3- 5	Very slender.		3

GROWTH OF VINES.—*Concluded.*

Variety.	Length.	Size.	Form of joint.	Vigor.
Planted in 1894.	Feet.			
Requa	3- 5	Sl		3
Rockwood	5- 7	M	L	5
Triumph	3- 5	Sl	S	3
Transparent	6- 8			6
Victoria	3- 4	Very weak.		3
Watt	3- 5	Slender and weak.		3
Woodruff Red	3- 5	T	S	3
Winchell	4- 6	Sl	S	4
Planted 1895.				
Opal	8-10	Sl	Very S	8
Presley	8-10	T	L	8
Rochester	4- 6	M	L	4
Rommel	6- 8	T	S	6
Black Delaware	5- 6	Sl	S	5
Brilliant	6- 8	M	L	6

THINNING FRUIT.

Results obtained at Maplehurst in 1897 by L. Woolverton.

Variety.	Date.	Quantity removed from one tree.	Hours thinning one tree.	Yield in 12 quart baskets.	
				Tree thinned.	Tree not thinned.
Peaches.					
Alexander ..... 2 trees compared	21st June	½	2	11½	*9½
" ..... "	23rd June	½	½	8	*4½
Honest John ..... "	"	½	¼	1	1
Centennial ..... "	"	¼	¼	†7	5
Hole's Early ..... "	"	½	1	9¼	*7
Waterloo ..... "	"	½	½	‡5	5½
Crawford ..... "	"	½	⅓	‡2	2
Early Rivers ..... "	"	½	⅓	13½	*9
Apples.					
Spy ..... 2 trees compared	July	½	.....	‡9	§13
Pears.					
Clapp's Favorite ..... 2 trees compared	July	.....	.....	11	15

* Loss from rot. † Increased size of fruit. ‡ Extra size and clean. § Thinned too late.

DESCRIPTIVE LIST

Bay of Quinte

Size.—S., Small, less than 1½ inches in diameter; M., Medium, 1½ to 3½ inches in diameter; L., Large,
Form.—An. Angular; Con., Conical; Cor., Corrugated; Ob., Oblate; Obl., Oblong; Obt., Obtuse;
Color.—B., Brown; Bh., Brownish; Bl., Blush; Blo., Bloom; Br., Bright; G. Green; Gh., Greenish; Reddish; Rus., Russet; Spl., Splashed or Splashes; Str, Striped or Stripes;
Cavity.—S, Shallow; N., Narrow; D., Deep; B., Broad.

Variety.	Origin.	Habit of tree.	Fruit.		
			Size.	Form.	Skin. Color.
Saxton	Massachusetts	US	M	rh., ob	y. shaded with r., str. dark r..
Stump	John Prue, Chili, N.Y.	U	M	obl., con	white, nearly covered with red, striped and splashed with crimson, numerous white dots.
St. Lawrence	Canada	S	L	rh, obl	greenish-yellow, striped and splashed with very dark red.
Stark		US	M	con., obl., often ribbed.	gh.-y, partly covered with dark splashes of r. and little white dots.
Scott's Russet	Ontario	S	M	rh., ov	gh.-y, nearly covered with a golden rus. and numerous gray dots.
Seek-no-further (Westfield)	Connecticut	S	M	conical; sometimes ribbed.	gh.-y, partly covered with red, sometimes quite russeted with russet dots.
Talman Sweet	Rhode Island	S	M	rh., ov	wh. y., sometimes a beautiful blush, sun side, nearly always a line from stem to calyx.
Trenton	G. Russet and Spy, by P. C. Dempsey, P. E. Co., Ont.	WS	M	r., obl	y. covered with r., nu. spl. and str of dark r., nu. white dots.
Wagener	Pen Yan, Yates, Co., N.Y.	U	M	r., ovate; ribbed.	y. nearly covered with red, numerous white dots.
Wealthy	Peter M. Gideon, St. Paul, Minn.	US	M	r., obl	y. nearly covered with str. and sp'. of light and dark r. a few light dots.
Wellington (Dumelow's seedling).	Mr. Dumeller, Shakerstone, Leicestershire, Eng. Introduced by Mr. Richard Williams to Horticultural Society, 1820, who named it Wellington.	US	M	r., ovate	pale yellow, large russet dots, light blush of red in sun.
Winesap		S	M	r, ovate	y., nearly covered with lively deep r.

OF APPLES, 1897.

STATION.

over 3½ inches in diameter.

Ov., Ovate; R, Round; Rh., Roundish; Rib., Ribbed.

Nu., Numerous; O., Orange; P.o., Pale Orange; P., Purple; Ph., Purplish; Pa., Pale; R., Red: Rh., Sun, on sunny side; W., White; Wh., Whitish; Y., Yellow; Yh., Yellowish.

	Fruit.								
Cavity.	Stem. Length in inches	Basin.	Calyx.	Weight.	Core.	Stem to calyx cross.	Flesh.		
						Measure.	Co'or.	Texture.	Flavor.
S	½ to ¾ ..	medium	closed .	3 oz....	ovate, sma l.	1¼ in. 3 in ..	yellowish ..	tender, jucy..	sub-acid.
B	¼ heavy.	medium	partly closed.	2½ oz ..	con	1½ in. 3 in ..	white	tender, juicy..	pleasant, sub-acid.
B	⅝ to ¾ ..	small ..	closed .	3 oz....	ovate ..	1¼ in. 3 in ..	white, often stained.	crisp, tender..	pleasant, sub-acid.
ND	3¼ stout.	ribbed .	closed .	3½ oz...	oblate .	1¾ in. 3 in ..	yellowish ..	tender	sub-acid.
BS	¾ stout..	medium	closed .	2¾ oz...	ovate ..	1½ in 2¾ in .	whitish yellow.	coarse grain ..	acid.
B	⅞.....	s. even .	partly closed .	2½ oz...	ovate ..	2 in. 3 in ...	white	tender, crisp..	very mild, acid
BS	¾	small, ribbed.	closed .	2¾ oz...	round .	2, 2¾ in	white	tender, crisp..	pleasant, sweet.
D	⅝	deep ...	partly open ..	2¾ oz...	round .	2 in. 2¾ in ..	yellow	tender, crisp..	pleasant, sub-acid.
B	¾.....	corrugated.	closed .	3 oz....	round .	1½, 3 in.....	yellowish ..	tender, crisp..	vinous, sub-acid.
D	¾	deep, corrugated.	closed .	3 oz....	ovate ..	1½, 3 in.....	yellowish white sometimes stained with red.	tender	pleasant, vinous, sub-acid.
N	½.....	plaited .	open ...	3 oz....	obovate.	2 in. 3¼ in ..	yellowish white.	crisp	very acid.
N	¾	regular .	closed .	2 oz....	obovate.	1½, 2½ in....	yellowish...	firm, crisp....	sub-acid.

ANNUAL RECORD

Bay of Quinte

Variety.	When planted.	Soil.	Cultivation.	Fertilizers used.	Date.	Fungi.	
						Name.	Treatment.
Stuart's Golden	1884	Sandy loam.	Cultivated till August.....	stable	April...	....	.....
Sops of Wine.....	1879	"	"	stable and bone.	" ..	scab.....	sprayed with Bordeaux.
Saxton	1884	"	"	stable and bone.	" ..	"	"
Stump	1882	"	"	stable	March.	.....	"
St. Lawrence	1878	"	"	stable, bone, ashes.	April...	scab.....	sprayed twice, Bordeaux.
Stark.	Top grafted on St. Lawrence, 1892	"	"	stable and bone.	" ..	very little scab.	"
Stotts Russet.....	1880	"	"	stable and bone.	" ..	some fungi	.....
Seek-no-further Westfield.....	1879	"	" ...	stable	May....	.....	....
Talman Sweet.....	1870	"	"	.....	March..	.....	... .
Trenton	1885	"	" .. .	stable	" ..	... .	.....
Wagener	1882	"	"	.....	" ..	....	.....
Wealthy	1882	"	"	stable	" ..	a little fungus in Aug. this year, the 1st I ever had on it.	....
Wellington....	Top grafted on St. Lawrence, 1887	"	"	stable and bone.	April...	.....	.....
Winesap	1887	"	"	stable and bone.	" ..	....	.....

OF APPLES, 1897.

STATION

Thinning—per cent. by hand or accident.	Time of blooming.	Date of maturity.	Date of gathering (berries 1st and last).	Yield.	Grade—per cent.			Storage.		Date of decay.	Average Price.	Remarks.
					Class 1.	Class 2.	Class 3.	Place.	Temperature.			
				bu.	bu.	bu.	bu.				per bbl.	
1	May 14..	March....	Oct. 20...	7	6½	¼	¼	shipped.....	.....	....	1.50	1896 crop.
4	" 13..	Sept. Aug.	Sept.....	4	3	¼	¾	.....	....	....	1.50	
1	" 14..	.....	Sept. 25..	4	3	....	1	shipped to Montreal.	.....	....	2.00	1897 crop.
1	" 14..	.....	" 15..	7	6	½	½	shipped to Liverpool.	. ...	....	1.75	"
3	" 15..	.....	" 25..	20	12	6	2	shipped to Montreal.	. ...	....	2.00	"
1	" 16..	April.....	Oct. 20..	15	14	½	½	fruit house..	30.38	....	2.00	1896 crop shipped to Liverpool Apr. 1897.
1	" 16..	.....	" 20..	4	3	....	1	shipped to Montreal.	.....	Oct.	1.25	1896 crop.
1	" 17 .	....	" 27..	10	9	¾	¼	fruit house..	.....	..	.75	shipped to Liverpool Feb. 1897.
1	" 15..	.....	" 21..	15	12	2	1	.....	.....	....	.75	1896 crop.
2	" 15..	.....	Sept. 15..	10	9	½	½	... .	.....	...	2.12	shipped to Liverpool.
1	" 16..	.....	Oct. 6..	9	8	½	½	.....	.....	....	2 50	shipped to Liverpool.
2	" 16..	....	Sept. 15..	7	6	....	1	.....	.....	....	2.12	shipped to Liverpool.
....	" 16..	.....	Oct. 20..	1	½	¼	¼	.....	.....	....	....	
....	" 16..	.....	" 20..	9	5	1	3	....	.....	....	2.75	have top grafted into Ontario.

ANNUAL RECORD

SIMCOE EXPERI

Variety.	Origin.	When planted.	Soil.	Cultivation.	Fertilizers used.
1. Duchess	Russia.	1880	loam	plowed and harrowed frequently.	stable, ashes and clover ploughed in.
2. Alexander	"	grafted on T. Sweet, 1890.	"	" "	" "
3. Wealthy	Minn. U.S.	1887	"	" "	" "
Berries.					
4. Columbian		1895	"	scuffler and hand hoe clean.	stable and ashes
5. Smith's Giant	St. Catharines, Ont.	1895	"	" "	" "
Currants.					
6. Versailles		1895	"	" "	" "
7. Cherry		"	"	" "	" "
8. Fay's Prolific		"	"	" "	" "
9. Prince Albert		"	"	" "	" "
10 Victoria		"	"	" "	" "
11. White Grape		"	"	" "	" "
12. Saunders		"	"	" "	" "
13. Lee's Prolific		"	"	" "	" "
14. Black Naples		"	"	" "	" "
15. Champion		"	"	" "	" "

SIMCOE STATION

Variety.	Fungi. Name.	Fungi. Treatment.	Time of blooming.	Date of maturity	Date of gathering (berries 1st and last.)
1. Duchess	none on this variety				Aug. 20 to Sept. 5
2. Alexander	scab	Bordeaux			Sept. 20
3. Wealthy	"	"			Sept. 25
Berries.					
4. Columbian	none		June 25		July 30 to Aug. 30
5. Smith's Giant	anthracnose very slight.	Bordeaux	" 20		July 25 to Aug. 10
Currants.					
6. Varsailles				July 20	July 20
7. Cherry				" 20	" 20
8. Fay's Prolific				" 20	" 20
9. Prince Albert				Aug. 1	Aug. 1
10. Victoria				" 1	" 1
11. White Grape				July 20	July 20
12. Saunders				Aug. 1	Aug. 1
13. Lee's Prolific				" 5	" 5
14. Black Naples				" 5	" 5
15. Champion				" 10	" 10

OF FRUIT, 1897.

MENT STATION.

Winter protection.	Weather favorable or unfavorable.	Pruning. Date.	Pruning. Method.	Pruning. System of training (grapes.)	Insects. Name.	Insects. Treatment.
none		June	pyramid		Codling Moth.	Bordeaux Paris green
"		"	"		"	" "
"		"	"		"	" "
none	fairly	spring	old canes cut out new ones shortened.	young canes pinched back in summer.		
"	"	"	" "	" "		
"	"	"	bush form thin'ed out	" "	Currant Worm	Paris green Bordeaux
"	"	"	" "		"	"
"	"	"	" "		"	"
"	"	"	" "		"	"
"	"	"	" "		"	"
"	"	"	" "		"	"
"	"	"	" "		"	"
"	"	"	" "		"	"
"	"	"	" "		"	"

RECORD.—*Concluded.*

Yield.	Grade per cent. Class 1.	Class 2.	Class 3.	Place of storage.	Average price.	Remarks.
3 trees, 10 bbls	9	1		shipped in refrigerator car	$1.25	windfalls and wormy only culled.
2 trees, 1 bbl ¼	90%	10%		shipped	1 75	one of the best and most profitable autumn apples
3 trees, 1 bush. each	75%	25%		"	1.75	a very good variety.
7 lbs. from one hill or lump					5 cts per box	
5 lbs. " "					5 cts per box	
lb. oz. 1 9 per plant					5 cts per qt.	
2 3 "					"	
2 1 "			bloom July 30 to Aug. 15.		"	
0 9 "					"	
0 6 "					"	
1 2 "					"	
1 8 "					"	
0 14 "					"	
0 12 "					"	
0 13 "					"	

DESCRIPTIVE TABLES

BURLINGTON

SIZE.—S., Small; M., Medium; L., Large. FORM.—R., Round; C., Conical; O., Ovate. SEASON.—E., Early;

Variety.	Origin.	Plant. Canes. Habit of growth.	Color.	Freedom from disease 1-10.	Propagation by tips or suckers.	Foliage.	Vigor. Scale 1-10.	Measurement, length and breadth in inches.
1. Agawam	See station record.	up. spr.	r. br.	9	s.	healthy	For vigor, hardiness and productiveness, see table of values.	7 x 5
2. Dorchester		up. spr.	r. b.	9	s.	healthy		1¼ x 1
3. Early Cluster		up	br	9	s.	fair		x
4. Early Harvest		up	r. br.	9	s.	healthy		1 x
5. Early King		up. spr.	br	9	s.	healthy		5 x
6. Eldorado		up. spr.	r. b.	9	s.	healthy		x
7. Erie		up. spr.	br	9	s.	healthy		x
8. Gainor		up	br	9	s.	healthy		1¼ x
9. Kittatinny		up	r. b.	9	s.	strong healthy		1½ x
10. Lovett's Best		up	r. b.	9	s.	healthy		x
11. Maxwell		we'k spr	r. b.	9	s.	healthy		1 x
12. Ohmer		up. spr.	r. b.	10	s.	healthy		1¼ x
13. Snyder		up	r. b.	10	s.	healthy		x
14. Stone's Hardy		up. spr.	r. b.	9	s.	healthy		x
15. Taylor		up	r. b.	10	s.	healthy		x
16. Wachusetts		up spr.	r b.	9	s.	healthy		x
17. Western Triumph		up	r. b.	10	s.	healthy		x
18. Wilson's Early		up	br	9	s.	healthy		1 x

ANNUAL RECORD OF

BURLINGTON

Variety.	Origin.	When planted.	Soil.	Cultivation.	Fertilizers used.	Winter protection.	Weather favorable or unfavorable.
1. Agawam		1895	Rich gravelly loam.	Ploughed in spring, then frequent cultivation and hoeing until fruit is ripe. Banked up for the winter.	stable manure	none.	Upon the whole favorable.
2. Dorchester		1896	"		"	"	
3. Early Cluster		1895	"		"	"	
4. Early Harvest		1895	"		"	"	
5. Early King		1896	"		"	"	
6. Eldorado	Eldorado, Ohio	1896	"		"	"	
7. Erie		1895	"		"	"	
8. Gainor		1895	"		"	"	
9. Kittatinny		1895	"		"	"	
10. Lovett's Best	Lovett, N. Jersey	1895	"		"	"	
11. Maxwell		1895	"		"	"	
12. Ohmer	Ohio	1895	"		"	"	
13. Snyder	Indiana	1895	"		"	"	
14. Stone's Hardy	Wisconsin or Illinois.	1895	"		"	"	
15. Taylor	Indiana	1895	"		"	"	
16. Wachusetts		1895	"		"	"	
17. Western Triumph		1895	"		"	"	
18. Wilson's Early		1896	"		"	"	

OF BLACKBERRIES.

STATION, 1897.

COLOR.—D., Dark; R., Red; P., Purple; O., Orange; B., Bright. FLESH.—F., Firm; S., Soft. M., Medium; L., Late.

Berry.							Remarks.
Size.	Form.	Color.	Tenacity (*i.e.* to calyx or receptacle.	Flesh.	Flavor.	Season.	
m	o. r ..	bl'....	m.....	f	poor	m	
v. l...	o. r ..	b	med	f	sweet, sprightly ..	m.....	
m. l..	o. r ..	b	m	f	good	m.....	
l.....	o. c ..	b	ten	f	poor	e.....	Early and productive. Poor quality.
s.....	o. r ..	b	m. free	f	good	e. m....	
m....	o. c ..	b	m.....	f	good, sprightly ...	m.....	
m. l ..	r. c ..	b	m.	f	sweet, pleasant ...	m	
v. l ..	o. r ..	b	m.....	f	fine, sprightly	m.....	A very large berry.
l.....	o. c ..	b	m.....	m....	the best	l	Hardy so far.
s. m..	o. r ..	b	m....	f	fair	l	
l.....	o. r ..	b	m.....	f	poor	m.....	
l.....	o. c ..	b	m	m....	good, sprightly ...	m.....	A good berry.
m....	o. c ..	b	m	f	sweet, good.....	m.....	
s. m..	o. c ..	b .. .	m.....	f	good	m.....	
m....	o. c ..	b	m.....	f	fine	m.....	
s. m..	o. r ..	b	m	m....	fine, sweet.... ...	m.....	
m....	o. r ..	b	m.....	f	good	m	Very thorny.
l.....	o. r ..	b	f. m.....	m....	pleasant.....	e. m....	

BLACKBERRIES FOR 1897.

STATION.

Pruning.		Insects.	Fungi.	Time of blooming.	Date of maturity.	Date of gathering (berries, 1st and last).	Yield per hill.	Remarks.
Date.	Method.	Name.	Name.					
Summer pruning in August, annual pruning March or April.	Similar to that of raspberries, only canes not shortened so much, long laterals also shortened.	Practically none.	Practically none.	June 14 ..	July 30 ..	July 30-Aug. 10.	1¾ lbs.	
				June 12 ..	July 30 ..	July 30-Aug. 10.	½ "	
				June 19 ..	July 30 ..	July 30-Aug 15.	1½ "	
				June 18 ..	July 20 ..	July 20-Aug. 5.	1½ "	
				June 20 ..	July 15 ..	July 15-Aug. 1.	½ "	
				June 12 ..	July 30 ..	July 30-Aug. 15.	½ "	
				June 19 ..	July 30 ..	July 30-Aug. 15.	2 "	
				June 19 ..	July 30 ..	July 30-Aug. 10.	2½ "	Offers well.
				June 19 ..	July 30 ..	July 30-Aug. 15.	1¼ "	
				June 19 ..	Aug. 1 ..	Aug. 1-15 ...	1½ "	
				June 20 ..	July 30 ..	July 30-Aug. 10.	½ "	Very weak cane.
				June 18 ..	July 30 ..	July 30-Aug. 10.	1 "	
				June 15 ..	July 25 ..	July 25-Aug. 10.	1¾ "	A standard here.
				June 14 ..	July 30 ..	July 30-Aug. 15.	2 "	
				June 14 ..	July 30 ..	July 30-Aug. 15.	1 "	
				June 12 ..	July 30 ..	July 30-Aug. 15.	½ "	Very few thorns.
				June 14 ..	July 30 ..	July 30-Aug. 15.	1 "	Does well here.
				June 20 ..	July 20 ..	July 20-Aug. 5.	⅓ "	

ANNUAL RECORD OF CHERRIES.

Maplehurst Cherry Station, 1897.

Prunus Avium (*Sweet Cherry Group*).

Habit.—U., Upright; S., Spreading; St., Stout; Sp., Spawling; Sl., Slender; M. Medium.

Variety.	Habit.	Vigor.			Insects.	
		Growth in inches.		Scale 1-10.	Name.	Treatment.
		July 17.	Aug. 12.			
Hearts—						
Black Eagle		12	24	7	Aphis	Clipping off the tips infested early in July.
Black Tartarian	Up	14	30	8		
Coe's Transparent	U. S	16	36	9		
Downer's Late	M. St	12	33	8		
Elton	U. S	18	39	10		
Governor Wood	Spreading, St.	18	43	10		
Early Purple		18	30	8		
Tartarian Improved	Sprawling, spreading, slender.	13	36	9		
Bigarreau—						
Cleveland	U. stout	16	30	8		
Centennial		12	24	7		
Elkhorn	U. stout	18	30	8		
Napoleon	U. S. stout	16	30	8		
Rockport	U. S. stout	18	44	10		
Schmitz Big	U. S. stout	18	30	8		
Yellow Spanish	Sp. stout	18	36	9		

Prunus Avium (*Sweet Cherry Group*).—Continued.

Variety.	Fungi. Name.	Date of maturity.	Date of gathering (first and last).	Yield.	Average price.	Remarks.
				qts.	c.	
Hearts—						
Black Eagle		July 7	July 12-15			
Black Tartarian		1	3-10	77	10-12	
Coe's Transparent		7	9			
Downer's Late						
Elton						
Governor Wood		June 29	July 1-8	78	6	
Early Purple		21	June 25 - July 1	250	12	
Tartarian Improved						
Bigarreau—						
Cleveland						
Centennial						
Elkhorn	Monilia on 19th.	July 12	July 12-16			
Napoleon		7	8-10	104		
Rockport		1		119		Rotted badly at last.
Schmitz Big						
Yellow Spanish	Rot slight	July 9	July 12-15	72		

STATION RECORD OF CHERRIES, 1897.

Prunus Avium (*Sweet Cherry Group*).

Variety.	Habit.	Vigor.			Date of maturity.	Date of gathering (first and last).	Remarks.
		Growth in inches.		Scale 1-10.			
		July 17.	Aug. 12.				
Dukes—							
Belle de Choisy	U. St	11	36	9			
Belle Magnifique	Sp. M. St.	10	24	7			
Empress Eugenie	U. S. St.	13	34	9			
Late Duke		6	24	7		July 20 - Aug. 7.	
May Duke	U. St	7	32	8	July 1	4-14	
Reine Hortense	S. St.	10	36	9	12		
Royal Duke	U. M. St.	7	30	7			

Prunus Crasus (*Sour Cherry Group*).

Kentish—							
Montmorency	Sp. Sr.		16	4	July 12	July 10-25	Best & most productive.
Montmorency Ordinaire		8	16	4			
Olivet	Sp. Sr.	6	20	5			
Morellos—							
Ida	Sp. Sr.	15	24	7			
Morello	Sp. Sr.	9	17	5			
Ostheim						July 18-20	
Wragg						July 18 - Aug. 10	

ANNUAL RECORD

BURLINGTON

Variety.	Origin.	When planted.	Soil.	Cultivation.	Fertilizers used.	Weather favorable or unfavorable.
Currants.						
1. Belle de St Giles		1896	Rich gravelly loam	The rows ploughed to in the fall, and ploughed from in the spring, then frequent cultivation and hoeing, until the fruit is nearly ripe—no cultivation after the middle of August.	Stable manure	Favorable for red, and unfavorable for black currants.
2. Black Victoria		1896	"		"	
3. Brayley's Seedling		1896	"		"	
4. Champion		1895	"		None	
5. Cherry		1896	"		"	
6. Collin's Prolific		1896	"		Stable manure	
7. Fay's Prolific	Portland, N.Y., probably a cross, cherry and Victoria	1896	"		"	
8. Naples		1895	"		None	
9. North Star		1896	"		Stable manure	
10. Raby Castle	Canada	1896	"		"	
11. Red Cross	N.Y., cross of cherry and white grape.	1896	"		"	
12. Red Victoria		1896	"		"	
13. Versailles		1896	"		"	
14. White Grape		1896	"		"	
15. White Imperial		1896	"		"	
16. Wilder	Irvington, Indiana, seedling of Versailles.	1896	"		"	

CURRANTS AT

SIZE.—S., Small; M., Medium; L., Large. FORM.—L., Long; S., Short; Sh., Shouldered. COMPACT
COLOR.—R., Red; B., Black; W., White; G., Green;

Variety.	Plant.					Bunch.		
	Origin.	Foliage.	Vigor, scale 1-10.	Productiveness, scale 1-10.	Freedom from mildew 1-10.	Size in inches.	Form.	Compactness.
Fay's Prolific	U. S.	Healthy	9	9	10	M	L	L
Cherry		"	9	10	10	L	Sh	C
Versailles		"	9	8	10	L	Sh	C
Prince Albert		"	8	7	10	M	Sh	C
Victoria		"	8	6	9	M	Sh	C
White Grape		"	9	8	9	M	Sh	C
Black Varieties.								
Saunders	Prof. Saunders	Healthy	9	10	9	M	Sh	C
Lee's Prolific		M	8	8	8	M	L	L
Black Naples		M	8	8	8	M	L	L
Champion		Healthy	9	8	9	L	Sh	C

OF CURRANTS, 1897.

STATION.

Pruning.		Insects.		Fungi.	Time of blooming.	Date of maturity.	Date of gathering (berries, first and last.	Yield.	Remarks.
Date.	Method.	Name.	Treatment.	Name.					
								per bush.	
Late in March.	Red and white currants—the branches shortened so as to throw out laterale and fruit spurs. Black currants—thinning and cutting back branches that have borne so as to produce new wood.	Currant worm and borer on red and white currants, the borer on the black.	For currant worm, Paris green for first brood, hellebore for the second. For the borer, cutting out the injured stems and burning them.	Slightly mildewed. Leaf spot affected both the leaves and fruit of the Champion.	May 9.	July 12.	July 13.....	Very few.	
					" 16.	" 15.	" 15—30.....	⅛ lb.	
					" 9.	" 10.	" 10—13.....	⅛ lb.	
					" 16.	" 30.	" 30—Aug. 10	1 lb.....	Offers well here.
					" 9.	" 10.	" 10—13.....	½ lb..	A standard variety here.
					" 16.	" 25.	" 25—30.....	½ lb.	
					" 9.	" 12.	" 12—13....	Very few.	Does well.
					" 16.	" 16.	" 16—30.....	⅜ lb.....	Largely grown.
					" 9.	" 10.	" 10—13.....	⅛ lb.	
					" 9.	" 15.	" 15.....	½ lb.	
					" 9.	" 12.	" 12—13.....	Very few.	
					" 9.	" 15.	" 15...	½ lb.	
					" 9.	" 12.	" 12—13.....	Very few.	
					" 9.	" 12.	" 12—13... .	¼ lb.	
					" 9.	" 12.	" 12—13.....	¼ lb.	
					" 9.	" 15.	" 15..... ...	¼ lb.	

SIMCOE STATION.

NESS.—C., Close; L., Loose; St., Straggling. FORM OF BERRY.—R., Round; Ov., Oval; Ob., Oblong Y., Yellow. SEASON.—E., Early; M., Medium; L., Late.

Berry.					Value, scale 1-10.		Remarks.
Size.	Form.	Color.	Flavor, (see Thomas).	Season.	Dessert.	Market.	
L	R	R	G	E	9	10	One of the best.
L	R	R	G	E	9	10	The most productive.
L	R	R	G	E	9	10	A very good variety.
M	R	R	Acid	M	7	8	
M	R	R	"	M	7	8	
L	R	W	Pleasant, good	E	10	8	
Rather M	R	B	G	E	9	9	A promising variety.
M	R	B	G	M	9	8	
M	R	B	G	M to L	9	8	
L	R	B	M	L	8	10	Berries fine and large.

DESCRIPTIVE

WENTWORTH

SPECIES.—E. Æstivalis; R. Riparia, L. Labrusca; H. Hybrid; X. Cross. SIZE.—S. Small; —C. Close; L. Loose; St. Straggling. SHAPE OF BERRY.—Ov. Oval; R. Round.

Variety.	Vine.							Bunch.	
	Origin.	Species.	Foliage.	Vigor, scale 1-10.	Hardiness, scale 1-10.	Productiveness, scale 1-10.	Freedom from disease 1-10.	Form.	Compactness.
America		....	healthy ..	8	9	6	7	L	L
Amenia	Roger Hybrid	H	" ..	6	8	7	7	S	C
Black Delaware	Delaware and Concord	H	" ..	4	7	4	7	S	L
Black Eagle		H	strong....	7	5	6	6	L	L
Bacchus	A seedling of Clinton	R	"	9	9	8	8	Sh	C
Barkmans	Clinton and Delaware	X	thin.....	6	6	5	7	Sh	C
Brilliant		....	strong....	8	8	7	7	L	C
Croton	Delaware and Chasselas	X	healthy ..	6	7	6	6	Sh	C
Cynthiana	Arkansas	E	thin.....	7	8	5	6	Sh	C
Cambridge		....	thick.....	8	8	8	6	S	C
Dr. Collier		....	healthy ..	7	8	8	7	Sh	C
Colerain	Concord seedling	....	" ..	7	7	8	8	Sh	C
Early Ohio	Chance seedling	....	" ..	7	8	8	8	L Sh	C
Lutie		....	" ..	7	8	9	8	S	C
Mills	Muscat, Hamburg and Creveling	X	strong....	6	8	7	7	Sh	C
Marion		....	"	8	8	7	8	L	C
Oneida	Oneida County, N. Y	H	healthy...	8	7	8	7	Sh	C
Poughkeepsie Red	Iona and Delaware	X	medium ..	7	6	5	6	Sh	C
Rockwood		....	strong....	8	7	9	6	L	C
Triumph	Concord and Chasselas	H	healthy ..	9	9	8	8	Sh	C
Transparent	Taylor seedling	....	" ..	7	7	7	6	Sh	L
Ulster Prolific	Seedling	....	" ..	7	8	8	7	S	C
Victoria	Concord seedling	....	strong....	7	6	6	7	L	C
Woodruff Red	Catawba and Concord	L	"	9	9	8	8	Sh	C

GRAPES.—WENTWORTH

Variety.	When planted.	Soil.	Cultivation.	Fertilizers used.	Winter protection.	Weather.	Pruning.		
							Date.	Method.	System of training.
Agawam	1887	Clay ...	Ploughed in the spring and kept mellow with cultivator and disk harrow.	none ..	None.	unfavorable.	During Feb. and March.	Fan system.	On three wires.
Brighton	1882	" ...		none		"			
Concord	1874	" ...		stable manure.		medium			
Catawba	1883	" ...		none		favorable ..			
Delaware	1874	" ...		stable manure.		" ..			
Lindley	1887	" ...		none		unfavorable.			
Moore's Early	1887	" ...		manure		medium			
Mayer	1886	" ...		none		"			
Niagara	1882	" ...		manure		favorable ..			
Salem	1884	" ...		none		unfavorable.			
Worden	1884	" ...		manure		favorable ..			
Wilder	1884	" ...		none		medium			

LIST OF GRAPES.

STATION.

M. Medium; L. Large. FORM OF BUNCH.—L. Long; S. Short; Sh. Shouldered. COMPACTNESS. COLOR.—B. Black; P. Purple; R. Red; W. White; L. Light; D. Dark.

Berry.									Value, scale 1-10.		Remarks.
		Skin.			Flesh.						
Size.	Shape.	Color.	Bloom.	Thickness.	Pulp.	Flavor.	Seeds.—Number and size.	Months of use.	Dessert.	Market.	
L	R	B	thin....	thin....	.....	poor	.....	Oct	2		Poor quality.
M	O	B	thin....	thick...	.....	fair	.....	Sept	6		
S	R	B	thin....	thin....	.....	good	3 & small	Sept	8		A very good grape.
L	O	B	heavy ..	thick...	.....	good	.....	Sept	8		
S	R	B	heavy ..	thin....	.....	poor	3.	Oct	2		Good wine grape.
S	R	R	thin....	thin....	.....	good	3.	Sept	7		
M	R	L R	thin....	thin....	.....	medium	.....	Sept	7		
S	O	W	thin....	thin....	.....	sweet and rich	.....	Sept	8		
S	R	B	thin....	thin....	.....	tart	.....	Oct	2		
L	R	B	medium	thin .	.....	good	4.....	Oct	8		
Sh	R	B	little...	thin....	soft	poor	2.....	Oct	4		
M	R	W	thin....	thin....	.....	good	4.....	Sept	8		
M	O	B	thick...	thick...	.....	spicy	3.....	last Aug .	5		Valuale on account of earliness.
L	R	D R	thin....	thick...	.....	musky	4, small	Sept	4		
L	R	B	thick...	thick...	.....	sprightly	3 seeds .	Sept	8		
S	R	B	thin....	thin....	no	spur	....	Oct	2		Good for red wine.
M	R	W	thin....	thin....	not much.	me lium	3 ...	Oct	5		
M	R	R	thin....	thin....	very little	good	2 seeds .	Oct	8		
M	O	D R	thin....	thin....	tough	very sweet ...	3 or 4 ..	Oct	8		Produced more than any other of same year's planting; very late in ripening.
L	R	W	thin....	thin....	no	sweet	2.....	Oct	6		
S	R	W	thin....	thin....	no	sweet	2.....	Oct	6		
M	R	R	little...	thin....	... .	medium	3.....	Oct	5		
M	R	W	thick...	medium	.....	fair	3.	Sept	6		
L	R	R	thin....	thick...	tough	fair	3 or 4 ..	Sept	8		

STATION RECORD.

Insects.		Fungi.		Time of blooming.	Date of maturity.	Date of gathering (berries, first and last.)	Yield.*	Grade. Per cent.			Average price.
Name.	Treatment.	Name.	Treatment.					Class 1.	Class 2.	Class 3.	
None.	None.	mildew.....	Sulphur.	June 26	Oct. 10	Oct. 12-16 ..	20	15	4	1	2½
		"		" 27	Sept. 16	Sept. 16....	15	13	2	....	2
		very little..		" 28	" 15	" 15....	21	19	2	....	1½
		none		" 29	Oct. 24	Oct. 30.....	21	18	2	1	2½
		"		" 28	Sept. 16....	Sept. 16-20..	15	14	1	....	3
		mildew.....		" 26	" 14....	" 17-21..	18	15	2	1	3
		none		" 28	" 7....	" 8	7	6	1	....	2½
		"		" 29	" 6....	" 8	10½	10	....	½	4
		"		" 28	" 18....	" 20-27..	24	22	2	....	1½
		very little ..		" 28	" 16....	" 16-20..	18½	17	1½	....	2½
		" ..		" 27	" 14....	" 14-20..	20	18	2	....	2
		none		" 27	Oct. 1.....	Oct. 1.....	15½	14	1	½	2

PEACHES.

TESTED AT

CAVITY.
S.—Shallow.
N.—Narrow.
D.—Deep.
B.—Broad.

Variety.	Origin.	Tree.				Skin.	
		Habit.	Foliage.	Age of bearing.	Size. in inches.	Color.	Down.
Foster	American	U	dark, plentiful	3	4x4	yell. with red cheek.	mod.
Hyne's Surprise	Capt. Hughes, West Plains, Mo.	U	glossy, healthful	3	m $2\frac{1}{4}$x$2\frac{1}{4}$	pale y. deep red cheek	light.
Jacque's Rareripe.	Massachusetts	U	abundant	4	3x3	yellow	light.
Longhurst	Niagara	U	narrowish leaves	3	3x$3\frac{1}{2}$	dull yellow	heavy
Steven's Rareripe.	Hudson Riv. district	U	dark, glossy	4	4x$3\frac{1}{2}$	greenish white red cheek.	mod.

PEACHES.

NIAGARA STATION.

SUTURE.

L.—Large. Ob.—Obscure.
D.—Distinct. Obs.—Obsolete.

Fruit.						Remarks.
Cavity.	Suture in stone fruits.	Stone.	Flesh.			
			Color.	Texture.	Flavor.	
D B	D	free.....	yellow	firmish	modera'ly rich	more free than any of the early peaches.
D	D	semi-cling ..	white	juicy	fair	
N D	D	free..... .	yellow	"	modera'ly rich	
N D	D	free.....	pale yellow...	firm.....	fair	good canning peach.
D N	D	free.....	white	juicy	good	good shipper.

PEACHES.

NIAGARA DISTRICT

Variety.	Origin.	When planted.	Soil.	Cultivation.	Fertilizers used.
Alexander		1886	sand	thorough	ashes and bone and barn-yard manure.
Centennial		1891	"	"	"
Early Crawford	New Jersey	1886	"	"	"
Early Richmond		1886	"	"	"
Early Rivers	English	1886	"	"	"
Foster	American	1894	"	"	crimson clover and ashes.
Hynes' Surprise	Texas	1892	s. loam.	thorough, seeded w. c. clover.	wood ashes
Late Crawford	American	1886	sand	thorough	manure, bone and ashes.
Longhurst	Niagara	1894	"	"	c. clover and ashes
Old Mixon	American	1886	"	"	manure, bone and ashes.
Steven's Rareripe	American	1882	s. loam.	thorough, seeded to clover Aug 5.	ashes

PEACHES.—*Continued*

Variety.	Fungi.		Thinning—per cent. by hand or accident.	Time of blooming.	Date of maturity.
	Name.	Treatment.			
Alexander	monillia		40%	May 5	August 6
Centennial	no			" 8	September 26
Early Crawford	little or none			" 7	" 9
Early Richmond	monillia			" 5	August 18
Early Rivers	monillia and black spot.		40%	" 5	" 15
Foster	nothing			" 7	September 20
Hynes' Surprise	monilla	Bordeaux	50%	" 5	August 18
Late Crawford	little or none			" 8	September 25
Longhurst	"			" 9	October 2
Old Mixon	"			" 8	September 15
Steven's Rareripe	"		50%	" 8	October 1

PEACHES.

STATION RECORD, 1897.

Winter protection.	Weather favorable or unfavorable.	Pruning.		Insects.	
		Date.	Method.	Name.	Treatment.
none	unfavorable.	late winter..	removal of dead wood and superfluous branches.	peach borer curculio.	digging out
"	"	"	" "	none	
"	"	"	" "	peach borer	digging out
"	"	"	" "	"	"
"	"	"	" "	"	
"	"	early spring.	shortening in	none	
"	"	"	"	borer curculio	Paris green
"	"	winter	Removal of dead wood and superfluous branches.	borer	digging out
"	"	early spring.	shortening in	none	
"	"	winter	Removal of dead and superfluous wood.	borer.	digging out
"	"	early spring.	shortening in	none of any account.	

PEACHES.—*Continued.*

Date of gathering.	Yield.	Grade. Per cent.			Storage.	Date of decay.	Average price per 12 quart basket.	Remarks.
		Class 1.	Class 2.	Class 3.	Place.			
	qts.						cts.	
August 6-15	108	40	50	10			35	more should have been thinned off.
September 26	24	90	10				40	good keeper but a cling stone.
" 9-20	120	10	60	30			25	too heavy crop, should have been thinned.
" 18-28	72	50	40	10			30	bad variety to rot.
" 15-25	105	40	50	10			50	
" 20	15	90	10				50	
" 18-30	96	66	30	5			37½	almost freestone.
" 25-30	60	60	40				40	
" 2-8	25	50	50				45	
" 15 25	108	10	70	20			25	
" 1-12	120	70	30		packing house.	Nov. 10.	35	White flesh, but good peach and long keeper.

CHERRIES.

NIAGARA DISTRICT

Variety.	When planted.	Soil.	Cultivation.	Fertilizer used.	Winter protection.	Weather favorable or unfavorable.	Date.
Knight's Early Black	about 1860	sand	grass grown for mulch.	none	none	medium	.....
Napoleon, sweet.	1890	"	thorough.	wood ashes	seeded to c. clover July 30.	"	.....
May Duke	1888	"	"	do	none.	"	e. spring
Early Richmond	1889	"	"	do sodded to c. clover July 30.	.....	"	"
Montmorency, sour	1889	"	"	wood ashes	none	.....	"

CHERRIES.

STATION RECORD, 1897.

Pruning.	Insects.		Fungi.		Time of blooming.	Date of maturity.	Date of gathering (berries 1st and last)	Yield.	Average price per quart.	Remarks.
Method.	Name.	Treatment.	Name.	Treatment.						
none.....	Curculio, cherry aphis.	Paris green, coal oil emul.	Rot..	Bordeaux.	May 6	July 2	2 —10	100qts	10 c.	A good many not picked owing to aphis.
very little pruning.	aphis.....	tobacco	"	"	" 5	" 6	6 — 9	24	7½	Bad cherry to rot.
slight thinning	.....	.....	"	"	" 6	" 8	8 —12	25	13½	A fine cherry.
"	aphis.....	tobacco	none .	.....	" 9	" 6	6 —13	30	9½	Season later than usual.
"	none	none	"	.....	"	" 19	19—24	33	5	

PEARS.

EAST CENTRAL STATION

Variety.	Origin.	When planted.	Soil.	Cultivation.	Fertilizers used.
Bartlett	Berkshire, Eng	1887	clay loam.	summer fallowed	stable manure.
Belle Lucrative	Flemish Pear	1889	"	" "	"
Buffam	Rhode Island, U.S	1889	"	" "	"
Beurre Clairgeau	Nantes, France	1891	"	clover sod	
Beurre d'Anjou	France	1889	"	"	
Beurre Superfine	France	1887	"	cultivated	
Beurre Antoine	France	1889	"	clover sod	
Brockworth Park	English	1889	"	cultivated	stable manure.
Clapp's Favorite	Rochester, Mass	1887	"	clover sod	ashes
Doyenne d'Ete	Van mons, seedling, France.	1889	"	cultivated	manure
Duchess d'Angoleme	Angers, France	1887	"	"	stable manure.
Beurre Gifford	Angers, France	1889	"	"	none
Flemish Beauty	Belgian Pear	1886	"	"	ashes
Glout Morceau	Flemish Pear	1890	"	"	stable manure.
Gray Doyenne	French	1889	"	"	"
Graslin	France	1886	"	clover sod	ashes
Goodale	Saco, Maine	1886	"	"	"
Howell	New Haven, Conn	1889	"	"	"
Idaho	United States	1894	"	cultivated	manure
Jos. d'Malines	Malones, France	1886	"	"	"
Keiffers Hybrics	Kirby, Pa	1887	"	clover sod	ashes
King Sessing	Philadelphia, Pa	1886	"	cultivated	
Lawrence	Flushing, L. Island	1886	"	clover sod	
Louise bonne de Jersey	France	1887	"	cultivated	
Mt. Vernon	Roxbury, Mass	1889	"	"	manure
La Conte	Philadelphia, U.S	1887	"	"	
President Drouard	American	1887	"	"	
President	Brookline, Mass	1887	"	clover sod	
Ritson	Oshawa, Ont	1892	"	cultivated	
Rosteizer	Foreign	1887	"	"	manure
Sheldon	Wayne Co.. N. Y	1876	"	"	ashes & manure
Souv. du Congress	Lyon, France	1887	"	"	"
Winter Nelis	Flemish Pear	1886	"	clover sod	none
Winter Seckel	Fredericksburg. Va	1889	"	"	"

PEARS.

RECORD FOR 1897.

Winter protection.	Weather favorable or unfavorable.	Pruning.		Insects.		Fungi.		Yield.	
		Date.	Method.	Name.	Treatment.	Name.	Treatment.	bus.	pk.
spruce 30 feet high	too wet and cold at blooming	March and April.	Cutting out suckers and cutting back previous season's growth where too lengthy.	none ...	Sprayed with Bordeaux and kerosene emulsion, and trees washed in spring with lye made from wood ashes.	none ...	Sprayed same as for insects.	3	1
"	"			" ..		" ..		3	
"	"			" ..		" ..			2½
.....	.....			" ..		" .			1
.....	.....			" ..		" ..		2	
.....	.....			" ..		" ..		1	1
.....	.....			" ..		" ..			3
.....	.....			" ..		" ..			1
.....	.....			" ..		" ..		3	
.....	.....			" ..		" ..			3
.....	.....			" ..		" ..		1	
.....	.....			" ..		" ..			3
.....	.....			" ..		" ..		1	
.....	.....			" ..		" ..			3
.....	.....			" ..		" ..			1
.....	.....			" ..		" ..		1	
.....	.....			" ..		" ..		1	
.....	.....			" ..		" ..		3	
.....	.....			" ..		" ..			
.....	.....			" ..		" ..		1	
.....	.....			" ..		" ..		3	1
.....	.....			" ..		" ..		3	
.....	.....			" ..		" ..			1
.....	.....			" ..		" ..			3
.....	.....			" ..		" ..		1	
.....	.....			" ..		" ..			3
.....	.....			" ..		" ..			1
.....	.....			" ..		" ..			2
Only a windbreak of spruce 30 feet high.	Cold and backward in spring and too dry in August and September.			" ..		" ..		3	
				" ..		" ..		3	
				" ..		" ..		1	
				" ..		" ..			3
				" ..		" ..			2

PEARS

Burlington Station

Variety.	Origin.	When planted.	Soil.	Cultivation.	Fertilizers used.	Weather favorable or unfavorable.	Pruning.		Name.
							Date.	Method.	
1. Anjou	Belgium	1880	clay-loam.	Plowed once a year in the fall or spring, then clean cultivation until last of July. Seeded down every few years to check growth of wood.	On dwarf trees a good deal of stable manure; on standards on clay soil, also stable manure once in two years.	favorable	March.	Heading back young trees up to 5 or 6 years old, to make them stocky and more compact in the top, and cutting out cross branches.	Slug, codling moth, curculio.
2. Bartlett	England	1880	"			"	"		
3. Clairgeau		1896	grav.-loam			"	"		
4. Clapp's Favorite	Massachusetts	1889	"			"	"		
5. Duchess	France	1889	"			"	"		
6. Flemish Beauty.	Flanders	1880	clay-loam.			unfavorable.	"		
7. Howell	Connecticut	1896	grav.-loam			favorable	"		
8. Keiffer	Pennsylvania, probably cross between Chinese sand pear and Bartlett.	1896	"			"	"		
9. Sheldon	New York	1889	"			"	"		

PEARS.

RECORD.—A. W. PEART.

Insects. Treatment.	Fungi. Name.	Fungi. Treatment.	Time of blooming.	Date of maturity.	Date of gathering.	Yield per tree.	Per cent. Class 1.	Per cent. Class 2.	Per cent. Class 3.	Average price.	Remarks.
						Bush.					
Paris green and lime. Two pounds of lime to one of Paris green to prevent injury to leaves; these in 200 gallons of water.	Some blight, scab.	Cutting out and burning, Bordeaux mixture.	May 18	Nov.-Dec.	Oct. 5..	1½	70	25	5	$4 per bbl	Drops too early.
			" 16	Sept	Sept. 6..	1¼	65	30	5	$3.50 per bbl.	
			" 20	Nov.....	Oct. 7.						
			" 16	Aug	Aug. 20..	1½	80	20	....	50c. per bskt.	
			" 20	Oct.-Nov..	Oct. 6..	½	50	45	5	$2.50 per bbl.	
			" 16	Sept	Sept. 8.	2	10	30	60	25c. per bskt.	Badly spotted.
			" 20	Oct	Oct. 7.						
			" 20	Oct -Nov .	Oct. 7.						
			" ..	Oct.-Nov..	Oct. 7 .	¼	75	25			

DESCRIPTIVE TABLE

Tested at Burlington

Size.—S., Small; M., Medium; L., Large. Form.—R., Round; C. Conical; O. Ovate.
Season.—E., Farly;

Variety.	Origin.	Plant. Canes. Habit of growth.	Color, Nov. 9th.	Freedom from disease, 1-10.	Propagation by tips or suckers.	Foliage.	Vigor, scale 1-10.
1. All Summer	See Station Record.	Upr	L. grey	9	S	Rank, healthy	For vigor, hardiness and productiveness, see Table of Values.
2. Columbian		Strong, up	Red	10	T	Heavy, healthy	
3. Cuthbert		Up., str	D. R	9	S	Light green, healthy	
4. Golden Queen		Up	D. R	10	S	Rank, healthy	
5. Gregg		Up., str	D. R	9	T	Medium, healthy	
6. Hilborn		Up	Brown	10	T	Medium, healthy	
7. Japan Wine		Up., str	Red	10	T	Rank, healthy	
8. Kansas		Up	D. R	10	T	Healthy	
9. London		Up	D. R	10	S	Healthy	
10. Lovett		Up	D. R	9	S	Fair	
11. Marlboro'		Up	D. R	10	S	Dark green, healthy.	
12. Ohio		Up., str	Bro. R	9	T	Healthy	
13. Older		Up	Bro. R	10	T	Good	
14. Palmer		Up	D. R	9	T	Healthy	
15. Progress		Up	D. R	9	T	Fair	
16. Redfield		Up., str	D. R	9	S	Healthy	
17. Reliance		Up	Brown	10	S	Healthy	
18. Shaffer's Colossal		Up	Br	8	T	Strong, healthy	
19. Smith's Giant		Strong, up	D. R	10	T	Good, healthy	
20. Souhegan		Up., str	D. R	9	T	Medium, healthy	
21. Thompson		Up	D. R	10	S	Healthy	

RASPBERRIES.—BURLINGTON STA

Variety.	Origin.	When planted.	Soil.	Cultivation.	Fertilizers used.	Winter protection.	Weather favorable and unfavorable.	Pruning. Date.	Pruning. Method.
1. All Summer		1895	rich grav. loam.	Plowed in spring, then frequent cultivation and hoeing until fruit is ripe. Banked up for the winter.	stable man	none	Favorable, on the whole, although the ripening season was very late.	Annual pruning early in April. Summer pruning in August of young canes, to make them stocky and throw out laterals. Old canes removed any time between fall of leaf and annual pruning.	
2. Columbian	Oneida, N. Y.	1895	" "		"	"			
3. Cuthbert	Riverdale, N. Y.	1894	" "		"	"			
4. Golden Queen	New Jersey	1896	" "		"	"			
5. Gregg	Indiana	1896	" "		"	"			
6. Hilborn	Leamington, Ont	1895	" "		"	"			
7. Japan Wine	Tokio, Japan	1896	" "		"	"			
8. Kansas	Kansas	1895	" "		"	"			
9. London	Janesville, Wis	1896	" "		"	"			
10. Lovett	New Jersey	1895	" "		"	"			
11. Marlboro'	Marlboro', N. Y.	1894	" "		"	"			
12. Ohio	Ohio	1896	" "		"	"			
13. Older	Iowa	1895	" "		"	"			
14. Palmer	Mansfield, Ohio	1895	" "		"	"			
15. Progress		1895	" "		"	"			
16. Redfield		1896	" "		"	"			
17. Reliance	New Jersey	1896	" "		"	"			
18. Shaffer's Colossal	Monroe Co., N. Y.	1895	" "		"	"			
19. Smith's Giant	St. Catharines, Ont	1896	" "		"	"			
20. Souhegan	New Hampshire	1896	" "		"	"			
21. Thompson	Ohio	1895	" "		"	"			

OF RASPBERRIES.

STATION —A. W. PEART, EXPERIMENTER.

COLOR.—D., Dark; R., Red; P., Purple; O., Orange; B., Bright. FLESH.—F., Firm; S., Soft. M., Medium; L., Late.

Measurement, length and breadth in inches.	Berry. Size.	Form.	Color.	Tenacity (*i.e.*, to calyx or receptacle).	Flesh.	Flavor. (See Thomas.)	Season.	Remarks.
x	M....	R....	R....	Free ...	S	Sweet, aromatic	E. L ...	July-Oct.
x	M....	R....	P	M.....	F	Sweet, sprightly	M	
x	L	R....	R....	M	F	Excellent	M. L...	
x	L .. .	R....	O	M.....	M....	Good	E.....	
x	S	R....	D	M ...	M....	Fair	M	
x	M....	R....	D	F	F	Excellent	E	
x	S	R....	B. R.	F	S	Acid	M	
x	L	R....	D	M.....	F	Fine	E	Best black cap here.
x	M....	R....	R....	M.....	F	Good	M	Offers well.
x	M....	R....	R....	M.....	F	Fair	M	
x	L	R....	R....	M.....	F	Fair	E. M ..	
x	L	R....	D	M.....	F	Excellent	E	
x	L	R....	D	F	M....	Inferior	E	
x	M....	R....	D	M	F	Sweet.....	E	
x	S. M.	R....	D	M.....	F	Sweet, good	E	
x	L	R....	P ...	M.....	F	Fine, good.....	M	
x	L .. .	R....	D. R.	M... .	F	Rich	E. M ..	Offers well.
x	L	R. ..	P	M.....	F ...	Only fair.....	M	
x	V.L..	R....	D. ..	M.....	F	Good, sprightly.....	L	Offers well.
x	L	R....	D	F	M....	Good	M	
x	M....	R....	R....	M.....	M....	Fair	M	

TION RECORD, 1897.—A. W. PEART.

Insects. Name.	Insects. Treatment.	Fungi. Name.	Fungi. Treatment.	Time of blooming.	Date of maturity.	Date of gathering. (Berries 1st and last.)	Yield.	Remarks.
							Per hill.	
The raspberry slug and snowy tree cricket, which were but few and did little harm.		Some, but very little anthracnose.	Cutting out and burning when crop is gathered.	June 12 ..	July 10 ..	July 10-Oct. 15 ...	2 lbs.	Fruits July to Oct.
				June 22 ..	July 20 ..	July 20-Aug. 1 ...	2½ "	Is doing well.
				June 25 ..	July 25 ..	July 25-Aug. 7 ...	2¼ "	A standard.
				June 15 ..	July 10 ..	July 10-25.....	.....	
				June 15 ..	July 20 ..	July 20-31	.....	
				June 14 ..	July 10 ..	July 10-20	1½ lbs.	
				June 15 ..	July 30 ..	July 30-Aug. 10 ..	.....	A very ornamental bush.
				June 14 ..	July 15 ..	July 15-25	3 lbs.	Is doing fine.
				June 20 ..	July 20 ..	July 20-Aug. 1....	.....	Offers well.
				June 20 ..	July 15 ..	July 15-31	1½ lbs.	A standard.
				June 15 ..	July 15 ..	July 15-30	2¼ "	
				June 12 ..	July 10 ..	July 10-20	.....	
				June 12 ..	July 15 ..	July 15-25	2 lbs.	
				June 10 ..	July 5 ..	July 5-20	3 "	
				June 10 ..	July 10 .	July 10-20	1 "	
				June 25 ..	July 20 ..	July 20-31	.....	
				June 15 ..	July 10 ..	July 10-25	½ lbs.	
				June 25	July 20 ..	July 20-31	1½ "	
				June 12 ..	July 20 ..	July 20-31	1 "	
				June 12 ..	July 20 ..	July 15-25	.....	
				June 15 ..	July 15 ..	July 15-30	.....	

STRAWBERRIES.—ST. LAW

Variety.	Origin.	When planted.	Soil.	Cultivation.	Fertilizers used.
Aroma, "S"	From Cumberland, and by E. W. Cruse, Kansas.	1896	Clay loam.	Hoed frequently during 1896 and left mulch between the rows for fruiting.	Horse manure free from straw or litter.
Buback, P	By J. G. Bubah, Ill.	do	do	do	do
Brandywine, S	Glen Dale x Cumberland, by E. Ingram, Pa.	do	do	do	do
Beauty, S		do	do	do	do
Belle, S		do	do	do	do
Greenville, P	Seedling, Ohio	do	do	do	do
Haverland, P	Ohio.	do	do	do	do
Saunders, S	By John Little, Granton, Ont.	do	do	do	do
Wm. Belt, S	By Wm. Belt, Ohio.	do	do	do	do
Woolverton, S	By John Little, Granton, Ont,	do	do	do	do

RENCE STATION RECORD.

Winter protection.	Weather favorable or unfavorable.	Insects.	Fungi.	Time of blooming.	Date of gathering (berries 1st and last.)	Yield.	Remarks.
Wheat straw.	Unfavorable heavy rains in early spring followed by very dry, hot weather at the time of ripening.	None.	None ; Healthy, vigorous.	May 21.	June 26 to July 8.	43 oz.	
do	do	None.	Some rust	May 24.	June 24 to July 2.	45 oz.	
do	do	None.	None; very healthy.	May 21.	June 24 to July 8.	87 oz.	
do	do	None.	Some rust ; vigorous.	May 28.	.....	.....	A good stand of fruit set on a short stem and the first fruit came nearly to maturity when it was completely cooked on the plants by the hot weather.
do	do	None.	Some rust ; very vigorous.	May 20.	June 26 to July 8.	56 oz.	
do	do	None.	Healty, vigorous	May 20.	June 22 to July 2.	74 oz.	
do	do	None.	Healthy, moderately vigorous.	May 24.	June 24 to July 2.	19 oz.	
do	do	None.	Rusted, vigorous, runners numerous.	May 30.	June 26 to July 8.	68 oz.	
do	do	None.	Rusted, vigorous, strong plant, large foliage.	May 20.	June 24 to July 8.	104 oz.	Leaf and stock both wilted down at last picking.
do	do	None.	Rusted, vigorous, strong plant, large, dark green foliage.	May 20.	June 24 to July 8.	156 oz.	Withstood the drought the best of any variety I had on trial.

PLUMS.

Described by John Mitchell,

HABIT.

S.—Spreading.
U.—Upright.
D.—Drooping.

SIZE.

S.—Small.
M.—Medium.
L.—Large.

CAVITY.

S.—Shallow.
N.—Narrow.
D—.Deep.
B.—Broad.

Variety.	Origin.	Tree.			Fruit.			
						Skin.		
		Habit.	Foliage.	Age of bearing.	Size.	Form.	Color.	Bloom.
Arch Duke....	....	U	luxuriant	3	M to L	oblong ...	black ..	heavy blue.
Burbank	Japanese	S	very abundant and healthy.	3	S to L	nearly globular.	cherry red.	thin lilac.
Bradshaw	.....	U	abundant and healthy.	4-5	L	oval obviate.	reddish purple.	light ...
New Goderich..	appears to be seedling of Lombard.	S	abundant and healthy.	5	M to L	globular..	red brown.	heavy ..
Pond Seedling..	English	U	abundant and healthy.	4	L	oval.....	red	thin white.
Reine Claude...	Maj. Esperene Vilvorde.	U	large, glossy, abundant.	4	M	greenish-yellow.	greenish yellow.	thin....

PLUMS.

OF THE GEORGIAN BAY STATION.

SUTURE.

L.—Large. Ob.—Obscure.
D.—Distinct. Obs.—Obsolete.

Fruit.						
				Flesh.		
Cavity.	Stem.	Suture in stone fruits.	Seeds or stone.	Color.	Texture.	Flavor.
S	long	D	free	yellow	fine and dry	moderately sweet.
.....	slender	D	cling	yellow	fine and juicy	sweet.
S	stout	L	semi-cling	yellowish	coarse and juicy	pleasant.
S	short	D	cling	yellow	rather coarse	not rich.
W & S	long and slender	D	cling	yellow	coarse	not rich.
S	short and stout	D	free	yellow	juicy	sugary, rich.

DESCRIPTIVE TABLE OF CURRANTS.

Tested at Burlington Station, 1897.

Size.—S., Small; M., Medium; L., Large. Form.—L, Long; S., Short; Sh., Shouldered. Compactness.—C., Close; L., Loose; St., Straggling. Form of Berry.—R., Round; Ov., Oval; Ob., Oblong. Color.—R., Red; B., Black; W., White; G., Green; Y., Yellow. Season.—E, Early; M., Medium; L., Late.

Variety.	Plant.			Berry.						Remarks.
	Origin.	Foliage.	Vigor, scale 1-10.	Diameter.	Size.	Form.	Color.	Flavor.	Season.	
Currants.										
1. Belle de St. Giles	See Station Record.	Healthy, medium.	For vigor, productiveness, and freedom from mildew, see table of values.	½ in.	L	R	R	Fine	M	
2. Black Victoria.....		Strong, healthy..		½ "	L	R	B	Sweet ...	L	
3. Brayley's Seedling ...		Healthy		⅝ "	M	R	R	Very acid	E. M.	
4. Champion		Vigorous, healthy.		⅝ "	V.L	R	B	Acid	L	Very late ripening.
5. Cherry		Strong, healthy..		½ "	L	R	R	Fine	M	
6. Collin's Prolific		Rank, healthy ...		⅝ "	V.L	R	B	Very acid	L	
7. Fay's Prolific		Healthy		½ "	M	R	R	Acid	M	
8. Naples		Healthy		½ "	M	R	B	Acid	L	
9. North Star		Healthy, medium.		½ "	L	R	R	Spr. good	E. M.	
10. Raby Castle		Strong vigorous..		⅝ "	M	R	R	Acid good	M	
11. Red Cross		Healthy		⅝ "	M	R	R	Good	M	
12. Red Victoria		Good, healthy ...		⅝ "	M	R	R	Fine	M	
13. Versailles.....		Healthy		⅝ "	M	R	R	Acid good	M	
14. White Grape.....		Healthy, medium.		⅝ "	M	R	W	Acid	E. M.	
15. White Imperial		Healthy		½ "	L	R	W	Fine	E. M.	
16. Wilder		Healthy, medium.		½ "	L	R	R	Acid good	M	

GOOSEBERRIES.—TESTED AT SIMCOE SUB-STATION.

S. Spellett, Experimenter.

Size.—S., Small, M., Medium; L., Large. Form.—L., Long; S., Short; Sh., Shouldered. Compactness.—C., Close; L., Loose; St., Straggling. Form of Berry.—R., Round; Ov, Oval; Ob., Oblong. Color.—R., Red; B., Black; W., White; G. Green; Y., Yellow; Season.—E., Early; M., Medium; L., Late.

Variety.	Plant.					Berry.					Value, scale 1-10	
	Origin.	Foliage.	Vigor, scale 1-10	Productiveness, scale 1-10.	Freedom from mildew, 1-10.	Size.	Form.	Color.	Flavor (see Thomas.)	Season.	Dessert	Market.
Autocrat	Eng.	Fair	7	8	8	V L.	Ob	G	V G.	L	10	10
Champion	Am	Good	9	10	7	M.	Ov	G W.	Fair.	M.	6	7
Chautauqua	Eng.	Fair.	8	....	8	L.	Ov	G W.	G	M.	9	10
Carnie's Golden	Foreign	Good.	9	....	9	L.	Ob	G	G		9	10
Crosby's Seedling	Foreign	Good	9	....	9	L.	Ov	R	G		9	10
Crown Bob	Eng.	Good	8	....	8							
Columbus	Eng.	Fair	8		8							
Downing	Am.	Good	8	9	9	M.	R	G W.	G	M.	9	8
Dominion	Foreign	Fair	8	....	8							
Golden Prolific	Foreign	Fair	8	....	8							
Green Chisel	Eng.	Good	8	....	8	M.	R	G W.	G	M.	9	8
Keepsake	Eng.	Fair	8	....	8							
Lancashire Lad	Eng.	Fair	7		8	L.	Ov	R	V G.	E	10	10
Large Golden Prolific	Eng.	Fair	8	....	8							
Mrs. Whittaker	Eng.	Fair	8	....	8							
Oregon Jumbo	Am.	Good	8	....	8							
Pearl	Am.	Good	9	9	9	M.	R	G W.	G	M.	9	9
Phoenix	Foreign	Fair	8	....	8							
Queen	Foreign	Fair	8	....	8	L.	Ov	G W.	G	M.	9	10
Red Jacket	Am.	Good	9	....	9	M.	R	R	G	M.	9	10
Success	Am.	Good	9	....	9	M.	R	G W.	G	M.	9	9
Triumph	Eng.	Good	7	8	8	V L.	Ov	G W.	G	M.	9	10
Whitesmith	Eng.	Fair	8	8	7	V L.	Ob	G W.	G	M.	9	10
White Crystal	Am.	Good	9	9	9	S	Ov	G W.	Fair.	M.	6	6

CATALOGUE OF FRUITS FOR THE USE OF PLANTERS.

Apples—Values given at Bay of Quinte Station, 1897.

Varieties tested.	Season of use.	Tree.			Total value of tree.	Fruit.				Total value of fruit.
						Quality, Scale 1-10.		Value, Scale 1-10.		
		Vigor, Scale 1-10.	Hardiness, Scale 1-10.	Productivess, Scale 1-10.		Dessert.	Cooking.	Home market.	Foreign market.	
Saxton	Sept.-Oct...	8	8	8	24	7	8	6	5	26
Stump	Sept.-Oct...	8	8	8	24	6	6	6	5	23
St. Lawrence	Sept.-Oct...	10	10	10	30	8	9	9	6	32
Stark	Feb.-May ..	10	10	10	30	4	6	6	8	24
Stott's Russett	Jan.-Feb ...	10	9	4	23	3	6	4	4	17
Seek-no-further (Westfield)	Dec.-Mar...	8	8	8	24	7	7	8	8	30
Talman Sweet	Dec.-April .	10	10	9	29	6	6	4	4	20
Trenton	Sept.-Oct...	9	9	10	28	8	8	9	7	32
Wagener	Dec.-Feb. ..	7	8	10	25	8	8	9	7	32
Wealthy	Sept.-Nov ..	7	9	10	26	8	8	8	7	31
Wellington	Dec.-Mar...	8	9	7	24	5	8	6	7	26
Wine Sap	Dec.-May ..	6	8	9	23	7	5	7	7	28

Apples—Values given at Lake Huron Station, 1897.

American G. Russett	Jan.-May .	8	10	7	25	8	8	7	9	32
Beauty of Kent	Oct.-Nov...	10	10	8	28	4	8	8	7	27
Ben Davis	Mar.-May ..	8	10	10	28	3	6	6	9	24
Colvert	Oct.-Jan ...	9	10	8	27	4	9	9	7	29
Duchess	Aug.-Sept. .	9	10	9	28	6	10	10	7	33
Early Harvest	Aug	7	8	8	23	9	8	6	.....	23
Fameuse	Oct.-Jan ...	8	8	10	26	10	8	10	9	37
Fall Painting	Sept.....	7	7	6	20	7	6	7	.....	20
Grime's Golden	Oct.-Feb ...	7	6	8	21	9	8	6	7	30
King	Oct.-Mar...	7	6	5	18	9	9	10	10	38
Keswick Codlin	Sept.-Oct...	8	10	9	27	.....	7	5	.....	12
Lowell Pippin	Sept.....	6	8	9	23	6	7	9	.....	22
Mann	Jan.-April..	9	10	9	28	5	6	7	8	26
Mountain Tulip	Sept.....	8	9	8	25	7	6	7	.....	20
Northern Spy	Jan.-May ..	10	8	10	28	9	10	10	10	39
Pewaukee	Jan.-May ..	10	10	10	30	7	8	8	8	31
R. I. Greening	Nov.-April .	8	6	8	22	9	10	8	8	35
Ribston Pippin	Oct.-Feb....	7	6	6	19	9	9	9	10	37
St. Lawrence	Sept.-Oct...	9	10	10	29	10	9	9	.....	28
Seek-no-further	Oct -Feb,. .	9	8	8	25	7	7	9	8	29
Sour Bough	Aug.-Sept ..	10	9	8	27	2	7	8	.....	17
Sweet Bough	Aug.-Sept ..	7	9	8	24	9	.....	5	.....	14
Talman Sweet	Nov.-April .	9	10	8	27	7	5	4	.....	16
Tetofsky	Aug.....	8	10	9	27	7	9	6	.....	22
Wagener	Nov.-Mar ..	8	8	10	26	9	8	8	8	33

CATALOGUE OF FRUITS FOR THE USE OF PLANTERS —*Continued.*

Apples—Values given at East Central Station, 1897.

Varieties tested.	Season in use.	Tree.			Total value of tree.	Fruit.				Total value of fruit.
						Quality, scale 1-10.		Value, scale 1-10.		
		Vigor, scale 1-10.	Hardiness, scale 1-10.	Productiveness, scale 1-10.		Dessert.	Cooking.	Home market.	Foreign market.	
Astrachan	August	8	9	8	25	8	8	7	...	23
American Golden Russett	Jan.-May	8	10	6	24	8	5	7	8	28
Baldwin	Dec.-March.	6	7	8	21	6	7	7	9	29
Boston Star	Nov.-Dec	9	10	10	29	6	9	7	8	30
Bellflower	Dec.-Feb.	9	8	9	26	6	7	8	6	27
Blue Pearmain	Nov.-April	8	8	7	23	8	7	8	9	32
Canada Red	Dec.-April	8	9	10	27	8	7	8	9	32
Chenango Strawberry	Sept.	6	7	7	20	9	7	7	.....	23
Duchess of Oldenburg	Sept.-Oct.	10	10	10	30	6	10	8	.....	24
Early Harvest	July-Aug	8	7	9	21	9	8	6	.....	23
Fameuse	Oct.-Dec	8	8	9	24	10	8	10	7	35
Fall Pippin	Oct.-Dec	8	8	7	23	7	7	6	5	25
Grimes' Golden	Dec.-March.	7	9	9	25	6	5	4	4	19
Haas	Sep.-Dec	10	10	9	24	...	4	4	4	12
Holland Pippin	Sep.-Dec	7	8	6	21	6	7	6	5	24
Kentish Fillbasket	Sept.-Oct.	9	9	8	26	4	9	7	.	20
King of Tompkins	Oct.-Dec	7	6	7	20	9	9	10	10	38
Minkler	Dec.-April	9	10	8	27	6	7	8	8	29
Maiden's Blush	Oct.-Dec	9	10	10	29	5	8	9	8	30
McMahon's White	Sep	7	7	7	21	6	9	6	..	21
Northern Spy	Jan.-March.	9	9	7	25	9	8	10	10	37
Ontario	Jan.-May	8	8	8	25	8	8	9	9	34
Pewaukee	Jan.-April	9	10	9	28	7	6	8	9	30
Princess Louise	Dec.-Feb.	5	7	9	21	8	6	8	9	31
R. I. Greening	Dec.-Feb.	8	9	8	25	6	7	7	9	29
Ribston Pippin	Nov.-April	8	8	7	23	8	7	8	10	33
Salome	Jan.-May	8	9	7	24	9	6	8	10	33
Seek-no-Farther	Oct.-March.	9	8	8	25	7	7	9	9	32
Swaar	Dec.-Mar.	8	8	7	23	8	7	8	9	31
Swayzie Pomme Grise	Jan.-May	6	8	9	23	9	5	6	8	28
Twenty Ounce Pippin	Oct.-Jan	7	6	7	20	4	6	5	6	21
Wealthy	Nov.-Jan.	9	10	10	29	7	6	8	7	28
Wagener	Nov.-July	7	7	8	22	6	7	7	9	29

CATALOGUE OF FRUITS FOR THE USE OF PLANTERS.—*Continued.*

PEARS—VALUES GIVEN AT EAST CENTRAL STATION, 1897.

Varieties tested.	Season in use.	Tree.			Total value of tree.	Fruit.				Total value of fruit.
		Vigor, scale 1-10.	Hardiness, scale 1-10.	Productiveness, scale 1-10.		Quality, scale 1-10.		Value, scale 1-10.		
						Dessert.	Cooking.	Home market.	Foreign market.	
Bartlett	Sept	7	7	9	23	9	5	10	.....	.....
Buffum	Oct	9	9	6	24	7	5	7	8	27
Belle Lucrative	Oct.-Nov.	6	7	8	21	8	4	7	7	26
Beurre Clairgeau	Oct.-Jan	9	8	9	26	8	7	8	9	32
Beurre d'Anjou	Oct.-Dec.	8	9	6	23	10	6	8	10	34
Beurre Superfine	Nov	7	8	8	23	8	4	6	8	26
Beurre Antoine	Oct.-Dec.	7	7	7	21	8	4	6	7	25
Brockworth Park	Dec	8	8	7	23	7	6	6	9	28
Clapp's Favorite	Dec.-Jan.	10	7	9	26	10	7	9	....	.....
Beurre Giffard	July-Aug	7	7	7	21	10	6	9	.....	.....
Doyenne d'été	Sep	9	7	8	24	8	...	8	.....	.....
Doyenne Grey	July	7	6	6	19	8	2	8	.....	.....
Duchess d'Angoulême	July-Aug	8	8	7	23	8	8	8	9	33
Glout Morceau	Nov	8	8	6	22	8	6	8	8	30
Grasline	Dec	8	7	8	23	8	7	7	7	29
Goodale	Oct.-Nov.	8	8	7	23	8	7	8	9	32
Howell	Oct.-Nov.	8	6	7	21	9	.....	8	.....	.....
Idaho	Oct.-Nov.	8	9	7	24	7	8	8	9	32
Josephine de Malines	Dec.-Jan	7	7	8	22	8	.....	7	9	.....
Keiffer	Dec	10	10	10	30	8	9	7	9	33
King Sessing	Nov	8	7	6	21	8	.....	8	.....	.....
Louise	Oct.-Nov	7	8	9	24	10	7	8	8	33
Lawrence	Jan..Feb	6	8	5	19	.....	.....	7	9	.....
Mount Vernon	Jan.-March.	9	7	8	24	8	6	7	8	29
Leconte	Oct.-Nov	8	7	7	22	7	8	9	7	31
President Drouard	Dec.-Jan	7	9	7	23	6	8	5	8	27
Ritson	Nov	9	10	8	27	8	.....	6	8	.....
Rostiezer	Sep	10	8	8	26	10	.....	8	.....	.....
Sheldon	Oct	9	7	7	23	10	7	8	.....	.....
Souv. du Congres	Sept.-Oct.	8	7	8	23	7	8	9	.....	.....
Winter Nelis	Dec.-Jan	8	10	9	27	8	.....	7	8	.....
Winter Seckel	Jan.-March.	6	7	6	19	7	.....	7	6	.....

APPLES—VALUES GIVEN AT ST. LAWRENCE STATION, 1897.

Alexander	Sept.-Oct.	9	10	8	27	5	8	9	.....	.....
American G. Russett	Jan.-April	8	10	6	24	9	8	9	9	35
Blue Pearmain	Nov.-April	8	10	6	24	8	7	9	9	33
Brockville Beauty	Aug.-Sept.	7	8	10	25	8	9	7	....	.....
Canada Red	Dec.-April	9	10	7	26	6	8	8	9	31
Duchess	Aug.-Sept.	9	10	10	29	5	9	10	.....	.....
Fameuse	Sept.-Jan	9	9	10	28	10	8	10	.....	.....
La Rue or Baxter	Oct.-Jan	8	9	8	25	5	9	8	.....	.....
Scarlet Pippin	Sept.-Jan	9	10	10	29	10	9	10	.....	.....
St. Lawrence	Aug.-Sept.	10	9	8	27	10	6	8		.....
Talman Sweet	Nov.-Mar	9	10	9	28	6	5	.....	.....	.....
Wealthy	Oct.-Dec	8	9	10	27	7	8	9	...	.....
Yellow Belleflower	Dec.-Mar	6	8	5	19	9	8	7	.....	.....

CATALOGUE OF FRUITS FOR THE USE OF PLANTERS.—*Continued.*

BLACKBERRIES—VALUES GIVEN AT BURLINGTON STATION, 1897.

Varieties tested.	Season in use.	Bush.			Total value of bush.	Fruit.				Total value of fruit.
		Vigor, Scale 1-10.	Hardiness, Scale 1-10.	Productiveness, Scale 1-10.		Quality, Scale 1-10.		Value. Scale 1-10.		
						Dessert.	Cooking.	Home market.	Foreign market.	
1. Agawam	July 30-Aug. 15.	9	10	8	27	5	.....	6	.....	11
2. Dorchester	July 30-Aug. 15.	9	9	8	26	9	.....	9	.....	18
3. Early Cluster	July 30-Aug. 15	8	10	8	26	7	.....	7	.....	14
4. Early Harvest	July 15-Aug. 1.	8	8	8	24	5	.....	8	.....	13
5. Early King	July 15-Aug 1.	8	9	8	25	8	.....	8	.....	16
6. Eldorado	July 30-Aug. 15.	9	9	7	25	9	.....	8	.....	17
7. Erie	July 30-Aug. 15.	7	10	7	24	7	.....	8	.....	15
8 Gainor	July 25-Aug. 10.	8	10	10	28	9	.....	9	.....	18
9. Kittatinny	July 30-Aug. 20.	9	8	8	25	10	.....	10	.....	20
10. Lovett's Best	Aug. 1-20	9	10	9	28	6	.....	5	.....	11
11. Maxwell	July 30-Aug. 15	5	10	5	20	5	.....	8	.....	13
12. Ohmer	July 25-Aug. 10.	8	10	7	25	8	.....	8	.....	16
13. Snider	July 25-Aug. 10.	9	10	9	28	8	.....	8	.....	16
14. Stone's Hardy	July 30-Aug. 15.	7	9	9	25	8	.....	8	.....	16
15. Taylor	July 30-Aug. 15.	7	10	7	24	9	.....	7	.....	16
16. Wachusetts	July 30-Aug. 15.	8	10	6	24	10	.....	7	.....	17
17. Western Triumph	July 30-Aug. 15.	10	10	9	29	8	.....	9	.....	17
18. Wilson's Early	July 30-Aug. 15.	7	9	8	24	8	.....	9	.....	17

CURRANTS—VALUES GIVEN AT BURLINGTON STATION, 1897.

Varieties tested.	Season in use.	Tree.			Total value of tree.	Fruit.				Total value of fruit.
		Vigor, Scale 1-10.	Freedom from mildew, Scale 1-10.	Productiveness, Scale 1-10.		Quality, Scale 1-10.		Value, Scale 1-10.		
						Dessert.	Cooking.	Home market.	Foreign market.	
1. Belle de St. Giles	July (middle)	6	8	5	19	9	.....	10	.....	19
2. Black Victoria	July 15-30	9	8	6	23	.....	.....	9	.....	.....
3. Brayley's Seedling	July (middle)	8	8	6	22	6	.....	8	.....	14
4. Champion	July 30-Aug. 15.	10	8	10	28	.....	.....	10	.....	.....
5. Cherry	July 10-30	8	8	9	25	9	.....	10	.....	19
6. Collier's Prolific	July 25. Aug. 10.	9	8	9	26	.....	.....	9	.....	.....
7. Fay's Prolific	July 10-30	6	8	5	19	7	.....	9	.....	16
8. Naples	July 15-30	9	8	9	26	.....	.....	9	.....	.....
9. North Star	July 10-30	6	8	6	20	7	.....	9	.....	16
10. Raby Castle	July 15-30	8	8	9	25	7	.....	8	.....	15
11. Red Cross	July 12-25	6	8	5	19	8	.....	6	.....	14
12. Red Victoria	July 15-30	8	8	9	25	9	.....	9	.....	18
13. Versailles	July 12-25	6	7	5	18	7	.....	8	.....	15
14. White Grape	July 12-25	8	8	7	23	7	.....	7	.....	14
15. White Imperial	July 12-30	8	9	7	24	10	.....	8	.....	18
16. Wilder	July 15-25	8	9	7	24	7	.....	10	.....	17

NOTE.—The above figures are based upon the results of this year alone as the bushes, excepting the Champion, Cherry and Naples, were only planted in 1896.

CATALOGUE OF FRUITS FOR THE USE OF PLANTERS.—*Continued.*

Peaches—Values given at Niagara Station, 1897.

Varieties tested.	Season in use.	Tree.			Total value of tree.	Fruit.				Total value of fruit.
		Vigor, scale 1-10.	Hardiness, scale 1-10.	Productiveness, scale 1-10.		Quality, scale 1-10.		Value scale 1-10.		
						Dessert.	Cooking.	Home Market.	Foreign Market.	
Alexander	Aug	9	10	9	28	4	4	7		15
Early Crawford	Aug.-Sept	8	8	8	24	10	10	6		26
Early Barnard	Aug.-Sept	6	10	10	26	7	8	5		20
Early Rivers	Aug	9	10	10	29	5	4	5		14
Early Richmond	Aug	8	8	7	23	5	6	6		17
Foster	Sept	8	8	8	24	9	10	8		27
Hynes' Surprise	Aug	9	10	10	29	6	6	7		19
Late Crawford	Sept	8	9	7	24	6	8	9		23
Longhurst	Sept.-Oct	7	10	10	27	5	9	8		22
Mountain Rose	Aug	7	8	9	24	9	8	6		23
Old Mixon	Sept	8	9	9	26	6	6	7		19
Steven's Rareripe	Sept.-Oct	10	9	10	29	6	7	8		21
Smock	Oct	8	10	9	27	4	8	9		21
Foster	Sept. 15	8	8	8	24	8	10	10		28
Hynes' Surprise	Aug. 10 to 20	10	10	10	30	6	5	7		18
Jacque's Rareripe	Sept. 15	8	8	9	25	7	9	9		23
Longhurst	Sept. 30	8	10	10	28	5	10	8		23
Steven's Rareripe	Oct. 1-10	10	8	10	28	7	7	6		20

Plums—Values given at Georgian Bay Station, 1897.

Arch. Duke	Last of Sept	8	10			6	8			
Burbank	Sept	10								
Bradshaw	Aug	9	8	8	25	6	9	10		25
New Goderich	Sept	9	9	10	28	5	8	8		21
Pond's Seedling	Last of Sept	10	10	8	28	4	7	10		21
Reine Claude	Sept.-Oct	10	10	8	28	10	10	10		30

CATALOGUE OF FRUITS FOR THE USE OF PLANTERS.—*Continued.*

Raspberries—Values given at Burlington Station, 1897.

Varieties tested.	Season in use.	Bush.			Total value of bush.	Fruit.				Total value of fruit.
						Quality, scale 1-10.		Value, scale 1-10.		
		Vigor, scale 1-10.	Hardiness, scale 1-10.	Productiveness, scale 1-10.		Dessert.	Cooking.	Home market.	Foreign market.	
1. All Summer	July-Oct	6	10	8	24	8	.....	8	.....	16
2. Columbian	July 20-Aug 1	10	10	10	30	7	.....	8	.....	15
3. Cuthbert	July 25-Aug 7	10	10	9	29	10	....	10	....	20
4. Golden Queen	July 10-25	9	10	8	27	9	....	6	....	15
5. Gregg	July 15-25	8	10	8	26	7	.....	7	.....	14
6. Hilborn	July 10-20	9	10	8	27	6	.....	7	.....	17
7. Japan Wine	July 10-20	9	9	5	23	5	.....	5	.....	10
8. Kansas	July 15-25	10	10	10	30	10	.....	8	.....	18
9. London	July 20-31	9	10	9	28	8	.....	8	.....	16
10. Lovett	July 15-31	8	10	8	26	6	.....	8	....	14
11. Marlboro	July 15-30	8	10	8	26	7	.....	10	.....	17
12. Ohio	July 10-20	9	10	9	28	9	.....	8	.....	17
13. Older	July 15-25	9	9	7	25	4	.....	8	.....	12
14. Palmer	July 5-20	9	10	9	28	9	.....	8	.....	17
15. Progress	July 10-20	8	10	5	23	8	.....	8	....	16
16. Redfield	July 20-31	9	10	8	27	9	.....	8	.....	17
17. Reliance	July 10-25	9	10	9	28	9	.....	9	.....	18
18. Shaffer's Colossal	July 20-31	10	10	8	28	5	.....	8	.....	13
19. Smith's Giant	July 20-31	10	10	10	30	8	.....	8	.....	16
20. Souhegan	July 15-25	8	10	8	26	7	.....	8	.....	15
21. Thompson	July 15-30	7	10	7	24	5	.....	7	.....	12

INDEX.

ANNUAL REPORT

OF THE

SUPERINTENDENT OF SPRAYING

FOR

ONTARIO

1897

(PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE, TORONTO.)

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1898.

REPORT

OF THE

SUPERINTENDENT OF EXPERIMENTAL SPRAYING.

Following the large crop of apples of 1896 that of 1897 was light. Insects injurious to fruit were very numerous and fungus was very prevalent. However, the result of the season's work was eminently satisfactory, as will be seen by the percentage of perfect fruit obtained. In calculating the percentage of perfect fruit obtained the following plan was adopted: A part of the tree was taken, and every apple carefully examined, and any specimen which had a worm or spot, no matter how small, was rejected. In some cases as high as 100 per cent. of clean fruit was obtained. These trees and their fruit were absolutely perfect.

The loss to the apple growers of Ontario this year through fungi and insects was enormous. First-class fruit brought as high as thirty-six shillings per barrel in the English market, and the demand was never better. But through the growers' neglect to take proper care of the crop very little of our fruit was fit for export.

The following instances will serve as examples of this loss: Mr. W. A. Warner, of Trenton, in whose orchard we sprayed twenty-five trees, says that the increased value of his crop on the trees was $150. Mr. J. P. Thorn, of Picton, in whose orchard we sprayed twenty-five trees, says the work was worth $75 to him, and that while his best unsprayed Spys were worth $2 per barrel, he was getting $3.50 per barrel for Spys which had been sprayed. Similar cases could be cited from many points, but these are enough to show the immense loss annually suffered. I believe the increased market value of the fruit harvested from trees sprayed by us this season would go far toward paying the cost of the work, although the crop was light in many places.

As suggested in last year's report, spraying was done this season at two points on the same trees which were sprayed by us last year. Stoney Creek and St. Catharines were the points selected, and the results were highly satisfactory. Numerous requests were received to have the work done at points we were unable to serve, in one case the Town Clerk writing that he was instructed to inquire upon what terms the spraying could be secured for that locality. Many of the gentlemen in whose orchards we sprayed report that they succeeded in carrying off a large number of prizes at the fall fairs with the sprayed fruit.

The attendance to witness the spraying operations reached almost the 3,000 mark. In one case a man came forty-three miles to see the work done and obtain information. Thirty thousand copies of a sixteen-page bulletin, entitled "Instructions in Spraying," and containing also a short paragraph on each of the more common insect enemies and fungi, with illustrations, were issued by the Department of Agriculture and distributed gratis. Many applications were made for these by mail. A great deal of interest was taken in the work, and the gentlemen in whose orchards we sprayed did all in their power to assist us.

The people are gradually waking to the fact that spraying is indispensable to the up-to-date orchardist, and every year the experimental, or more properly now the instructional, spraying of fruit trees is receiving more and more attention.

These experiments have demonstrated that spraying not only increases the percentage of clean fruit, but the specimens are larger, brighter, better flavored and possess superior keeping qualities, because the foliage is protected from injury by insects and fungi, and, being healthy, performs its important functions properly.

Spraying was conducted at twenty-nine points in twenty-three counties, covering the Province from Lake Huron to Lancaster.

This territory was divided into three routes, Mr. R. H. Dewar taking the western, Mr. J. H. McNeilly the central, and Mr. J. B. Pettit the eastern. They started on their trips on April 20th, 20th and 26th respectively.

The original plan was for six sprayings at each point.

This would have finished the work about July 3rd. However, about this time scab began to appear at many points and was gaining headway. Accordingly the men were sent out again on July 8th, and the work was finished by July 18th.

The scab appeared very late in the season this year, and many growers who sprayed early but neglected to treat the scab in July lost heavily.

Only one solution was used—Bordeaux mixture according to the following formula :

Copper sulphate	4 pounds.
Fresh lime	4 pounds.
Water	40 gallons.

To this was added in every case 4 ounces of Paris green.

On account of the law which forbids the spraying of fruit trees while in full bloom, and on account of rain, many applications were omitted and numbers of applications were discounted or lost by being closely preceded or followed by rain.

Curculio, bud-moth, leaf-crumpler, canker-worm, tent caterpillar, leaf roller, eye-spotted bud-moth and case-bearer, were found at work during the blooming period. However, we found no difficulty arising from the regulations, and observed the law to the letter and successfully dealt with these insects by spraying before and after blossoming.

The following plan of spraying was followed as closely as possible :

First spraying : When the buds are swelling.

Second spraying : Just before the blossoms open.

Third spraying : When the blossoms have fallen.

Sprayings at intervals of about twelve days until the danger of scab is past.

It is probable that three or four sprayings are all that would be required if the orchard could be watched and the application made just at the proper time. The cost of labor and material for an orchard is about two cents per tree per application.

One gentleman in whose orchard we sprayed with splendid success said that he had sprayed for four years with very unsatisfactory results. The trouble was that instead of breaking up the spray as should be done until it looks like vapor and settles like a fog on every part of the tree, he had made a coarse spray, with which it is impossible to touch every part of fruit and foliage.

In this way the scab had an excellent chance to spread, and much of the foliage was not poisonous to insects feeding upon it. When the coarse spray is used the work is only half done and there is a great waste of material. When the nozzle is working properly and the sun is shining a miniature rainbow will often be seen on the spray.

Spraying outfits were purchased from the Spramotor Co., of London, Ontario, and The Aylmer Iron Works Co., of Aylmer, Ont., and gave entire satisfaction.

W. M. ORR, Superintendent.

FRUITLAND, Ont., Jan. 6, 1898.

RECORD OF SPRAYINGS.

Clarkson, Peel County—Mr. C. G. Davis' Orchard.

1st application, April 26th.—Heavy rain in morning and showers during afternoon. Buds just bursting. Orchard in fine condition, well trimmed. Oyster-shell bark-louse very bad.

2nd application, May 7th.—Fine and cool. Leaves about the size of rose leaves. Aphis at work and tent-caterpillar plentiful.

3rd application, May 18th.—Fine and very warm. Tent-caterpillar and bud-moth working. Snows and Astrachans could not be sprayed as they were in full bloom.

4th application, June 1st.—Fine, and strong wind. Aphis and case-bearer on the trees. Could only spray Snows and Astrachans, as other varieties were in full bloom.

5th application, June 11th.—Fine and warm, Trees are looking very healthy. Bud-moth, case-bearer and green apple-leaf tyre on unsprayed trees. Oyster-shell bark-louse is moving. Experimental trees free from caterpillars, but there are many of them on the other trees. Saw a little scab on sprayed Snow and Spy leaves.

6th application, June 24th.—Fine and very warm. The experimental trees are almost free from insect enemies, and foliage is excellent. Scab is showing a little, especially on Spys.

7th application, July 8th.—Fine and warm. Experimental trees in good condition, except a little scab appearing on Spys, Snows and Greenings.

I inspected Mr. Davis' orchard and found results to be as follows :

Snow.—Experimental spraying, 75 p. c. clean ; sprayed three times, 30 p .c. clean ; unsprayed, 5 p c. clean, and dropped most of the fruit.

Spy.—Experimental spraying, 60 p. c. clean ; unsprayed, 10 p. c. clean. The clean sprayed fruit was much larger than the clean unsprayed, and there was double the crop. The spotted apples from sprayed trees were also much better and larger than the spotted apples from unsprayed trees.

Red Astrachan.—Experimental spraying, 90 p. c. clean ; unsprayed dropped.

Greenings.—Experimental spraying, 45 p. c. clean, about half a crop on the trees ; sprayed three times, very poor crop of inferior fruit ; four unsprayed ; trees in experimental plot will not give half a bushel of fruit.

Oshawa, Ontario Co.—Mr. R. J. Mackie's Orchard.

1st application, April 27th.—Clear and windy. Buds rather backward ; a few just bursting. Orchard under good cultivation, but needs trimming, and trees badly infected with oyster-shell bark-louse.

2nd application, May 8th.—Fine and cool. Leaves pushing out. Aphis at work.

3rd application, May 19th.—Cloudy with strong wind. Leaves nearly half grown and not in a healthy condition, owing to prevalence of bud-moth, aphis, case-bearer and tent caterpillar.

4th application, June 2nd.—Fine. Could not spray as trees were in full bloom. Insects attacking the foliage still bad. Found the green apple-leaf tyer. Good show of bloom.

5th application, June 12th.—Fine. Oyster-shell bark-louse moving. From 30 to 60 per cent. of bloom has set.

6th application, June 25th.—Fine, with heavy wind, which made it difficult to get mixture on well. Foliage on sprayed trees is quite clean and free from insects, but other trees are being badly eaten. A little scab showing on sprayed Snows. On some orchards it is already very bad.

7th application, July 9th.—Fine. Some scab showing on experimental trees.

I visited this orchard on October 12th, and found the following results :

Yellow Bellefleur.—Sprayed, 95 p. c. clean ; unsprayed, no clean fruit.
Talman's Sweet.—Experimental spraying 80 p. c. clean ; unsprayed, 10 p. c. clean.
Stark.—Experimental spraying, 92 p. c. clean ; unsprayed, no clean fruit,
Greening.—Experimental spraying, 84 p. c. clean ; unsprayed no clean fruit.
Rawle's Janet.—Experimental spraying, 100 p. c. clean.
Kings.—Experimental spraying, 90 p. c. clean ; unsprayed, 10 p. c. clean.
Holland Pippins.—Experimental spraying, 85 p. c. clean ; unsprayed, no clean fruit.

Spy.—Experimental spraying, 85 p. c. clean; unsprayed, 2 p. c. clean. The culls from the sprayed Spy trees are better than the unsprayed fruit.

Snow.—Experimental spraying, 60 p. c. clean; unsprayed, no clean fruit. The 40 p. c. of defective fruit from the sprayed Snows is worth double the unsprayed Snows. Mr. Mackie says it would have been worth $200 to him if his orchard had been sprayed.

Port Hope, Durham Co.—Mr. E. Mitchell's Orchard.

1st application, April 28th.—Clear and warm. Buds just opening. Found bud-moth and aphis. Oyster-shell bark-louse very bad. Orchard in very good condition, but needs trimming.

2nd application, May 10th.—Fine and very windy. Fruit buds plentiful and some showing color. Found a few tent caterpillars.

3rd application, May 20th.—On account of a heavy rain, spraying could not be done.

4th application June 3rd.—No work on account of rain. Some varieties are in full bloom.

5th application, June 14th.—Fine and warm. Oyster-shell bark-louse moving to-day. Harvest and Snow apples have set fairly well, but Spys only about 15 per cent. Owing to an accident, part of mixture was upset, and the Snow tree was only partly sprayed.

6th application, June 26th.—Cool and cloudy. Sprayed trees free from insects. Considerable scab showing on several of the Spy trees. As flower cuttings had been planted in part of the orchard, the Snow apple tree could not be sprayed to-day.

7th application July 10th.—Fine and warm. Some scab showing, especially on Snow apples.

I visited Mr. Mitchell's orchard October 13th. Following are the results:

Spy.—Experimental spraying, 95 p. c. clean; unsprayed, no clean fruit.
Early Harvest.—Experimental spraying, 80 p. c. clean; unsprayed, 15 p. c. clean.
Snow.—In both experimental spraying and unsprayed, no clean fruit.
Baldwin.—Experimental spraying, had no bloom; unsprayed, 5 p. c. clean.

Mr. Mitchell has not a large orchard and the crop was not heavy, but he says it would have been worth $100 to $150 to him had he sprayed his orchard.

The failure to get results on the Snow apple tree will easily be understood by looking over the notes taken of the third, fourth, fifth and sixth application.

Brighton, Northumberland Co.—Mr. J. N. Nisbett's Orchard.

1st application, April 29th.—Fine and warm. Buds just bursting. Some of the trees are already alive with tent caterpillars, and eggs are plentiful. Oyster-shell bark-louse very plentiful. Otherwise the orchard is in good condition and well cultivated.

2nd application, May 11th.—Fine and warm. Leaves about the size of a rose leaf. A good showing of fruit-buds. Aphis at work, and tent caterpillar very bad.

3rd application, May 21st.—Clear and cool. Greening, Snow and summer varieties in full bloom. Aphis, tent caterpillar, bud-moth and case-bearer still at work. I also found some canker-worms, which are the first found. Tent caterpillar reported very bad in this district.

4th application, June 4th.—Fine and high winds. Trees in full bloom and could not be sprayed. Foliage on sprayed trees looks much better than on unsprayed.

5th application, June 15th.—Fine and warm. Fruit has set about 50 p.c. Insects still numerous, found green apple-leaf-tyer and green apple-worm. Oyster-shell bark-louse moving to-day. Foliage on experimental plot looks clean and healthy.

6th application, June 28th.—Fine and cool. A little scab appearing on the Spy leaves. Borers are bad in this orchard, and many limbs have been killed. Codling moth is bad.

7th application, July 12th.—Postponed at Mr. Nisbett's request; he will do the work.

I visited this orchard on October 13th, and found the fruit had been packed and shipped. I was informed that the results were satisfactory.

Trenton, Hastings Co.—Mr. W. A. Warner's Orchard.

1st application, April 30th.—Warm and windy with prospects of rain at night. Buds just bursting. Aphis very bad. Tent caterpillar at work. Orchard well trimmed, but trees too close.

2nd application, May 12th.—Cloudy with heavy showers in the evening. Blossoms showing color. Found a few case-bearers. Aphis, bud-moth and tent caterpillar very bad.

3rd application, May 22nd.—Fine and strong wind. Leaves about half grown and in good condition. Insects still bad on unsprayed trees. Could only spray Spy and Baldwin as other varieties were in full bloom.

4th application, June 5th.—Warm and cloudy. Bloom has fallen from all varieties. Insects still bad, especially on unsprayed trees.

5th application, June 16th.—Fine and warm. There is a noticeable difference between sprayed and unsprayed trees. Green apple-worm is doing a little damage.

6th application, June 29th. Could not spray on account of rain. Mr. Warner will spray when it clears. Green apple-worm is doing great damage in this orchard, and in the orchards in this locality, but could only find a few on sprayed trees Tent caterpillar is also bad around here, some orchards being defoliated. A little scab showing on Snow and Spy, but not bad.

7th application, July 13th.—Fine and warm. Some scab on sprayed trees, but very little, others quite bad.

I inspected Mr. Warner's orchard on October 14th, and found the following results :

Spy.—Experimental spraying, 76 p.c. clean ; unsprayed, 8 p.c. clean.
Snow.—Experimental spraying, 75 p.c. clean ; unsprayed, no clean fruit.
Wealthy.—Experimental spraying, 90 p.c. clean ; unsprayed, 20 p.c. clean.
Summer Pearmain.—Experimental spraying, 75 p.c. clean ; unsprayed, 5 p.c. clean.
Baldwin.—Experimental spraying, 90 p.c. clean ; unsprayed, 10 p.c, clean.
Bottle Greening.—Experimental spraying, 76 p.c. clean ; unsprayed, 5 p.c. clean.

The apple packers say this is the best fruit they have handled this year.

Mr. Warner says the increased value of crop on the 25 trees sprayed was $150.

Consecon, Prince Edward Co.—Mr. J. L. Adams' Orchard.

1st application, May 1st.—Cloudy and high wind, followed by heavy rain at night. Buds just bursting. Aphis very bad. Borers and oyster-shell bark-louse bad. Orchard in good cultivation but trees are rather close.

2nd application, May 13th.—Fine and warm. Aphis, tent caterpillar and case-bearer bad.

3rd application, May 25th.—Fine and warm. Foliage on sprayed trees looks much healthier than on unsprayed trees. Insects previously mentioned and bud-moth still working. Tent caterpillar reported very bad in this locality, and plenty of them in this orchard, on both sides of experimental rows, but not one to be found on sprayed trees.

4th application, June 7th.—Could not spray on account of rain.

5th application, June 17th.—Warm and cloudy. Blossoms have set only fairly well.

6th application, June 30th.—Fair and high wind. Foliage clean and healthy looking. Scab showing a little on sprayed Snows. Green apple-worm doing damage on unsprayed trees.

7th application, July 14th.—Fine and warm. A little scab on unsprayed Spy and Snow trees.

I visited Mr. J. L. Adam's orchard on October 15th, and found :

Spy.—Experimental spraying, 90 p.c. clean ; unsprayed, 40 p.c. clean.
Early Harvest.—Experimental spraying, 95 p.c. clean ; unsprayed, 5 p.c. clean.
Snow.—Experimental spraying, 90 p.c. clean ; unsprayed, 20 p.c. clean.
Baldwin.—Experimental spraying, 90 p.c. clean ; unsprayed, 40 p.c. clean.
Russett.—Experimental spraying, 90 p.c. clean ; unsprayed, 35 p.c. clean.

All of the sprayed fruit was larger than the unsprayed.

An apple buyer who visited the orchard one day while Mr. Adams was absent says he could easily pick out every tree which had been sprayed, from fruit and foliage.

Picton, Prince Edward Co.—Mr. Jas. P. Thorn's Orchard.

1st application, May 3rd.—Fine and warm, every appearance of rain toward night. Buds just bursting. Aphis and bud-moth at work. Orchard well trimmed and cultivated.

2nd application, May 14th.—Rained in the morning and could not spray. Mr. Thorn did the work when it cleared on the 18th. Found a few case-bearers.

3rd application, May 26th.—Fine and cool. Could only spray Spy trees as others were in full bloom. Foliage looking first-class. A few tent caterpillars at work in orchard.

4th application, June 8th.—Impossible to spray on account of rain. Prepared the mixture and Mr. Thorn promised to apply it when it cleared. For some reason the mixture was not applied as promised.

5th application, June 18th.—Fine and warm. Blossoms have set very well. Saw a very little scab on Snow and Spy leaves. Tent caterpillar still at work on unsprayed trees.

6th application, July 1st.—Fine and very warm. Foliage and fruit on whole orchard is good. The best orchard in the eastern division. Green apple-worm at work, also a few aphis.

7th application, July 15th.—Fine and warm. Sprayed fruit in splendid condition. Unsprayed spotting considerable.

I inspected this orchard in October, and had the pleasure of the company of John Caven, M.L.A., of Picton. I found results as follows:

Spy.—Experimental spraying, 90 p.c. clean; unsprayed, 10 p.c. clean.
Colvert.—Experimental spraying, 90 p.c. clean.
St. Lawrence.—Experimental spraying, 75 p.c. clean; unsprayed, 10 p.c. clean.
Snow.—Experimental spraying, 75 p.c. clean; unsprayed, 25 p.c. clean.
Golden Russet.—Experimental spraying, 90 p.c. clean; unsprayed, 25 p.c. clean.
Bellefleur.—Experimental spraying, 75 p.c. clean; unsprayed, 10 p.c. clean.
Swaar.—Experimental spraying, 75 p.c. clean; unsprayed, 10 p.c. clean.
Red Astrachan.—Experimental spraying, 80 p.c. clean; unsprayed, 15 p.c. clean.

Mr. Thorn says the spraying of the twenty-nine trees we experimented on was worth $75 to him. He further says that while unsprayed Spys were worth $2 per bbl. he was getting $3.50 per bbl. for sprayed fruit.

Prescott, Grenville Co.—Mr. Geo. Bowyer's Orchard.

1st application, May 4th.—Clear and cool. Buds just opening. Aphis and tent caterpillar at work. Oyster-shell bark-louse very bad. Orchard in poor condition and needs trimming.

2nd application, May 15th.—Fine and high wind. In addition to insects already mentioned case-bearer is at work. Tent caterpillar bad.

3rd application, May 27th.—Fine and cool. Trees in full bloom, Could not spray.

4th application, June 9th.—Could not work on account of rain. However Mr. Bowyer did the work of June 10th, which was a fine day. Bud-moth and green apple-leaf-tyer here. Trees looking very well.

5th application, June 19th.—Cool and high wind. Case-bearer very bad.

6th application, July 2nd.—Fine and warm. Foliage mostly clean and healthy looking. A little scab appearing on the Snow apple trees.

7th application, July 16th.—Fine and warm. Little scab on sprayed fruit, others bad.

I visited Mr. Bowyer's orchard in the fall and found:

Canada Red.—Experimental spraying, 60 p.c. clean; unsprayed, 16 p.c. clean.
Talman Sweet.—Experimental spraying, 80 p.c. clean; unsprayed, no clean fruit.
Snow.—Experimental spraying, 96 p.c. clean; unsprayed, no clean fruit.

A tree of snow apples sprayed on one side gave on the sprayed side 88 p.c. clean fruit, and on the unsprayed side not one clean specimen could be found. Mr. Bowyer says he has no good fruit this year except the sprayed fruit.

Lancaster, Glengarry Co.—Mr. Alex. Cameron's Orchard.

1st application, May 5th.—Fine and warm. Buds just opening. Aphis at work. Orchard in old sod, and does not receive much care apparently. Oyster-shell bark-louse very bad.

2nd application, May 17th.—Warm and bright. Aphis and case-bearer at work.

3rd application, May 28th.—Cool and cloudy. Could not work as trees were in bloom. Found a few bud-moth.

4th application, June 10th.—Raining ; cleared about one p.m. and spraying was done while trees were still wet.

5th application, June 21th.—Rain in forenoon and also part of afternoon. Sprayed when it cleared, but rain set in again about an hour after work was finished. Very few insect enemies.

6th application, July 3th.—Fine and very warm. Scab is showing a little on Snow apples. One of the spectators present to-day came forty-three miles to see the spraying.

7th application, July 17th.—Fine and very windy. Foliage splendid and fruit very clean.

I inspected this orchard October 19th and found :

St. Lawrence.—Experimental spraying, 90 p.c. clean ; unsprayed, 10 p.c. clean.
Maiden's Blush.—Experimental spraying, 100 p.c. clean ; unsprayed, no clean fruit.
Snow.—Experimental spraying, 100 p.c. clean ; unsprayed, no clean fruit.
Alexander.—Experimental spraying, 100 p.c. clean ; unsprayed, 10 p.c. clean.
Bolter.—Experimental spraying, 90 p.c. clean ; unsprayed, 10 p.c. clean.
Hash.—Experimental spraying, 100 p.c. clean ; unsprayed, 20 p.c. clean.

Mr. Cameron is getting $4.00 per bbl. for sprayed Maiden's Blush and 75 cents per bbl. for unsprayed.

Stoney Creek, Wentworth Co.—Mr. Robt. Grainger's Orchard.

1st application, April 20th.—Fine and cool. Buds swelling on early varieties. Oyster-shell bark louse, canker worms eggs, and apple-leaf Bucculatrix in abundance.

2nd application, May 1st.—Could not work on account of rain.

3rd application, May 13th.—Fine and windy. Early harvest and Red Astrachan in bloom. A few tent caterpillars at work in this orchard.

4th application, May 26th.—Fine and warm. Spy, King and Greening in bloom. Aphis here.

5th application, June 7th.—Rainy. Prepared the mixture and Mr. Grainger promised to apply it when it clears.

6th application, June 33rd.—Fine and warm. Only 10 p.c. to 40 p.c. of a crop on the different varieties. Green apple worm has been doing some damage.

7th application, July 7th.—We sprayed these trees last year.

I inspected this orchard September 20th. Sprayed Snows were 80 p.c. clean. The bloom was light and the crop was small. Unsprayed Snows dropped most of their fruit, and not a clean specimen on the tree.

The result on Spys was also good. Mr. Granger says : "I have eight acres of orchard. There was not a large crop of apples around here this year. They sprayed twenty trees, and I had more apples off those twenty trees than off all the others put together."

Lynden, Wentworth Co.—Mr. Robt. Vansickle's Orchard.

1st application, April 21st.—Fine. Buds swelling on early varieties. An abundance of oyster-shell bark-louse and tent caterpillar eggs. Orchard in sod, appears healthy, but needs trimming.

2nd application, May 3rd.—Rained until 2.30 o'clock p.m., after which spraying was done. Aphis and tent caterpillar moving.

3rd application, May 14th.—Unsettled ; shower while we were spraying and another shortly after work was finished. Early varieties in bloom. Tent caterpillar very bad.

4th application, May 27th.—Very fine. Spy in full bloom. Apple-leaf Bucculatrix and tent caterpillar very bad.

5th application, June 8th.—Fine and warm. Blossoms all off.

6th application, June 24th.—Fine and warm. The green apple worm doing some damage.

7th application, July 8th.—Fine and warm.

Apples set very poorly here, many varieties bearing no fruit. In varieties which did set, sprayed trees were better loaded and the fruit was larger :

Snow.—Experimental spraying, 90 p. c. clean ; unsprayed, no clean fruit.
Spy.—Experimental spraying, 20 p. c. clean ; unsprayed, no clean fruit.

BURFORD, BRANT CO.—MR. W. H. LEWIS' ORCHARD.

1st application, April 22nd.—Warm and windy; light showers while spraying. Buds just bursting on early varieties. Borers bad here, many large limbs killed.

2nd application, May 4th.—Fine and very windy. Tent caterpillar just hatching. Aphis at work. Oyster-shell bark-louse bad.

3rd application, May 15th.—Light showers while spraying. Early apples in full bloom.

4th application, May 28th.—Rained until 3:30 p.m. Spy and Greening in full bloom. This orchard has been sprayed once each year for two years, and twice this year.

5th application, June 9th.—Fine. Aphis still at work.

6th application, June 25th.—Fine and cool. Green apple worm has done some damage. It worked on both fruit and foliage, and sprayed and unsprayed trees.

7th application, July 9th.—Fine and warm.

I visited Mr. Lewis' Orchard on October 6th, and found results as follows:

Snow.—Experimental spraying, 90 p. c. clean; unsprayed, 10 p. c. clean.
Baldwin—Experimental spraying, 95 p. c. clean; unsprayed, 5 p. c. clean.
Spy.—Experimental spraying, 85 p. c. clean, sprayed twice by Mr. Lewis, 36 p.c. clean; unsprayed, 6 p. c. clean, well loaded but smaller than sprayed fruit. Mr. Lewis sprayed just before blooming and just after the apple was formed.

TILSONBURG, ELGIN CO.—MR. JAS. HANEY'S ORCHARD.

1st application, April 23rd.—Warm, followed by rain in evening. Buds slightly swollen on early varieties. Oyster-shell bark-louse very bad.

2nd application, May 5th.—Very fine. Aphis and tent caterpillar at work.

3rd application, May 17th.—Fine and very windy. Blossoms open on early varieties. This orchard needs trimming and cultivating.

4th application, May 29th.—Could not spray on account of bloom. Tent caterpillar bad on unsprayed trees, but sprayed trees are free from them.

5th application, June 10th.—Fine. Tent caterpillar still very bad on unsprayed trees.

6th application, June 26th.—Fine and warm. Green apple worm at work. Foliage better on sprayed trees.

7th application, July 10th.—Fine and warm.

I visited the orchard on October 5th, and found results as follows:

Baldwin.—Experimental spraying, 90 p. c. clean; unsprayed, 10 p. c clean.
Spy.—Experimental spraying, 75 p. c. clean; unsprayed, heavily loaded, small and scabby, no clean fruit, only fit for cider.

Russet.—Experimental spraying, 50 p. c. clean; unsprayed, no clean fruit.

All varieties except Spy were a light crop. There are over 400 trees in this orchard. From the 20 sprayed trees 14 barrels were packed; from the 380 or more, only 5 barrels.

PORT DOVER, NORFOLK CO.—MR. GEORGE DIXON'S ORCHARD.

1st application, April 24th.—Fine and warm. The buds which are just opening are covered with Aphis. Found some oyster-shell bark-louse. The trees are old and very large.

2nd application, May 6th.—Fine. Tent caterpillar just hatching.

3rd application, May 18th.—Fine. Blossom open on early varieties.

4th application, May 31st.—Fine and cool. Could only spray five trees, as remainder were in bloom.

5th application, June 11th.—Very fine. Aphis still at work.

6th application, June 28th.—Fine and warm. Green apple worm at work. A great difference can be seen between sprayed and unsprayed trees, both in fruit and foliage. Fungus quite bad on unsprayed trees.

7th application, July 12th.—Fine and warm.

The following are the results in Mr. Dixon's orchard :

Baldwin.—Experimental spraying, 75 p. c. clean.

Red Astrachan.—Experimental spraying, 50 p. c. clean ; unsprayed, 1 p. c. clean.

Greening.—Experimental spraying, 70 p. c. clean ; unsprayed, 1 p. c. clean, fairly well loaded with undersized fruit.

Talman Sweet.—Experimental spraying, 50 p. c. clean ; unsprayed, 12 p. c. clean.

Sweet Bough.—Experimental spraying, 50 p. c. clean ; unsprayed, 20 p. c. clean.

Phœnix.—Experimental spraying, 70 p. c. clean ; unsprayed, no clean fruit.

Spy.—Experimental spraying, 70 p. c. clean. There were no unsprayed Spys in this orchard, but in neighboring orchards, only from 1 p. c. to 10 p.c. of the fruit was clean.

CALEDONIA, HALDIMAND CO.—MR. W. RICHARDSON'S ORCHARD.

1st application, April 26th.—Clear and cool. A fine young orchard. Found aphis and oyster-shell bark-louse.

2nd application, May 7th.—Fine. Blossom just opening on some varieties. Foliage a good color and doing well.

3rd application, May 19th.—Fine and cool. Some varieties in bloom. Tent caterpillar bad on unsprayed trees.

4th application, June 1st.—Fine and cool. Some varieties in full bloom.

5th application, June 12th.—Fine. Caterpillar still on unsprayed trees.

6th application, June 29th.—Could not work on account of rain.

7th application, July 13th.—Fine and warm.

On inspecting this orchard I found the following results :

Spy.—Experimental spraying, 92 p. c. clean ; sprayed four times by Mr. R., 60 p. c. clean ; sprayed three times by Mr. R., 30 p. c. clean ; unsprayed, 6 p. c. clean.

Baldwin.—Experimental spraying, 90 p. c. clean ; sprayed four times by Mr. R., 60 p. c. clean ; unsprayed, worthless.

Kings.—Experimental spraying, 95 p. c. clean ; unsprayed, 10 p. c. clean.

Early Harvest.—Experimental spraying, 60 p. c. clean ; unsprayed, worthless.

Spitzenberg.—Experimental spraying, 50 p. c. clean.

Snow.—Experimental spraying, 70 p. c. clean ; unsprayed, no clean fruit.

Mr. King, an apple buyer of Toronto, says that the sprayed fruit in this orchard is the best he has seen this year.

DUNNVILLE, HALDIMAND CO.—MR JOHN TAYLOR'S ORCHARD.

1st application, April 27th.—Cool. Aphis already at work. Some oyster-shell bark-louse.

2nd application, May 8th.—Very fine. Foliage looks well. Leaves about one-fourth grown. Tent caterpillar at work to-day. Trees need trimming very badly.

3rd application, May 20th.—Could not spray on account of rain. However, Mr. Taylor promised to do the work when it clears. Some varieties in bloom.

4th application, June 2nd.—Fine and cool. Blossoms nearly all fallen.

5th application, June 13th.—Fine and warm.

6th application, June 30th.—Fine and warm. A few green apple worms here. Fungus appearing badly on some varieties. A great difference between sprayed and unsprayed fruit and foliage.

7th application, July 14th.—Fine and warm.

The crop here was very light, but the fruit was excellent on sprayed trees.

NIAGARA FALLS SOUTH, WELLAND COUNTY.—MR. THOMAS SMITH'S ORCHARD.

1st application, April 28th.—Fine and warm. Aphis feeding on the young buds, found some tent caterpillars' eggs.

2nd application, May 10th.—Rain in the morning, but fair in the afternoon. Leaves about half grown. Some oyster-shell bark-louse here.

3rd application, May 21st.—Fine and warm. Could not spray on account of bloom. Mr. Smith will spray as soon as it falls.

4th application, June 3rd.—Cool and rain while we were working.

5th application, June 14th.—Fine and warm.

6th application, July 1st.—Very warm. Fungus appearing on some trees.

7th application, July 15th.—Fine and warm. Foliage of sprayed trees looking fine.

I visited Mr. Smith's orchard on September 23rd, and found results as follows :

Roxbury Russet.—Experimental spraying, 75 p. c. clean and trees well loaded; unsprayed, fruit undersized and spotted, and fully 50 p. c. of crop dropped.

Alexander.—Experimental spraying, 90 p. c. clean, and good crop ; unsprayed, 25 p. c. clean ; fruit not so large and crop lighter.

Bottle Greening.—Experimental spraying, 60 p. c. clean ; unsprayed, no clean fruit, and dropped two-thirds of crop.

We sprayed twenty-two trees. There are 120 trees in the orchard. There will be five times as much clean fruit on the trees we sprayed as on the remainder of the orchard.

St. Catharines, Lincoln County.—Mr. A. Pay's Orchard.

1st application, April 29th.—Fine and warm. Aphis already on the buds.

2nd application, May 11th.—Fine. Found aphis and tent caterpillar.

3rd application, May 22nd.—Trees in full bloom. Mr. Pay will do the work when the blossoms fall.

4th application, June 4th.—Work could not be done to-day. Was done on 7th.

5th application, June 15th.—Fine and warm. Greenings dropping very badly.

6th application, July 2nd.—Very hot. A few green-apple worms here. Remainder of orchard has been sprayed twice. Fungus bad on Snows and Greenings. Same on others.

7th application, July 16th.—Fine and warm.

We sprayed these same trees in Mr. Pay's orchard last year with excellent results. On inspecting the orchard this year, we found the following results :

King.—Experimental spraying, somewhat spotted ; unsprayed, very badly spotted, and not half as much fruit as sprayed. The only *Baldwins* that fruited were sprayed trees, and the fruit was 80 p. c. clean.

Greening.—Experimental spraying, 80 p. c. clean, good crop ; unsprayed, dropped nearly all the fruit, and what is left is almost worthless.

Pomme Grise.—Experimental spraying, 90 p. c. clean, good crop ; unsprayed, dropped the crop except a few culls.

Snow.—Experimental spraying, 60 p. c. clean ; unsprayed, no clean fruit,—dropped.

Spy.—Experimental spraying, 90 p. c. clean, heavily loaded ; unsprayed, no clean fruit. Trees heavily loaded with undersized fruit.

Every tree except two Baldwins in last year's experimental plot is loaded.

Mr. Pay says that if all his orchard was as heavily loaded with as good fruit as are the trees which we have sprayed for two years ; it would be worth $2,000 to him this year, with apples at $2 per barrel.

Smithville, Lincoln Co.—Mr. George Adams' Orchard.

1st application, April 30th.—Light shower just as we finished work. Aphis and oyster-shell bark-louse bad.

2nd application, May 12th.—Rain in the morning, cleared about noon. Tent caterpillar bad. Leaves about half grown.

3rd application, May 25th.—Very fine. Could not spray as the trees were in bloom. Tent caterpillar very bad on all unsprayed trees. Only found two nests on the fourteen sprayed.

4th application, June 5th.—Fine and cool. Found one tent caterpillar's nest on sprayed trees. On forty unsprayed trees we cut 154 nests.

5th application, June 16th.—Fine. Some varieties dropping badly.

6th application, July 3rd.—Very warm. Fruit still dropping badly. Fungus quite plentiful on some varieties which are not sprayed.

7th application, July 17th.—Fine and warm.

In Mr. Adams' orchard results were as follows :

Swaar —Experimental spraying, 80 p. c. clean and held its crop ; unsprayed, dropped three-fourths of its crop and not a clean specimen to be found.

Roxbury Russet.—Experimental spraying, 90 p. c. clean and held its crop ; unsprayed, dropped most of its crop and what remains is worthless.

Canada Red.—Experimental spraying, 90 p. c. clean ; unsprayed, worthless.

Snow.—Experimental spraying, 80 p. c. clean.

Newtown Pippin.—Experimental spraying, 90 p. c. clean.

Spy.—Experimental spraying, 90 p. c. clean and well loaded ; unsprayed, well loaded but under size, and not a clean specimen to be found.

There are ninety trees in this orchard ; we sprayed fourteen. Apart from these, Mr. Adams says he did not have more than two barrels of clean fruit.

ST. THOMAS, ELGIN CO.—MR. E. LUTON'S ORCHARD.

1st application, April 20th.—Fine. Buds just pushing out. An old orchard.

2nd application, May 3rd.—Light rain all day and nearly all night. Found oyster-shell bark-louse, aphis, and tent caterpillar.

3rd application, May 14th.—Fine. Sprayed trees quite free from insects.

4th application, May 28th.—Rain to-day. Blossoms fully open.

5th application, June 10th.—Fine.

6th application, June 23rd—Fine. A marked difference in foliage on sprayed and unsprayed.

7th application. July 8th.—Fine and warm.

I inspected this orchard on October 5th, and found :

Spy.—Experimental spraying, 80 p. c. clean ; unsprayed, well loaded but fruit smaller than on sprayed trees and only 5 p. c. clean.

Greening.—Experimental spraying, 50 p. c. clean ; unsprayed, dropped fruit and lost foliage badly.

Blenheim Pippin.—Experimental spraying, 85 p. c. clean ; unsprayed, 25 p. c. clean.

Golden Russet.—Experimental spraying, 75 p. c. clean ; unsprayed, dropped fruit and foliage is poor.

There are 93 trees in this orchard, and 90 p. c. of the clean fruit from them will be off the 20 trees sprayed by us.

BOTHWELL, KENT CO.—MR. A. C. SUSSEX'S ORCHARD.

1st application, April 21st.—Fine. Orchard in good condition. Buds starting.

2nd application, May 4th.—Fine. Found oyster-shell bark-louse, aphis, tent caterpillar and apple-leaf Bucculatrix.

3rd application, May 15th.—Trees all in bloom. Did not spray.

4th application, May 29th.—Blossoms not yet fallen. Mr. Sussex will spray when they fall.

5th application, June 11th.—Rain in the forenoon. Sprayed in the afternoon. Bud-moth doing damage on unsprayed trees.

6th application, June 24th.—Fine and warm. Scab quite bad on some of the unsprayed trees, and two of the sprayed trees slightly affected.

7th application, July 9th.—Fine and warm. Unsprayed fruit, especially Spys, are badly scabbed. Unsprayed Snows have dropped badly, and while foliage on unsprayed trees is yellow and falling, that on sprayed trees is a healthy dark green.

Inspected Mr. Sussex's orchard and found :

Spy.—Experimental spraying, 95 p. c. clean ; unsprayed, dropped, and no clean fruit.

Snow.—Experimental spraying, 90 p. c. clean ; unsprayed, no clean fruit.

Wealthy.—Experimental spraying, 95 p. c. clean; unsprayed, 25 p. c. clean.

Baldwin.—Experimental spraying, 85 p. c. clean; unsprayed, dropped crop.

Golden Russet.—Experimental spraying, 80 p. c. clean; unsprayed, dropped most of crop, no clean fruit.

Ben Davis.—Experimental spraying, 95 p. c. clean; unsprayed, 20 p. c. clean.

Most unsprayed trees dropped their crop before it was half grown and at this date (October 4th) have lost nearly all their foliage, while on sprayed trees the foliage is still in first-class condition.

WALLACEBURG, KENT CO.—CAPT. J. W. STEINHOFF'S ORCHARD.

1st application, April 22nd.—Fine and warm. Buds somewhat advanced. Trees badly infested with oyster-shell bark-louse and tent caterpillar. Needs pruning.

2nd application, May 5th.—Fine. A few aphis and apple-leaf Bucculatrix.

3rd application, May 17th.—Trees in full bloom, could not spray.

4th application, May 31st.—Fine. Blossoms fallen. Sprayed trees very free from insects.

5th application, June 12th.—Fine. Some varieties have set a full crop.

6th application, June 25th.—Fine. Fruit on unsprayed trees affected badly with fungus. Caterpillars of the Tussock-moth are plentiful here on unsprayed trees.

7th application, July 10th.—Fine and warm. Orchard looking well.

Inspected this orchard October 1st, and found the following results:

Baldwin.—Experimental spraying, 90 p. c. clean; unsprayed, 50 p. c. clean, fruit smaller and foliage gone.

Golden Russet.—Experimental spraying, 60 p. c. clean; unsprayed, well loaded but no clean fruit, foliage gone.

Snow.—Sprayed, 60 p. c. clean; unsprayed, fairly well loaded but no clean fruit.

Spy.—Sprayed, 75 p. c. clean; unsprayed, no clean fruit and foliage very poor.

SARNIA, LAMBTON CO.—MR. JEHU DAVIS' ORCHARD.

1st application, April 23rd.—Rain immediately after work was finished. Buds just bursting. Orchard in good condition.

2nd application, May 6th.—Fine, followed by rain. Oyster-shell bark-louse and aphis.

3rd application, May 18th.—Fine. Leaf-roller abundant. Some trees in bloom, not sprayed.

4th application, June 1st.—Fine. Bud-moth and leaf-folder at work. Insects are very bad at this point.

5th application, June 14th.—Fine and warm. Orchard is terribly infested with bud-moth.

6th application, June 26th.—Fine. Sprayed trees free from insects. Crop very light here.

Baldwin.—Experimental spraying, 80 p. c. clean; unsprayed, no clean fruit.

Spy.—Unsprayed, no clean fruit; we did not spray any Spy.

Other varieties not bearing this year.

LUCAN, MIDDLESEX CO.—W. E. HOOPER'S ORCHARD.

1st application, April 24th.—Fine. Buds just swelling; oyster-shell bark-louse here.

2nd application, May 7th.—Fine. Aphis and apple leaf Bucculatrix in this orchard.

3rd application, May 19th.—Trees in full bloom; could not spray,

4th application, June 2nd.—Fine. Could only spray four trees as the remainder were in full bloom; found some tent caterpillar.

5th application, June 15th.—Rain in the morning; cleared in the afternoon.

6th application, June 28th.—Fine. Apples clean and foliage looking well.

I visited Mr. Hooper's orchard and found results as follows:

Spy—Experimental spraying, 90 p.c. clean.
Baldwin—Experimental spraying, 80 p.c. clean.
Sweet Bough—Experimental spraying, 90 p.c. clean.

This is only a garden and all the trees were sprayed.

KINCARDINE, BRUCE CO.—MR. NORMAN MCPHERSON'S ORCHARD.

1st application, April 26th.—Fine and windy. Oyster-shell bark-louse and aphis on this orchard; large trees.

2nd application, May 8th.—Fine, followed by rain next day.
3rd application, May 20th.—Rained all day. Mr. McPherson will spray when it clears.
4th application, June 3rd.—Trees in full bloom except three Spys.
5th application, June 16th.—Fine. Could not spray Spys on account of bloom.
6th application, June 29th.—Rained until 4.30 ; sprayed at 5.30. A little scab showing on Snows.
7th application, July 13th.—Rained until 5 o'clock, then cleared ; sprayed at 7 o'clock. Scab bad on unsprayed trees, and some on sprayed trees.

I visited this orchard and found :

Baldwin.—Sprayed 80 p.c. clean.
Spy.—Sprayed, 10 p c. clean ; unsprayed, no clean fruit.
Snow.—Sprayed, 75 p.c. clean fruit ; unsprayed, no clean fruit.

Sprayed Snows realized $4 per tree ; unsprayed Snows were hardly worth picking.

There were only two sprayings here which were not closely followed by rain.

WINGHAM, HURON CO.—MR. G. MOFFAT'S ORCHARD.

1st application, April 29th.—Fine day. Oyster-shell bark-louse bad here.
2nd application, May 10th.—Fine and warm. Aphis and tent caterpillar at work.
3rd application, May 21st.—Fine. Some varieties in full bloom.
4th application, June 4th.—Fine. Could only spray a few trees (rest were in bloom).
5th application, June 17th.—Fine. Aphis doing considerable damage in this locality.
6th application, June 30th.—Fine. Fruit and foliage on sprayed trees looking fine.
7th application, July 14th.—Fine. Scab very bad on unsprayed fruit.

I visited Mr. Moffat's orchard Sept. 29th, and found the following results :—

Blenheim Pippin—Experimental spraying, 90 p.c. clean ; unsprayed, no clean fruit.
Greening.—Experimental spraying, 95 p.c. clean good crop ; unsprayed, 30 p.c. clean, but dropped most of crop.
Spy.—Experimental spraying, 85 p.c. clean ; unsprayed, no clean fruit, fruit small.
Duchess.—Experimental spraying, 100 p.c. clean ; unsprayed, 50 p.c. clean.
Maiden's Blush.—Experimental spraying, 95 p.c. clean ; unsprayed, 50 p.c. clean.
Talman Sweet.—Experimental spraying, 95 p.c. clean ; unsprayed 20 p.c. clean.
Snow.—Experimental spraying, 100 p.c. clean ; unsprayed 50 p.c. clean ; trees well loaded, but fruit almost worthless.

Colvert.—Experimental spraying, 90 p.c. clean ; unsprayed, 40 p.c. clean.

ARTHUR, WELLINGTON CO.—MR. WM. CAHALAN'S ORCHARD.

1st application, April 28th.—Fine. Buds just bursting ; oyster-shell bark-louse and aphis bad ; orchard needs pruning.
2nd application, May 11th.—Fine. Tent caterpillar at work to-day.
3rd application, May 22nd.—Fine. Blossoms showing color.
4th application, June 5th.—Could not spray as trees were in full bloom.
5th application, June 18th.—Fine. Fruit has set well.
6th application, July 1st.—Fine. Foliage good and fruit clean.
7th application, July 15th.—Fine. Sprayed fruit much larger and cleaner than unsprayed.

On examining Mr. Cahalan's orchard I found :

Snow.—Experimental spraying, 94 p.c. clean ; unsprayed, 10 p.c. clean.
Spy.—Experimental spraying, 95 p.c. clean : unsprayed, 16 p.c. clean.
Roxbury Russet.—Experimental spraying, 95 p.c. clean ; unsprayed, 45 p.c. clean.

ORANGEVILLE, DUFFERIN CO.—MR. D. MCPHEETER'S ORCHARD.

1st application, April 29th.—Appearance of rain. Old orchard, and badly in need of pruning ; oyster-shell bark-louse here.
2nd application, May 12th.—Fine. Tent caterpillar at work.
3rd application, May 25th.—Fine. Sprayed trees free from insects.
4th application, June 7th.—Trees in full bloom, did not spray.
5th application, June 19th.—Fine. Most varieties have set well.
6th application, July 2nd.—Fine. Sprayed trees looking well.
7th application, July 16th.—Fine. Very little scab on fruit in this orchard.

I visited Mr. McPheeter's orchard and found results as follows:

Alexander.—Experimental spraying, 95 p.c. clean, and a full crop; unsprayed, 75 p.c. clean, but dropped two-thirds of crop.

Talman Sweet.—Experimental spraying, 95 p.c. clean; unsprayed, 80 p.c. clean; sprayed trees have 50 p.c. heavier crop than unsprayed.

Spy.—Experimental spraying, 99 p.c. clean; unsprayed, 90 p.c. clean, but not so large or bright as sprayed fruit.

Snow.—Experimental spraying, 98 p.c. clean; unsprayed, 70 p.c. clean. The fruit on this orchard is the best unsprayed fruit I have seen.

MILTON, HALTON CO.—MR. ROBT. E. HARRISON'S ORCHARD.

1st application, April 30th.—Followed immediately by rain. Buds partly open; oyster-shell bark-louse and tent caterpillar here.

2nd application, May 13th.—Fine. Tent caterpillar very bad.

3rd application, May 26th.—Could not spray as trees are in bloom. Aphis bad.

4th application, June 8th.—Fine. The tent caterpillar is a regular plague in this locality. In some orchards they are in millions and cover the trees, which they have completely stripped of foliage. None, however, are to be found on our sprayed trees.

5th application, July 21st.—Fine. This orchard is not well cared for, the trees are full of dead wood, and the sod has not been broken for forty years.

6th application, July 3rd.—Fine.

7th application, July 17th.—Looks like rain. Sprayed trees looking well.

I inspected this orchard Oct. 12th and found:

Spy.—Experimental spraying, 100 p.c. clean of spot, 90 p.c. clean of worms; unsprayed, 50 p.c. clean.

Snow.—Experimental spraying, 100 p.c. clean.

Greening.—Experimental spraying, 90 p.c. clean; unsprayed, dropped fruit.

A neighboring orchard of Spys which I visited, and which was not sprayed, had a heavy crop, but only 10 p.c. of clean fruit.

SPRAYING WITH ICE WATER.

Experiments were made in spraying fruit trees with ice water while in bloom, to ascertain the effect of cold rains on the fertilization of blossoms and the setting of fruit; also to ascertain if heavy bloom could be partly sterilized in this way, thus saving the labor of thinning fruit.

The work was done by Mr. Jas. Tweddle at Fruitland, Ont., and was in connection with the experimental spraying of fruit trees carried on by the Department of Agriculture of Ontario.

Three trees of Longhurst peaches, three of Shipper's Pride plums, three of Keiffer pears, and one side of an Astrachan apple tree were selected for the work. The peach, plum and pear were in full bloom at the time of commencing work and the apple bloom was just opening.

For spraying, a barrel of water was cooled to the lowest temperature possible with broken ice. The tripple nozzle was used. One tree each of the peach, plum and pear were drenched for seven minutes, one of each for three and one half minutes, and one of each had one side drenched for seven minutes, the other half being unsprayed. One side of the apple tree was drenched for seven minutes. This work was performed on May 13th, 14th and 15th on all the trees, and on the 17th and 18th on all except the peach, from which the bloom was falling. On the 18th the plum and pear bloom began to drop. The weather was fine and warm, excepting a shower on the afternoon of the 15th. Results were carefully watched, and no difference could be noticed in the crop set on sprayed and unsprayed trees of the same variety, nearly 100 per cent of the blossoms setting in each case.

It would appear from the results of the above experiment that cold rains during the blooming period do not injure the blossoms unless they are so prolonged as to interfere with the fertilization of the blossoms.

TWENTY-EIGHTH ANNUAL REPORT

OF THE

ENTOMOLOGICAL SOCIETY

OF

ONTARIO

1897.

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CONTENTS.

JAMES FLETCHER, LL.D., F.R.S.C., F.L.S.

Dominion Entomologist and Botanist, President of the Entomological Society of Ontario, 1886-88.

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TWENTY-EIGHTH ANNUAL REPORT

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ENTOMOLOGICAL SOCIETY OF ONTARIO

1897.

To the Honorable John Dryden, Minister of Agriculture :

SIR,—I have the honour to transmit to you the twenty-eighth annual report of the Entomological Society of Ontario. It contains a full account of the proceedings at our thirty-fifth annual meeting, which was held in the City of London, on the 12th and 13th of October last, for the election of officers, the reading of papers and the transaction of the general business of the Society. The report includes the financial statement of the Treasurer and the reports of the various sections and departments of the Society, as well as the papers read and addresses delivered during the course of the meeting. Much attention was given to the alarming outbreak of the San Jose Scale insect in various parts of Ontario, and a valuable paper on the subject is included in this report.

The *Canadian Entomologist*, the monthly magazine issued by the Society, has now completed its twenty-ninth volume, and begun the publication of the thirtieth ; this is a record unequalled by any other monthly publication on entomology that has appeared in North America. The recently completed volume will be found to contain a large number of highly scientific and valuable papers contributed by the most eminent students of this department of science in Canada and elsewhere.

I have the honor to be, Sir,
Your obedient servant,

CHARLES J. S. BETHUNE,
Editor.

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PORT HOPE.

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Committee on Field Days	DOCTORS WOOLVERTON AND HOTSON, MESSRS. SPENCE, BALKWILL, RENNIE, ELLIOTT, BOWMAN, ANDERSON, SAUNDERS AND LAW.	London.
Library and Rooms Committee.	MESSRS. MOFFAT, BETHUNE, DEARNESS, SAUNDERS AND BALKWILL.	

ANNUAL MEETING OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO, 1897.

The thirty-fifth annual meeting of the Entomological Society of Ontario was held in its new room in the Young Men's Christian Association Building, Wellington Street, London, on Tuesday and Wednesday, October 12th and 13th, 1897, the President, Mr. J. W. Dearness, of London, occupying the Chair.

The meeting was called to order at 2.30 p.m., on Tuesday, when the following members were present: Dr. James Fletcher and Mr. W. H. Harrington, Ottawa; Mr. H. H. Lyman, Montreal; Rev. T. W. Fyles, Quebec; Mr. J. D. Evans, Trenton; Rev. C. J. S. Bethune, Port Hope; Mr. T. Hart, Woodstock; Messrs. W. E Saunders (Secretary), J. A. Balkwill (Treasurer), J. A. Moffat (Curator), J. H. Bowman, C. D. Anderson, and J. Law, London.

Letters of apology were read from Prof. Panton, of Guelph, who had been seriously ill for some weeks, and Mr. Arthur Gibson, of Toronto, regretting their inability to attend. The Chairman also reported that Mr. A. H. Kilman. of Ridgeway, one of the Directors of the Society, was ill in a hospital at Buffalo, N.Y.

The first paper was read by the Rev. T. W. Fyles on "An Arctian Larva—What is it?" and was illustrated by specimens of the moth from which the eggs were obtained and of some varieties of *Hyphantria cunea*. Dr. Fletcher, in commenting on the paper, said that Dr. Riley, in the Report of the Entomological Commission on Forest Insects, page 246, had figured ten varieties of this moth ranging from the common pure white, immaculate form to one profusely dotted with black and brown, and expressed his belief, founded upon the frequent breeding of specimens, that these are all varieties of one species, which should be known by Drury's name of *H. cunea* rather than *H. textor*, Harris.

Mr. Lyman said that this was an opposite case to that of *Euchætes collaris* and *egle*, which were supposed for a long time to be the same, but were found by breeding to be different species.

Mr. Lyman read a paper by Mr. Winn and himself entitled "Notes on Grapta Interrogationis," which will be published in the December number of "The Canadian Entomologist." This butterfly was very abundant about Montreal and other parts of the Province of Quebec during the season of 1896. Advantage was taken of this abundance by the authors of the paper to rear the insect from egg to imago in considerable numbers and in this way to settle some doubtful points in its life history. They described the various incidents that related to the rearing, egg-laying, duration of moults and of larval and pupal stages, emergence of the imago, etc. The larvæ were fed on elm and hop, in confinement and out-of-doors, and many in their natural condition were found to be severely parasitized. Out of one batch of 101 eggs laid by a single female, Mr. Lyman made a microscopical examination of fifty-two, and found that of these thirty-one had nine ribs and twenty one had ten. This year (1897) only one specimen of the butterfly was seen by Mr. Winn.

Mr. Fyles spoke of the former rarity of this butterfly in the Province of Quebec, and how for a few years it became fairly common, culminating in the remarkable abundance during 1896.

Dr. Fletcher drew attention to the fact observed by Mr. Lyman that the eggs laid by a single female had a variation in the number of ribs, though Mr. Scudder had supposed that each female would lay eggs with the same number of ribs, the number possibly varying with different individuals. The ordinary food plant is the elm, but it feeds also on nettle as well as hop. He found that the butterflies of the Vanessa group were very variable as regards the number of individuals from year to year. Sometimes *V. antiopa* was so abundant on the young elms at the Ottawa Experimental Farm that the larvæ had to be destroyed in order to save the trees.

Dr. Fletcher then brought up the subject of facilities for obtaining illustrations for "The Canadian Entomologist," and asked for information regarding cost, length of time required for execution, etc. Dr. Bethune in reply gave a full explanation of what was done regarding the many beautiful plates and excellent wood cuts that had appeared in the magazine during the last year or two, and pointed out the difference in the mode of preparing photo-gravures and process reproductions and their relative cost.

The meeting then adjourned till the evening, and the Council at once held a session for the transaction of business. The President remarked upon the removal of the Society's property since the last annual meeting to their new quarters, and the work done by the Curator in the moving. The local committee thought that some substantial expression of the Society's appreciation of the work that Mr. Moffat had performed should be made.

Mr. Balkwill said that there had been a great deal of extra labour involved in the moving, packing and unpacking of the cabinets and specimens, the taking down and rearranging of the library, etc., and that all had been done with so much care that no books or specimens were damaged in any way.

Mr. Fyles congratulated the members on their happy removal from the old building to the present cheerful room, and the escape from the beating of drums and other noises from the Salvation Army barracks below that often proved a serious annoyance. He thought that the thanks of the Council were fully due to the Curator, and that some substantial recognition of his careful work and extra labour should be made.

Dr. Fletcher concurred in the congratulations on the removal into so nice a room and into so fine a building, and he considered that the Society was under great obligation to Mr. Moffat for his unfailing kindness for many years to all the members of the Society in naming specimens and doing other work which could not be fairly said to be included in his duties.

Mr. Balkwill, in presenting the following resolution, said that the sum was not as large as he would like to see given, but he thought that it was all that the limited funds of the Society could afford. He then moved, seconded by Mr. W. E. Saunders, That the Council desire to place on record their appreciation of the services of the Curator, Mr. J. Alston Moffat, during the removal of the books and specimens from the former to the present room, and it is resolved that the sum of twenty-five dollars be given to Mr. Moffat in recognition of his labour on this occasion.—*Carried.*

The question of the heating of the room was next discussed, and it was then stated that it was inadequate in the autumn and early winter and again in the spring. The President was authorized to bring the matter before the officials of the Y. M. C. Association in order that the difficulty might be remedied, and also to sign and execute the lease.

Dr. Bethune drew attention to a suggestion of the President that each Director of the Society should be expected to make at the annual meeting a short report on the insects in his district which had been of special note during the season; he thought it an admirable idea and one that if carried out would add much to the value and interest of the annual report. The suggestion was highly approved of by those present, and it was decided that it should be the duty of the Directors in future to make such reports.

Mr. Fyles, at the request of Dr. Fletcher, gave an interesting account of the formation of the Quebec Branch of the Society, which was already so successful and numbered about five and twenty members

In the evening the Society held a public meeting in its new room on Wellington street, at which there was a largely increased attendance of members and friends. In addition to those who were present during the day may be mentioned Messrs. H. P. Bock, B. Green, T. Green, R. W. Rennie, W. Scarrow, W. Percival, J. B. Spencer, W. Lochhead and Drs. Woolverton and Stevenson, London. The chair was taken by the President, Mr. Dearness, at 8 o'clock, and the meeting was opened by the reading of the report of the Council for the past year by the secretary, Mr. W. E. Saunders, which was on motion adopted.

REPORT OF COUNCIL.

The Council of the Entomological Society of Ontario have much pleasure in presenting the following report of their proceedings during the past year :

They have great gratification in stating that the work and influence of the Society have been much extended, and its membership increased by the formation of Branches in Toronto and Quebec. "The Toronto Entomological Society" was formed in February, 1896, with Mr. E. V. Rippon as president, and Mr. Arthur Gibson as secretary ; regular fortnightly meetings were held and much enthusiasm was displayed by the members. Towards the end of the year the desirability of affiliating with our Society was brought before the members, and after full deliberation it was decided to join us on the first of January, 1897, and to become a Branch of this incorporated Society in accordance with the terms of our constitution. A few months later another Branch of the Society was formed at Quebec through the exertions of our colleague, the Rev. T. W. Fyles, and twenty more names were added to our roll of membership. The old established Branch at Montreal is as vigorous as ever and continues to accomplish much good work. The Society has now four centres for holding regular meetings and promoting the welfare and extending the usefulness of the students of entomology in Canada. It is to be hoped that before long similar work may be carried on in the Maritime Provinces where little interest has yet been shown in this department of natural science, but where a great deal of important work could undoubtedly be done.

The twenty-seventh 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 beginning of May. It contained one hundred and twenty-seven pages and was illustrated with one hundred and three wood cuts and six full page plates. With the exception of the first report (1870) it was the largest volume yet issued by the Society and contained more illustrations than any previous one. In addition to an account of the proceedings at the last annual meeting, the report contains the annual address of the president, Mr. John Dearness, and the following interesting and important papers : "Some insectivorous Mammals," by Mr. Robert Elliott ; "Notes on the Season of 1896," by Messrs. Fyles, Fletcher, Bethune, Moffat and Gibson ; "Entomology for Rural Schools," and "Two Insect pests of 1896," (the Army-worm and Tussock moth) by Prof. Panton ; "The importance of Entomological Studies to an Agricultural and Fruit-Growing Community," and "Lepidopterous Pests of the Meadow and the Lawn," by the Rev. T. W. Fyles ; "Some beetles occurring upon Beech," by Mr. W. H. Harrington ; "The San Jose Scale" and "Warning Colours, protective mimicry and protective coloration," by Prof. F. M. Webster.

The Canadian Entomologist, the monthly magazine published by the Society, completed its twenty-eighth volume in December last. Ten numbers of the twenty-ninth volume have now been issued ; they contain 248 pages and are illustrated with eight full page plates, several of them of great beauty, and a number of original wood cuts. Among the many valuable papers published may be mentioned the continuation of the series of illustrated articles on the Coleoptera of Canada, by Prof. H. F. Wickham, which are most useful to students of this order, and are specially designed to be of assistance to beginners of the study of our beetles. It is with profound regret that the Council have learnt from Prof. Wickham that he is obliged to abandon the study of systematic entomology on account of trouble with his eyes, and they desire to express their deep sympathy with him in this affliction which so seriously interferes with his valuable and important work.

A number of interesting specimens of moths new to the Canadian lists have been added to the Society's collection by the kindness of Mr. J. Bice who has been a diligent collector at the electric lights in the city of London.

In the latter part of November, 1896, the Society removed its head quarters from the rooms it had occupied for over sixteen years in Victoria Hall on Clarence street to more accessible, commodious and better lighted premises in the Young Men's Christian Association fine new building on Wellington street. The cases of books and insects were

safely and conveniently installed without loss or injury under the careful management of the curator, Mr. J. Alston Moffat. In the new rooms the Council believe that the valuable property of the Society will be safer from fire and more easily reached by the members and the public. (See Plate 2 which shows a part of the Library.)

The Librarian's report will show that a large number of volumes of scientific Societies' publications and pamphlets have been bound and placed for consultation on the shelves. The "Canadian Entomologist" is exchanged for the proceedings of various scientific and learned societies in all parts of the world. The number of such exchanges at present on the list is 74.

The Council desires to express its entire satisfaction with the efficient manner in which the curator, Mr. J. Alston Moffatt continues to discharge his duties.

The Treasurer's report shows that the finances of the Society are in a very satisfactory condition. While the expenses have been necessarily increased, owing to the change of rooms and the cost of removal, the balance on hand will no doubt be sufficient to provide for the expenditure that will be required during the remainder of the year.

The reports of the Secretaries of the several scientific sections of the Society, printed elsewhere, show that they continue to hold regular meetings and to accomplish much useful work.

The Society was represented at the meeting of the Royal Society of Canada, held at Halifax, Nova Scotia, in the month of June last, by Mr. J. D. Evans, of Trenton, whose report is published herewith. At the meeting of the British Association for the Advancement of Science, held in Toronto in August, the Society was represented by the president, Mr. J. Dearness, and the editor, Dr. Bethune, and was attended by several other of the members.

All of which is respectfully submitted.

London, October 12, 1897. John Dearness,
President.

REPORT OF THE MONTREAL BRANCH.

The 207th regular and 24th annual meeting of the Montreal Branch of the Entomological Society of Ontario was held in the rooms of the Natural History Society of Montreal on 25th May.

The following members were present: Messrs. H. H. Lyman, President; A. F. Winn, Vice-President; G. C. Dunlop, T. Dwight Brainerd, A. Griffin, J. B. Williams, E. A. Norris, H. T. Pye, L. Reford, O. Stevenson, G. A. Moore and L. Gibb, Sec.-Treas.

The chair was taken by the President and the minutes of the previous regular meeting were read and confirmed, and the minutes of the last annual meeting were also read.

The President then submitted the following report of the Council for the past year:

Report of Council.

In presenting their twenty-fourth annual report the Council have much pleasure in referring to the continued prosperity of the Branch.

Since our last annual meeting two new members have been added to our roll, but two others have resigned and we have also to deplore the loss by death of Mr. George Kearley, whose genial disposition and interest in the Branch and its work had won our high esteem.

During the year eight meetings have been held, at one of which we had the pleasure of the attendance of the Rev. Dr. Bethune, whom our members had thus the pleasure of meeting for the first time, and the following papers and communications were read:

Annual address of the President. H. H. Lyman.

Nasturtium as a food plant of Pieris Rapæ. A. F. Winn.

Description of two remarkable aberrations of Colias Philodice. J. D. Brainerd.

Address on the past season. Rev. Dr. Bethune.

The Crambidæ of the Province of Quebec. Rev. T. W. Fyles.

Notes on Grapta Interrogationis. A. F. Winn.

Notes on Grapta Interrogationis. H. H. Lyman.

A novel breeding cage. E. A. Norris.

Butterfly books. H. H. Lyman.

Description of the larva and pupa of Aulax Nabali. Rev. T. W. Fyles.

Notes on the past season of 1896 at Edgarstown, Mass. T. D. Brainerd.

Notes on Colias Cæsonia. Sent by T. E. Bean.

Notes on the occurrence of Thyatira Rectangulata in Canada. A. F. Winn.

Notes on the season of 1896. H. H. Lyman.

During the season several of our members again co-operated with the Natural History Society in continuing the course of short lectures to young people, on Saturday afternoons, with, it is believed, encouraging results.

Greetings have been exchanged with the newly formed Toronto Branch and we rejoice to learn that another branch has been formed in this Province, in the ancient City of Quebec, where a branch formerly flourished.

The Treasurer's report shows that the finances of the Branch are in a satisfactory condition.

Respectfully submitted on behalf of the Council.

H. H. Lyman,
President.

The Treasurer then submitted his report, which showed an accumulated balance on hand of $35.46.

Upon the motion of Mr. G. C. Dunlop, seconded by Mr. C. Stevenson, the reports of the Council and Treasurer were received and adopted.

The President then read his annual address, giving a resume of the past year's work and pointing out a few lines for future guidance.

Some discussion then took place upon the suggestion to obtain a cabinet for a general collection for the Branch, the matter being finally left in the hands of the incoming council.

The following officers were then elected for the ensuing year :

President—Henry H. Lyman.

Vice-President—A. F. Winn.

Secretary-Treasurer—Lachlan Gibb.

Council—G. C. Dunlop and T. Dwight Brainerd.

The meeting then adjourned.

Lachlan Gibb.
Secretary-Treasurer.

REPORT OF THE QUEBEC BRANCH.

The Quebec Branch of the Entomological Society of Ontario came into existance at the close of a course of lectures on natural science given in Morrin College during the winter of 1896-97.

It was thought desirable that an interest in entomological and botanical pursuits should be continued during the summer vacation and to promote this interest the formation of an Entomological Association was determined upon.

At a meeting held in Morrin College on Wednesday, April 7th, and presided over by Reverend Principal Macrae, M.A., D.D., a constitution was adopted, officers were chosen and a resolution asking for recognition by the Ontario Society was agreed upon.

The following is the list of officers :

President—Rev. Professor Fyles.

Vice-President—Miss Macdonald, Principal of the Quebec Girls' High School.

Secretary-Treasurer—Lieut -Col. Crawford Lindsay.

Council—Messrs. J. Geggie, Richard Turner and J. Eveleigh Treffry : The Misses Bickell and B. Winfield.

On the 10th of May, the members met at the house of the President to examine his extensive collections. On this occasion the equipments necessary for a working entomologist were examined, and the methods of capturing, preserving and mounting insects were noted.

A field day was held at the "Gomin" on June 12th, when a number of rare specimens were taken. The presence and help of Messrs. Winn and Brainerd, of the Montreal Branch, added greatly to the day's enjoyment.

After the summer holidays, the members again met to compare and identify specimens. The President gave an address on the condition of the insect world in the winter months ; and Professor Walters one on "Entomological Experiences at Bourg Louis." *Colias interior*, *Terias lisa*, *Phyciodes Harrisii* and other rare insects were taken by Mr. Walters at that place.

By kind permission of the authorities of Morrin College, the members of the Branch enjoy the privilege of holding their regular meetings in the College Buildings and of attending the College lectures on natural history.

W. A. Crawford Lindsay,
Secretary-Treasurer.

REPORT OF THE TORONTO BRANCH.

The first annual general meeting of the Toronto branch was held in the Society's room, 451 Parliament street, on Friday evening, the 2nd April, 1897.

The following members were present: E. V. Rippon, President ; Arthur Gibson, Secretary-Treasurer ; T. G. Priddey, Librarian-Curator ; C. T. Hills, R. J. Grew, C. H. Tyers, J. H. McDunnough, H. S. Austen, Arthur Cherry and H. D. Chipman.

The Secretary read the following report of the Council, which was duly adopted :

Report of Council.

The Council of the Toronto branch of the Entomological Society of Ontario take pleasure in presenting the following report of the proceedings of the Society during the past year.

While the membership of the Society has not increased to any great extent, yet the Council feel that the first year of the Society's existence has been a success. Since organization eight new members have been added to the roll. Of these eight, five have severed their connection with the Society, while the other three are still interested in its welfare. The membership now numbers twelve, and the council have every reason to hope that these figures will be increased during the coming year.

A most important event in connection with the Society was the affiliation of the Toronto Entomological Society with the Entomological Society of Ontario. This affiliation took place on the 1st January last, since which date the Society has been known as the Toronto Branch of the Entomological Society of Ontario.

During the past year twenty-four ordinary meetings have been held, and the following list of papers, contributed by the members, added much to their success:

March 6th, 1896.—The Classification of Insects, by Mr. T. G. Priddey.

March 20th, 1896.—A Few Notes on Coleoptera, by Mr. R. J. Crew.

April 2nd, 1896.—The Sphingidae, or Hawk Moths, by Mr. Arthur Gibson.

April 17th, 1896.—Notes on the ova of Lepidoptera, by Mr. C. T. Hills.

May 1st, 1896.—A new species of Diptera, belonging to the Genus Diopsis, by Mr. E. V. Rippon.

May 15th, 1896.—Mysteries of Insect Life, by Mr. T. G. Priddey.

September 18th, 1896.—Notes on Toronto Sphingidae, by Mr. J. H. McDunnough.

October 2nd, 1896.—Notes on Collecting Coleoptera, by Mr. R. J. Crew.

December 4th, 1896.—Injurious Insects, by Mr. C. H. Tyers.

January 8th, 1897.—Sense of Sight in Insects, by Mr. S. R. Carter.

February 5th, 1897.—The Uses of Insects, by Mr. Arthur Gibson.

March 5th, 1897.—Obnoxious Insects, by Mr. T. G. Priddey.

The number of volumes in the library at the present date is forty-six, besides some fifty-two pamphlets, Government bulletins, etc., all relating to Entomology, and all of which have been kindly donated to the Society during the past year.

Considerable work has been done on the Society's collection of insects, especially during the last few months, and through the kindness of the members in presenting specimens, a fair number of insects are now in the Society's possession.

The Treasurer's report shows that the finances are in a satisfactory condition. Among the expenditure will be noticed that a considerable sum has been spent in the purchase of chairs, cases, etc., and also for rent of room.

Respectfully submitted on behalf of the Council.

E. V. Rippon,
President.

The reports of the Treasurer and Curator-Librarian were submitted and on motion duly adopted as read.

The election of officers for the ensuing year resulted as follows:

President.—E. V. Rippon.

Vice-President.—R. J. Crew.

Secretary-Treasurer.—Arthur Gibson.

Curator-Librarian.—T. G. Priddey.

Council.—C. T. Hills and C. H. Tyers.

The President then addressed the meeting, and in the course of his remarks congratulated the members on the work done during the year, and felt certain that the first year of the Society's existence had been a success. During the coming season he

hoped that each member would take a special interest in some particular species, working out the life history of at least one insect, and also that considerable time would be spent in the study of those insects which are beneficial or injurious to mankind. In the United States particularly economic entomology is making great strides, and Mr. Rippon advised the members to give particular attention during the coming season to those insects which are known to be injurious. Concluding, Mr. Rippon thanked the members for the honor conferred upon him in re-electing him to the position of President for the ensuing year.

The meeting then adjourned.

ARTHUR GIBSON,
Secretary.

REPORT OF THE BOTANICAL SECTION.

The Botanical Section organized in April.

A paper, illustrated with a fine series of examples, on Narcissus was presented by Mr. J. B. Bond.

One evening was devoted to Prof. Bailey's work on Plant Breeding, led by Mr. Dearness.

Another interesting paper by Mr. Bond on Iris afforded material for an evening's profitable discussion.

The other meetings were more or less informal and were occupied by examining and discussing specimens brought by the members.

Additions to the local flora were Draba Caroliniana, Anthemis arvensis, and Specularia perfoliata. Messrs. Bowman, Dearness, Elliott and Balkwill were the chief collectors.

J. B. BOND, Chairman.
ELLIOTT RICHMOND, Secretary.

REPORT OF THE GEOLOGICAL SECTION.

The Section in Geology beg to submit their annual report as follows :—

The meetings have been held weekly throughout the year with the exception of six weeks in midsummer.

During this interval several of our members made holiday excursions to various parts of our country, for the collection of material, and gaining useful information on subjects pertaining to our branch of science.

We have extended our trips to a greater distance from home than usual.

Mr. George Kirke spent several weeks in the northwest mineral regions in the vicinity of Rossland.

Mr. Brown spent five or six months prospecting on the north shore of Lake Superior and in the Wabigoon district.

Mr. A. Blackburn has been opening mines in the Lake of the Woods district.

Dr. Woolverton, chairman of the Section, has lately returned from collecting minerals from the north Hastings gold fields.

This shows great activity on the part of our members, and a determination to become better acquainted with the mineral resources of our country.

Our removal to the present room provided by the parent society, has not given us, as we anticipated, any more room for the display of specimens pertaining to our particular section. In other respects it is all that could be desired.

Many specimens of ores have been received, and placed upon the table, from various mining locations throughout the country, and we are pleased to learn that a large collection of minerals and ores from British Columbia has lately been sent, as a gift to our Public Library collection, to which our members will have free access.

The subjects studied during the year were various.

We reported to the local papers the find of coal or anthraxolite in the vicinity of Sudbury. Its value as a fuel has not yet been definitely settled by geologists.

We received the borings of various wells put down for oil in the vicinity of London, viz. :—Delaware, Parkhill and Mount Brydges, only a slight trace of oil being met with so far, showing that they are not within the true oil belt.

The Section has been materially assisted by donations of some of the products of the factories at Niagara Falls—resulting from the great electrical power now gener ated at that point.

Dr. Hough, a resident of that place, sent a small box containing carbide of calcium from which is made acetylene gas, which is likely to prove of some importance in the near future.

We also obtained from the proprietor of the carborundum works, fine specimens of this material, which, in hardness exceeds anything in nature or art except the diamond. This may be called the first step in the manufacturing of diamonds.

By vote of the Section the chairman was asked to attend the meeting of the British Association for the Advancement of Science at Toronto and report thereon, which was satisfactorily carried out.

Papers were read by the following members of the Section :

I. Dr. Wilson.

II. Mr. Geo. Kirke.

III. Mr. Goodburn.

IV. Mr. John Law.

V. Mr. D. G. Buchanan.

Steps are being taken to establish a public collection as a necleus for a museum in our Public Library.

Our members are ready to assist in carrying out the project to a successful issue as this would assist them in their work and also widen the sphere of influence in the Geological Section.

Submitted on behalf of the Section.

S. Woolverton, Chairman.
John Law, Secretary.

A large and very handsome specimen of carborundum was exhibited to the meeting by Dr. Woolverton, who procured it from the works at Niagara Falls.

REPORT OF THE MICROSCOPICAL SECTION.

During the past season, meetings were held every two weeks after the opening meeting, until the close of the term in March. The average attendance was eight members. In addition to these meetings the Entomological Society kept open house on the first of January, 1897, this being the formal opening of the Y. M. C. A. building, in which the Society's new rooms are located, and on this occasion one of the principal attractions was the exhibit of microscopic objects by the members of this Section, and much interest was shown by the numerous visitors in the display. Eight or nine members took part, and the rooms were kept open all day as well as in the evening.

Among the papers read at the meetings of this year were the following: A Study of Lichens, by Prof. John Dearness; a subsequent evening being devoted to the practical handling, examination, and the mounting of these interesting plants, under the direction of the same gentleman.

The Growth of Ferns, by Wm. Lochhead, M.A., illustrated by blackboard drawings and figures drawn by the speaker from microscopic mounts.

Observations on microscopic and other forms noted during a recent trip across the Continent, by W. E. Saunders; illustrated by specimens of interest in various branches of natural life.

Microscopic Manipulation, by R. W. Rennie, illustrated by beautiful pieces of apparatus made by the speaker. The attendance and interest in the meetings were good, and on the whole, the Section looks back on a fairly satisfactory year.

J. H. Bowman, Secretary.

REPORT FROM THE ENTOMOLOGICAL SOCIETY OF ONTARIO TO THE ROYAL SOCIETY OF CANADA.

Having been chosen as the Delegate to represent the Entomological Society of Ontario on this most interesting occasion, the commemoration of the landing of Cabot, it becomes my privilege to submit a report of its work and proceedings during the past year.

The membership of the Society I am pleased to report has been well maintained and in addition thereto it is very gratifying to be able to say that on or about the opening of the current year a branch of this Society was inaugurated in Toronto by the affiliation of the Local Society formed about a year before, thus starting out with quite a considerable membership and manifesting much enthusiasm under the new regime.

The additions to the library were quite important including, among others, a full set of the annals of the "Entomological Society of France." The additional volumes, numbering ninteen, thus bringing the total library register up to 1,418 volumes.

There was also a limited addition to the collection of insects.

The official organ of the Society, "The Canadian Entomologist," still maintains its high standing among its class of literature. During the year 1896 it completed its twenty-eighth volume of 319 pages. Of the forty eight contributors thirty were from the United States, two from New Mexico, one from New Zealand, two from Europe, the remaining thirteen being Canadian. The contributors aggregated eighty-six articles, in some of which were described one hundred and eleven new species and four new genera.

Among the more important papers published during the year the following deserve particular mention.

The Coleoptera of Canada, by Prof. H. F. Wickham. These are a very useful series of illustrated articles for beginners as well as those more advanced. They were continued through five numbers and are a continuation of similar articles in two previous years.

The North American species of Gnathodus, by Mr. Carl F. Baker.

The American species of Isotoma, by Mr. Alex. D. MacGillivray.

Canadian Hymenoptera No. 7, by Mr. W. Hague Harrington, F.R.S.C.

A Contribution to the knowledge of North American Syrphidae, by Mr. W. D. Hunter.

Lepyrus, by John Hamilton, M.D.

The Cigar case-bearer of the Apple (Coleophora Fletcherella,) by Dr. Jas. Fletcher.

New American parasitic Cynipidae (Allotriinae), by Mr. Carl F. Baker.

The larger species of Argynnis and the mystery of their life history, by Mr. H. H Lyman, M.A.

On two interesting new genera of scale insect parasites, by Mr. L. O. Howard.

Index to the Mantidae of North America north of Mexico, by Mr. Samuel H. Scudder.

A summary of the members of the Genus Chilosia, Meig, in North America with descriptions of new species, by Mr. W. D. Hunter.

Some notes on Insect enemies of trees, by Mr. A. D. Hopkins.

Some new Nematids, by Mr. C. L. Marlatt.

Notes on the preparatory stages of Erebia Epipsodea, Butler, by Mr. H. H. Lyman, M.A.

A number of book notices, current publications of Entomological literature, correspondence, obituary notices, etc., also appear. At this time it will not be inopportune to mention the serious loss to the Society, from death, of two of its very active members, Mr. John M. Denton of London, and Captain J. Gamble Geddes, of Toronto.

The thirty-fourth Annual Meeting of the Society was held in its rooms, in London, on Wednesday and Thursday, the 21st and 22nd of October, 1896. A very full report of these proceedings is given in the Annual Report published by the Society (in addition to the Monthly Magazine) to the Department of Agriculture of the Province of Ontario.

This report consists of 127 pages replete with numerous illustrations. Two plates of these illustrations are worthy of particular mention as illustrating the study of economic entomology in the public schools, a work which should be heartily commended.

In addition to the report of the proceedings of the parent Society in which is embodied an extended and interesting Annual Address from the President, it contains also—

The reports of the Geological, Botanical, and Microscopical Sections of the Entomological Society.

The report of the Montreal branch with the annual address of its President.

And the report from the Entomological Society of Ontario to the Royal Society of Canada.

The following papers also appear in this annual report, viz.

Notes on the Season of 1896, by Rev. T. W. Fyles, F.L.S.

Some Insectivorous Mammals, by Mr. Robert Elliott.

Entomology for Rural Schools, by Prof. J. Hoyes Panton. Especially to be commended for the introduction and propagation of knowledge of economic Entomology among the children of both sexes.

The Importance of Entomological Studies to an Agricultural and Fruit-growing Community, by Rev. Thos. W. Fyles, F.L.S.

Two Insect Pests of 1896, by Prof. J. Hoyes Panton.

Notes on Insects of the Year 1896, by Rev. C. J. S. Bethune.

Insect Injuries to Ontario Crops in 1896, by Dr. Jas. Fletcher.

Some Beetles Occurring upon Beech, by Mr. W. Hague Harrington, F.R.S.C.

Notes on the Season of 1896, by Mr. J. Alston Moffat.

Warning Colours, Protective Mimicry, and Protective Coloration, by Prof. F. M. Webster.

The San Jose Scale, by Prof. F. M. Webster. A very exhaustive and valuabl treatise on the subject.

Lepidopterous Pests of the Meadow and the Lawn, by Rev. T. W. Fyles, F.L.S.

Rare Captures During the Season of 1896, by Mr. Arthur Gibson.

The Butterflies of the Eastern Provinces of Canada, by Rev. C. J. S. Bethune.

The Geological Section reported that regular meetings were held weekly during the year with a fair attendance. Several places of geological interest had been visited by members and collections made. Valuable papers had been read, also four or five lectures given.

A collection of minerals having been presented by the Dominion Goxernment to the free library, which is accessible to our members, will be an incentive to more active work and increased membership.

The Botanical Section reported that the weekly meetings from the 1st May to the middle of July were well attended, several very pleasant outings had been held, and that the work of the year had been encouraging.

The Microscopical Section reported having had a year of continued success with fortnightly meetings from October 11th to April 17th, when its meetings were discontinued in favor of the Botanical Section. The subjects studied were arranged under ten different classifications, each led by a different member.

Each of the Sections above enumerated, as well as the parent society, look forward with anticipations of much greater usefulness and increase of membership upon occupying the new suite of rooms which have been secured and are now occupied.

The Montreal Branch presented its twenty-third annual report which showed a very marked increase in the membership. Eight meetings had been held during the course of the year at which ten excellent papers had been read, and the financial status was explained to be in a very healthy condition. The President's annual address was a very impressive one, urging upon the members to undertake and work up some special subjects among the very many open and now neglected, and enumerating a long list of such.

JOHN D. EVANS,
Delegate.

ANNUAL ADDRESS OF THE PRESIDENT.

BY JOHN DEARNESS, I.P.S., LONDON.

Members of the Entomological Society of Ontario :

LADIES AND GENTLEMEN,—It is my pleasant duty this evening to welcome you to the thirty-fifth annual meeting of the Society.

Since our last annual gathering our quarters have been removed from a room in the highest flat of the old Victoria Hall to these commodious and well lighted apartments in the beautiful new Y.M.C.A. Building. The removal of the cases, library, instruments, etc., a difficult matter, was well directed by the librarian, assisted by Mr. Balkwill. It was effected without accident or injury to the glazed cases or specimens. The librarian merits our commendation and thanks for the pleasing and convenient arrangement of the library, specimens and furniture of the Society in these rooms.

The year's work of the parent Society will be disclosed as the meeting progresses. Reports of branch societies and of the sections into which the members break up for the practical study of allied sciences will be presented by the respective officers. This year we shall have the pleasure for the first time of having reports from two new branches formed respectively in Quebec City and Toronto.

Last year we mourned the encroachment made by death in the ranks of our membership. At this meeting we are grateful that no name has thus to be taken off our roll, although our sympathies are called forth towards two of our directors who are unable to take part in the proceedings by reason of serious illness, viz., Mr. A. H. Kilman, director for the fourth division, and Professor Panton. We trust that God will bless the means employed to their speedy and complete recovery. Professor Panton's work last year was so helpful and acceptable that we miss him the more at this meeting.

The Insects of the Year.

Fig. 1. Amputating brocade moth (*Hadena Arctica.*)

In 1895 a cut-worm moth (*Hadena Arctica*, Fig. 1) in prodigious numbers made housekeepers miserable in the evenings,—in the following spring the larvæ of the same insect did great injury to grain crops sown on ground which had been freshly broken out of sod. One might expect when the time of the pupation of these larvæ had expired to witness a reappearance of the moth in increased numbers. Such expectation was happily entirely disappointed. Every suitable acre of pasture ground or meadow was doubtless as thickly stocked with the larvæ as those acres of spring grain referred to, many of which had to be re-sown. No parasite was reported on them. What became of them?

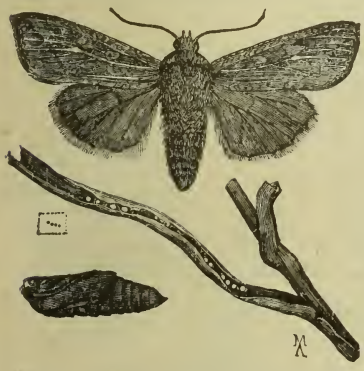

Fig. 2. Eggs, pupa and moth of the Army Worm (*Leucania unipuncta.*)

In 1896 the army-worm (Figs. 2 and 3) devastated grain fields in many townships of Ontario, as witness the dark patches of infested country shown in the map of the Province published on page 45 of our last report. To illustrate how numerous they were in one school section in my own division: a lady told me that coming along at the time when the army was migrating from a grain field on the east side of the road in search of forage farther west they were so thick on the road that the faster travellers were crawling over the others instead of seeking a way round, if, indeed one could be found, and that not knowing but that the procession might be of indefinite duration she was constrained to lift her skirts and pick her steps on tip-toe, even then very unwillingly stopping forever at every step the progress of some of the hungry marchers. The Province throughout its length and breadth was thus patched over with incalculable numbers of the army worm. True their predatory enemies, during the short season their larvæ were fair prey, waxed fat and multiplied on them. The red-tailed Tachina, or possibly the yellow-tailed one, Fig. 4, adorned many a neck with one or two pretty eggs, but notwithstanding the great losses from these and other causes the one-spotted Leucania was the most common moth to be seen in the fall even in townships where not a larva had been reported. Why was not the whole country overrun with this insect this year? The causes and conditions of the appearance and the still more curious disappearance of such insects as the amputating brocade (cut-worm) moth and army worm challenge and invite investigation.

Fig. 3. Army Worm.

Fig. 4. Tachina fly (*Nemoraca leucaniae.*

If the army worm had its "innings" last year, this year the San José Scale has had the lion's share of attention. It is to be earnestly hoped that we are more frightened than hurt, but I am truly thankful we are well frightened. So far as I know, Dr. Fletcher and Prof. Panton, the officers of the Ottawa and Guelph experiment stations, deserve the chief credit for sounding the alarm. One benefit from the scare is that it has led many people to discover what a scale-insect is and to learn that for years their fruit trees have been injured by the native or naturalized species of this class of insect. If the alarm perpetuates, as it appears to have started, a crusade against scale insects of all kinds much good will result. I have been sent or shown several things and asked whether they were the dreaded

scale. They were mostly the Oyster-shell Bark-louse, *Mytilaspis pomorum* (Fig. 5.) One or two I took to be the Scurfy Bark-louse (Fig. 6), others included the woolly aphis, insect eggs, and a species of lichen. Doubtless the experiment station officers could give a long list of similar inquiries. Attention being diverted to those minute insects the presence of the San José one will be the more promptly detected. The destructiveness of this scale and the expense and difficulty of killing it except by methods that endanger its host will, if a few more instances of its introduction from nurseries occur,

Fig. 5.
Oyster-shell
Bark-louse.

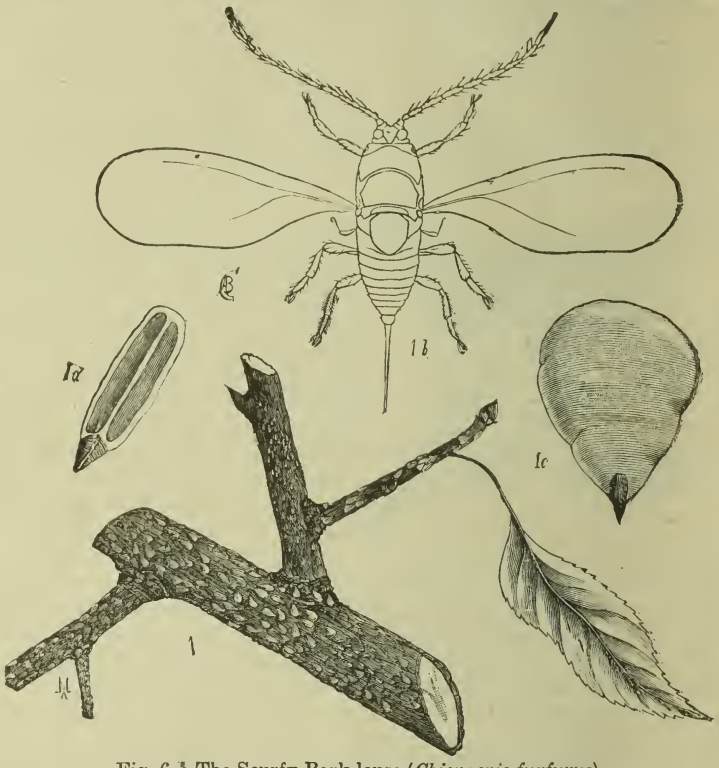

Fig. 6. The Scurfy Bark-louse (*Chionaspis furfurus*).

lead to legislation. I have met some people who had got the idea that there is a quarantine already established against nursery stock imported from abroad. Reports of the efforts to obtain such measures on the other side of the line have probably given rise to the impression. This meeting offers a fitting time and place to give an expression as to whether legislative action should be taken*

The San José Scale, if it ever becomes established in this country, will not, like the moths above referred to, be marked by sudden disappearance, nor will it, like the codling-moth or pear *Psylla*, confine its ravages to a single species of tree, nor even to trees under cultivation. Prof. Webster, of the Ohio Experiment Station, has published a list of twenty two trees and shrubs upon which this scale has been found in his State. A list that includes plants with such dissimilar saps and cambiums as walnut, willow, elm, gooseberry, peach, grape, sumac and basswood may be extended to include almost every tree and shrub in the country. The State of Massachusetts has, within the past seven years, expended over $600,000 in its efforts to control and exterminate the gypsy moth, but no amount of money could effect the extermination of this destructive scale insect if it once got a foothold in a widely scattered number of our woodlands and orchards.

* In a late discussion Dr. Fletcher placed reliance for the suppression of this insect more upon the education and individual efforts of farmers and of fruit-growers than on legislation. Government might assist—as it is doing now through established agencies—but it would be most dangerous for the people to lapse into indifference owing to the belief that they are protected by an Act of Parliament against invasion by this scale insect.

In respect to protection, we have much to hope from the vigilance and energetic action of economic entomologists in the United States. In this connection much credit is due to Prof. Webster, of Wooster, for outspoken and manly denunciation of nursery companies he named who negligently contributed to the spread of this pest and of whose criminal negligence we have had a taste in Ontario. It was doubtless at his prompting that the Ohio Horticultural Society issued the call for the National Convention held in Washington last March to consider the suppression of insect pests and plant diseases by legislation. The proceedings of this convention served to direct attention to the dangers from imported insects that confront our fruit growers and to prepare the way for guaranteeing nursery stock and adopting other legislative preventives of the spread of pernicious insects and fungi.

Entomology in Schools.

It must have pleased the friends of scientific education who read the last annual report to observe that the teaching of entomology in the public schools occupied so large a share of attention.

The Western Fair Board this year repeated its offer of prizes for the life histories of injurious insects exhibited by schools. The prizes were won by Mr. J. W. Atkinson's

Fig. 7.—Pieris rapæ, male.

Fig. 8.—Pieris rapæ, female.

Fig. 9.—Pieris rapæ; *a*, caterpillar; *b*, chrysalis.

school, Avon P.O., and Miss Corsaut's, No. 15, London Township. The former exhibited the cabbage butterfly, *Pieris Rapæ*, in egg, larvae (Fig. 9*a*) blown and in alcohol, pupæ (Fig. 9*b*) and imagines of both sexes (Fig. 7 the male, Fig. 8 the female butterfly), pressed

Fig. 10.—Red-legged grasshopper.

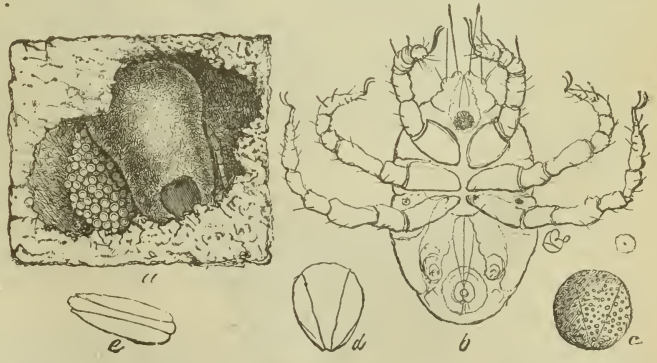

Fig. 11.—Trombidium Locustarum.—*a*, a female with her batch of eggs; *b*, newly hatched larva—natural size indicated by the dot within the circle on the right; *c*, egg; *d*, *e*, vacated shells (after Riley).

leaves showing the work of the larvæ, and a readable description of the insect and account of the observations made upon its life history.

Miss Corsaut's school exhibited a series of specimens of grasshoppers (Fig. 10) one or two with parasites attached, the red mite, *Trombidium locustarum* (Fig. 11), and a dissection of a locust.

It is to be hoped that an increasing number of county and township fair boards will follow the example of the Western in offering encouragement to the true study of insects in life. Collections of insects as commonly seen at county fairs have little claim to the honor of scientific exhibits. Their proper place is with wax flowers, rosettes of sea-weed, and other such pretty bric-a-brac. There is little scientific value in a collection of insects arranged at hap-hazard without notes and dates, be they ever so nicely spread. Economic interest in nine cases out of ten centres in the larval form of insects. Exhibits to be worthy of the name of science should attempt to show the phases of the life cycle, or at least something more than the mere capturing and preserving of a pretty object. The best prizes in the class ought to be offered for exhibits of complete representations of insects in their various stages. We should add to our extensive collections here such series of the more important economic insects, taking as a pattern this one of the gypsy moth* which shows so well the egg, larvæ, pupa and imago of that insect.

Du ing the year I received several inquiries from teachers near and remote asking suggestions in the matter of directing children in the practical study of insect life. Anticipating that in the future others may desire the information, I avail myself of the opportunity afforded by the printing and circulation of this report, to gratify the desire more fully and satisfactorily than I could do by letter.

At the outset the purpose of the lessons should be clearly defined in the teacher's mind. The aim should not be to fill the learner's memory with knowledge about insects but to train the young eye to see and the mind to reason about, to connect and relate the phenomena observed and to make these observations and reasonings the occasion for practice in correct expression by voice, pen and pencil.

The study, if natural, will be attractive to children. Flowers and insects are the classes of objects, next to mud pies, that they take most delight in. Now I recall Wordsworth's lines :—

"Oh ! pleasant, pleasant were the days,
The time, when, in our childish plays,
My sister Emmeline and I,
Together chased the butterfly !
A very hunter did I rush
Upon the prey :—with leaps and springs
I followed on from brake to brush
While she, God love her ! feared to brush
The dust from off its wings."

In a recent biographical sketch of that eminent training-school principal, Edward Austin Sheldon, of Oswego, by his talented daughter, there occurs this passage :—"This latter book (Harris's 'Insects Injurious to Vegetation,') was quite a classic with my father and me. We would sit in an unfurnished room of our unfinished house with the light burning so as to attract insects in at the open windows. We would soon have a delightful collection of moths, beetles and flies which we caught, killed, and then tried to determine by comparison with his book—an operation in which my father found me an enthusiastic rather than a valuable assistant. This keen and special interest in insects came about from the fact that my father's own work in the young training school was for some time zoology, and he saw that with the masses of children, insects gave one of the easiest and most inviting entrances to the whole domain of organic life. This idea, however, cost him much persecution and ridicule from those who could not understand the connection between grasshoppers and a well-educated child, not knowing grasshoppers very well themselves."

Each teacher will as skilfully as he can, introduce the study. Plans to arouse an easily obtained interest will readily suggest themselves.† The main points may be

* The speaker here exhibited a case received from the State Entomologist Fernald illustrating all the stages in the development of this destructive insect.

† Since writing the above I have received from Prof. Roberts, director of the College of Agriculture, Cornell University, Ithaca, N. Y., a series of seven "Teacher's Leaflets on Nature Study," entitled respectively : "How a squash plant gets out of the seed," How a candle burns, Four apple twigs, A children's garden, Some tent-makers, What is nature-study ? Hints on making collections of Insects. Some of the illustrations used in this paper are borrowed from leaflets Nos. 5 and 7. I can highly commend the series. The printer, W. F. Humphrey, Geneva, N. Y. is permitted to sell them to non-residents of the State at 5c. each or in large quantities at 1c. each. J. D.

illustrated by one or two examples and the technique rather than the methods may be described here. Take for example the cabbage butterfly, *Pieris Rapae* (figs. 7, 8 and 9) the study of which won the first prize above referred to. For a class beginning after midsummer holidays this insect is always easily obtained. Construct a cage by covering a box of horizontal cross section of from 40 to 100 square inches with mosquito netting or cheese

Fig. 12. Apple-tree Tent Caterpillar (*Clisiocampa Americana Harris*). Two bracelets of eggs on apple twig. Eleven eggs enlarged. A full grown caterpillar. Three cocoons under a chip. Imago of moth. (After Anna B. Comstock in Teacher's Leaflet No. 5.)

cloth ; or, being more convenient for feeding and studying, take an ordinary band-box, remove the bottom and substitute a netting or cheese-cloth covering. Use the latter to set over a smaller box such as a chalk-box. Many insects pass the pupal stage buried in the ground but chrysalids of butterflies are commonly found suspended in dry situations.

Earth to the depth of an inch may be put in the box and upon that some brushy twigs upon which to lay the leaves for food and chips to which the chrysalids may be attached. In the case of the cabbage worm, have the children collect the worms of various sizes and with them bring a leaf or parts of leaves to serve as food. If the supply of food is maintained the larvæ will eat voraciously, grow fast, and in a few days prepare to transform into pupae or chrysalids. When these are formed, in the example under notice the box may be set away in the wood-shed or other secure cool place until the following spring awaiting the final transformation. Will you await the delightful surprise to discover to the children the connection between the beautiful white butterfly and the green cabbage-worm, (figs. 7, 8 and 9) or will you lead them to discover it when they are collecting and observing the larvæ? Circumstances will determine. You can and should stimulate a search for the youngest and smallest specimens. Some pair of sharp eyes may trace one to the egg, attached alone by its end to the under side of a cabbage leaf. Then institute a search for eggs, these will be brought in numbers and the hatching studied. It is needless to say you should have a magnifying lens; every teacher should have one.

In the spring the tent caterpillar is very suitable for study. It is no trouble in the beginning of the season to find a bracelet of varnished eggs encircling a twig of apple tree or wild cherry, (fig. 12) cut off the twig with another attached so as to form a fork that the newly hatched insects may weave a tent upon it. Set two or three of these forks in bottles of water, to stimulate the growth of the buds so that when the eggs are hatched the young tent-makers may have some leaves to feed upon. In time transfer them to the breeding cage with chips resting on the earth, under these chips they will spin their cocoons. These cocoons may be given to the children to watch during the holidays, for before the 1st of September the moths will have emerged. The conditions of growth in the school-room may be so unfavorable that healthy cocoons are not formed; supplement the supply by out-door captures. These two examples are selected out of many that might be taken. Nothing has been said of the important part of the study—observations on the habits, moulting, organs, mouth, antennæ, legs, segmentation, etc. These should all receive due attention.

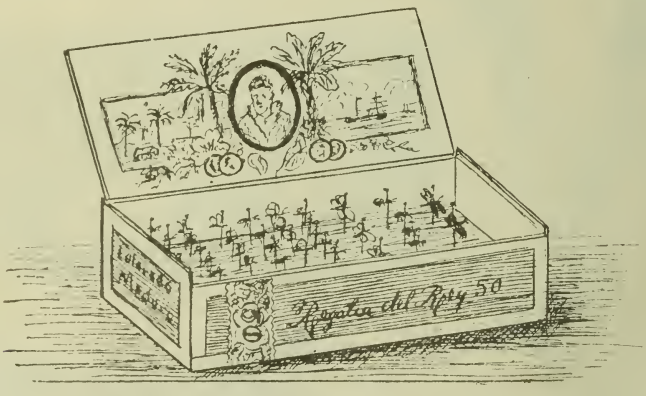

Fig. 13. In Teachers' Leaflet No. 7 (A. B. Comstock.)

When the moths are bred you may, if you wish, release them, but you may wish to preserve what represents a life history of the insect. Obtain a box 6 or 8 by 10 inches, 2 to 4 inches deep with a close wooden or glass cover, a cigar-box does very well for a beginning. (Fig. 13). Tack linoleum or cork in the bottom and then line the inside with white glazed paper. Two boxes similarly lined, hinged together, covered to resemble a large book and shutting very tightly are much used for insect cases.

The eggs are easily preserved. The leaf, twig, etc., may be pinned in the box, the eggs may be touched with coal oil to prevent hatching.

The larvæ are taken at various stages and killed with fumes referred to below or by dropping into hot water or into water and alcohol. They may be 'blown' as follows: snip off the anal end, empty by repeated gentle rollings with a lead-pencil from the head backwards, then blow up through a straw inserted in the opening, tie to keep the air in, and dry. Or they may be preserved in alcohol by putting them first into a 20 per cent. solution in water, the next day in a 40 or 50 per cent. solution, the next day into a 60 or 75 per cent. solution. They will keep indefinitely in a 75 per cent. or stronger solution. The more gradually the strength of the alcohol is raised the better the form and marking will be retained. If put at once into strong alcohol, soft bodied insects are shrivelled out of recognition.

Fig 14. Cyanide bottle (after Riley).

Frequently parasites may be discovered in or upon (living) insects. These should be carefully observed and specimens of them kept.

Butterflies and moths (*Lepidoptera* from *Lepis* a scale and *pteron* a wing, the wings being more or less covered with scales or microscopic feathers which give them their markings) whatever way captured, commonly with a net when in the open field, are transferred to a bottle or tin box and there killed with fumes of chloroform, ether, benzine, creosote, tobacco or cyanide of potassium. A cyanide bottle (Fig. 14) which should have a wide mouth and a tight cork, is prepared by dropping one or a few small lumps of cyanide of potassium, enough altogether to be as large as a marble, varying of course with the size of the bottle, pour over the lumps enough of a mixture of plaster of Paris and water of cream-like consistency to well cover the cyanide, or put in water enough to cover and add dry plaster of Paris enough to make a cement. Allow it to dry before corking. It is well to slip in strips of paper or a thin layer of cotton batting or discs of blotting paper or thin cork for the insects to rest on. Robertson's cyanide bottle described in the American Naturalist is constructed by putting some pieces of cyanide in a pill-box which can be inserted into the under side of the cork of the bottle or glued to it. The free side of the pill-box is perforated with pin holes. Keep tightly corked except when inserting or taking out an insect. To use chloroform, ether or benzine put a few drops on a bit of cotton batting and shut in box or bottle with the insect, or in like manner use a piece of cork saturated with creosote.

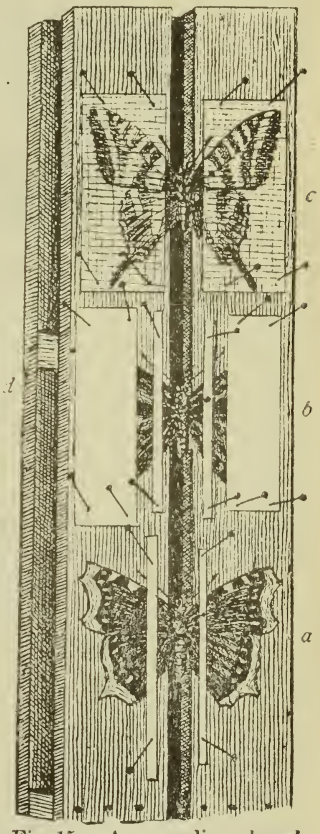

Fig. 15. A spreading board. The cleat *d* is one of two short ones that do not extend in far enough to interfere with the linoleum strip. Another should be shown at the upper end extending all the way across. (After Anna B. Comstock in Teacher's Leaflet No 7; Coll. of Agric., Cornell Univ).

After killing, lepidoptera are spread on a board until dry. The spreading is easily done before the insect becomes rigid. To make a spreading board (Fig. 15) take two pieces of smooth soft board one-third to one-half inch thick and ten to eighteen inches long by two or three inches wide, tack them a half inch apart at one end, a quarter inch at the other to cross cleats; below the opening tack an inch-wide strip of linoleum, corky side upwards, from cleat to cleat.

Insert a pin through the body of the killed insect just behind the head, stick the pin into the linoleum so that the insect's body will be carried down to the wings through the opening between the boards. Carefully, so as not to brush the "dust" off the wings expand them on the boards and over or across them pin narrow strips of paper (Fig. 16) to keep them in proper position until they dry. Two or three days will suffice for the drying. Beetles should be pinned through the right wing-cover (Fig. 17).

In the box we have spoken of nicely arrange the preserved material—eggs, larvæ

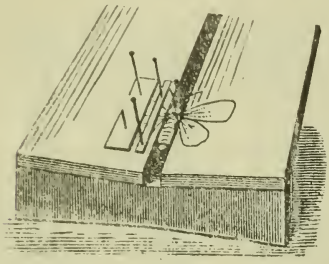

Fig. 16. Spreading board for butterflies and moths (after Riley).

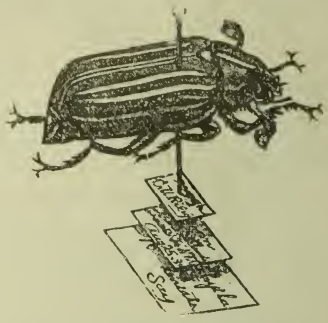

Fig. 17. Method of pinning and labelling beetles (after Riley).

dried or in vials of alcohol, parasites if any, pupæ, moths, or butterflies, etc. Photographic sketches of three such preparations were published in last year's report opposite p. 32. Keep living insects out, first by having boxes which close and stay tight, second by keeping in them a camphor ball or crystals of napthaline. Above all take good care of your accurately dated notes of observations. One such box as this the results of the teacher's and pupils' own efforts and investigations is likely to prove of greater educational and practical value than memorizing a whole text-book on entomology even though such study were supplemented by catching at random and mounting hundreds of beetles, moths and butterflies.

One of the most serious defects in our public school system of education is the lack of exercises that train children to observe and to reason from their own observations. Such kind of training cannot be obtained from text-books nor tested by examinations, and hence will the more slowly gain its proper place. But I hope that the influential efforts of this society, now that it has taken the subject up, will continue to stimulate and encourage nature study in our schools, at least along that line in which it is particularly interested which the quotation from Mr. Sheldon shows to be so appropriate and which is no less practical than disciplinary.

Mr. Fyles, in moving a vote of thanks to the President, expressed the pleasure experienced by all who were present in listening to the address; he found it most interesting and full of valuable lessons to all.

Dr. Fletcher seconded the motion and said that he thought all had enjoyed very much the presentation of the affairs of the year that Mr. Dearness had given. For himself he considered the remarks in the address singularly pertinent. No branch of science meant more in actual dollars to the people of the country than that of entomology. Of all the crops that we grow, whether in the field, the orchard or the garden, at least one-tenth was lost owing to the depredations of insects, and yet to-day fewer persons applied themselves to this study than to almost any other branch of science. The strange thing is that so little is done to instruct children regarding their insect friends and foes. The plan proposed by the President in his address—the study of practical entomology in the rural schools, is an admirable one, and yet nothing has hitherto been done in Ontario in this respect. In Manitoba the rural schools are much in advance of ours; there the children are taught some practical entomology and botany, and are rapidly coming to know the insects and weeds that are giving trouble, and to recognize common plants and other

objects. Children on the farm may, by a little instruction of this kind, save many false steps from being taken in the warfare against pernicious weeds and insects. Through his official correspondence he finds a vast amount of ignorance about these things that ought not to exist, and the only way to remedy it was by beginning with the young. He considered that the President's address was eminently practical and useful, because it treated of such common insects as the tent caterpillar and the cabbage butterfly. Knowledge such as this, if spread throughout the country schools, would mean the saving of hundreds of thousands of dollars. Take the San José Scale for instance, the most destructive insect yet known. How few persons could recognize it if they saw it! How few could tell it from the oyster-shell bark-louse! Who can answer the question as to its effect upon Canada? He believed that President Dearness was doing a great deal by this address, in spreading a knowledge of the work of this Society, and in popularizing the study of entomology. Turning to the reports of the Branches, which had been read, he drew attention to the fact that the Montreal Branch had held no less than 207 meetings, and of these probably 200 had been held in Mr. Lyman's own house, where he entertained the members and enabled them to make use of his valuable library and extensive collections. Few men had done such a good work for the science as this.

Dr. Bethune rose to put the vote of thanks to the meeting, and said that all present must highly appreciate the address of the President and heartily subscribe to the favourable comments which Dr. Fletcher had made upon it. He was glad to find that the President again took up the subject of teaching entomology in the rural schools, which he and Prof. Panton had brought before the annual meeting last year. It was satisfactory to learn that the Western Fair Association continued to offer prizes for the exhibition of life histories of insects by school children, and the good work presented showed that some of the schools at any rate appreciated the opportunity afforded them. With regard to the extraordinary disappearance of insects that were prevalent in immense numbers last year, he thought that there were two causes for their destruction, viz., the work of parasites and the very changeable weather during the winter. Mr. Moffat, last year, when the army worm was swarming all over the Province, predicted that we should not be troubled with it this year, and we all know how true his prophecy proved. We may ascribe its absence this year to the excessive mortality caused by its parasites and other natural enemies. Dr. Bethune then put to the meeting the motion for a hearty vote of thanks to the President for his excellent address, and pronounced it "carried" amid much applause.

The Rev. T. W. Fyles then read the following paper:

THE LOCUSTS OF THE BIBLE.

Rev. Thomas W. Fyles, F.L.S., South Quebec.

Solomon, the favoured of God, who lived in the golden age of Israelitish history, was renowned as a wise ruler, an enlightened philosopher, a gifted poet. He was moreover a distinguished naturalist, for it is told in his praise that "he spake of trees, from the cedar that is in Lebanon, even unto the hyssop that springeth out of the wall; he spake also of beasts, and of fowl and of creeping things, and of fishes."*

We may infer then that a knowledge of Natural history is not unbecoming in the man of position, the man of affairs, the gentleman, the scholar.

Such knowledge was needed in Solomon's days, for amongst the Baalim worshipped by the heathen around, and too often by Israel herself, was *Baalzebub*, the god of the flies, whose name was afterwards given to the Jewish devil. What bugbears have arisen in the minds of men ignorant of natural science!

Before Solomon's time the great Israelitish lawgiver, Moses, had paid much attention to the economic aspects of entomology, and by sacred writers in other periods of the history of God's ancient people thoughtful allusions, inculcating important lessons, were made to insect life and habits.

* I Kings iv. 33

In studying these references and their teaching, we have to encounter great difficulties arising from the fact that between the science of the ancients and that of our own day there is but little connection. Most of Solomon's wise sayings in natural history have passed into oblivion. The reasons for the discrimination made by Moses in regard to food are unknown. The treasury of Egyptian wisdom that he drew from is gone, and generally, we have to form conclusions from obscure meanings of obsolete terms, and from statements made in highly figurative language.

Moreover, we have to fit the information thus gathered to a fauna with which we are imperfectly acquainted, and which exists under changed circumstances, and may itself have undergone changes both by losses and accretions.

Among the insects most frequently mentioned in the Scriptures, the locusts take a leading place. They are sometimes called grasshoppers, and they are often associated with "the caterpillar and the palmer-worm." It is of this army I purpose now to treat.

And first, for the better understanding of my subject, it may be well for us to take a glance at the modern systematic arrangement in which locusts and grasshoppers appear.

Both are found in that large order of insects named the ORTHOPTERA from two Greek words *orthos*, straight; *ptera*, wings. They are straight-winged insects.

By Westwood the Orthoptera were sub-divided into four groups which he named respectively *Cursoria*, *Graptoria*, *Ambulatoria* and *Saltatoria*; into

Runners, like the Cockroach.

Graspers, like the Mantis.

Walkers, like the Spectre Insect.

Leapers, like the Locust and Grasshopper.

The locust and grasshopper then are leaping straight-winged insects.

To set before you the points of distinction between them, that have come to be recognized by Naturalists in our own day, I cannot do better than make two brief quotations from Harris, whose work on "Insects injurious to Vegetation" is one of our Entomological classics. He says:—

"Grasshoppers, properly so called, * * are those jumping orthopterous insects, which have four joints to all their feet, long bristle-formed antennæ, and in which the females are provided with a piercer, flattened at the sides, and somewhat resembling

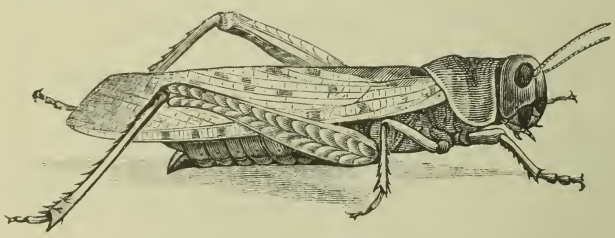

Fig. 18. A Grasshopper or Locust.

a sword or cimeter in shape. The wing-covers slope downwards at the sides of the body and overlap only a little on the top of the back near the thorax. This overlapping portion, which forms a long triangle, is traversed, in the males, by strong projecting veins, between which in many of them, are membranous spaces as transparent as glass. The sounds emitted by the males, and varying according to species, are produced by the friction of these overlapping portions together." *Ins. inj. to Veg.*, p. 155.

Again he says:—

"The various insects included under the name of locusts (Fig. 18) nearly all agree in having their wing covers rather long and narrow, and placed obliquely along the sides of the body, meeting, and even overlapping for a short distance, at their upper edges, which together form a ridge on the back like a sloping roof. Their antennæ are much shorter

than those of most grasshoppers, and do not taper towards the end, but are nearly of equal thickness at both extremities. Their feet have really only three joints; but as the under side of the first joint is marked by one or two cross lines, the feet, when seen only from below, seem to be four or five jointed. The females have not a long projecting piercer, like the" * * "grasshoppers, but the extremity of their body is provided with four short, wedge-like pieces placed in pairs above and below." * *

"The males, though capable of producing sounds, have not the cymbals and tabors of the crickets and grasshoppers; their instruments may rather be likened to violins, their hind legs being the bows and the projecting veins of their wing-covers the strings. *Ibid*, p. 165.

Between the grasshopper and the locust then there are well-marked differences in structure, and in their methods of producing musical notes. But these differences have come to be recognized by naturalists in very modern days.

By the English generally both kinds of insects are still called grasshoppers. If I had been asked when a boy to tell the differences between them, I should probably have said, the locusts are creatures that we read of in the Bible and books of travel; the grasshoppers are those long-legged fellows that spring up before you when you walk through the grass.

We learn from Kirby and Spence that it was reported that a cloud of grasshoppers had enveloped a ship when it was distant 200 miles from land. Here locusts were certainly meant, for grasshoppers (as *we* understand them) are incapable of long sustained flight. And Hasselquist quoted by the same authors tells of "locusts *or* grasshoppers."

I have no doubt that with the translators of our English Bible "grasshoppers" and "locusts" were synonymous terms. The Hebrew word *Arbeh* is translated by them, in some places (as in Exodus X, Proverbs XXX, 27) LOCUST, in others (as in Judges VI, 5 and Jeremiah XLVI, 23) GRASSHOPPERS. And in the Prayer Book version of the Psalms—a version retained from the "Great Bible" of A.D. 1540—the reference in Psalm CV, 34, to the Plague of Locusts in Egypt reads thus,—"He spake the word, and the grasshoppers came, and caterpillars innumerable: and did eat up all the grass in their land, and devoured the fruit of their ground."

Again, for the better understanding of my subject I will ask you to glance at the life history of the locust as it is known to us. It is very much the same in all lands.

The mother locust when about to deposit her eggs makes an opening in the earth about an inch deep, using her abdomen as a drill. The horny plates at the extremity of her body which she can bring to a point for the penetrating of the soil, and expand for the widening of the orifice made, enable her to work with facility. In the receptacle thus formed she lays a batch of eggs surrounding it with a frothy mucous which hardens into a protection against moisture. She then conceals the hole.

It is calculated that each female will deposit in the course of the season from 10 to 175 eggs.

In due time the young larvæ appear, and comical little fellows they are, largely made up of legs of which they have six. They are gregarious by instinct, and they have healthy appetites. They feed and grow, and cast off their skins when these become too tight for them—having more expansive ones beneath.

They have no wings; and when they march they take a few steps and then a jump, —a few steps and then a jump,—and so onwards. In Eastern lands where they abound, this mode of progression gives to their advancing multitudes a strangely undulatory and wave-like appearance.

With many kinds of insects the pupal state is a quiescent state—not so with the locusts. Their pupæ are both active and voracious. They cannot fly, but they bear the cases in which the wings of the future imagines are forming.

At length the time comes for the perfect insect to appear; the skin of the pupa splits along the back, and the imago extrudes itself, drawing its wings out of their cases, and

its legs from theirs as if it were drawing off its boots. In a few minutes it is fully developed, and is ready for feeding, for pairing and for flight.

Our largest Quebec locust, *Œdipoda Carolina*, Burm., measures about three inches and a quarter in expanse of wings. The *Œdipoda migratoria* of Palestine is double that in size. But it must not be forgotten that the locust plague of Egypt was a unique and miraculous visitation. We are expressly told that "Before them there were no such locusts as they, neither after them shall be such.' They came on an east wind that had blown for a day and a night. Traditions concerning them must have lingered long, and probably gained in the telling; and so it is not, perhaps, very strange that Pliny the elder should have heard of locusts from India that had a length of three feet and legs so set with spines that the women used them for hand-saws. Men in Pliny's time could doubtless "draw the long bow" and listen, *auribus patentibus*, to travellers' wonders. In our day we tell *bear* stories, *moose* stories and *fish* stories. It seems that in Pliny's day they told *locust* stories.

I have in my collection a locust from the tropics which has an expansion of wings of nine inches, and its legs are four inches long. This formidable insect is hard, warty, and crested like a lizard, and its wings are of a dark blood-red. Fancy creatures such as this descending in "numbers numberless"—darkening the sky—tumultuous—bewildering—beating in your face—clinging to your hair and clothing—writhing under your feet—whirring, clattering, gnawing all around you—devouring everything eatable, and then in the rage of hunger falling upon one another.

The scene is too horrible. Yet it is one that has been often witnessed. The Tartars tell of men smothered by locusts.* And but a few months ago it was stated that a French explorer had been overpowered by locusts, and when the swarm lifted and men came they found *a skeleton.*

The Hebrew word ARBEH which, as we have seen, is translated *locusts* or *grasshoppers*, originally signified *multitudinous.* It is translated in the Septuagint *akris*; in the Vulgate *locusta*, and in Suker's German Bible, *henschrecke.* In Judges, VI. 5, and in Jeremiah, XLVI., our English translators rendered it *grasshoppers.* It is generally believed to have been the *Œdipoda migratoria.* The *wandering* locust according to modern term—the *swarming* locust according to the ancient appellation.

It was my good fortune to see and to capture several specimens of this interesting insect when I was a boy. After long-prevailing south-east winds, they had been brought, probably from Spain or Africa, to the east coast of England. Certainly I accounted it a noble creature, with its helmeted front and its wide-spreading, fan-like under-wings, which one might fancy to be formed of delicate green gauze. When it alighted its horny feet came down together with a clatter that was startling.

Another word is in frequent use in the Jewish Scriptures to denote locusts. It is CHAGAB, which is derived from a word that signifies to *veil* or *cover*—The swarms cover the earth and veil the sun. By our English translators Chagab is usually rendered *grasshoppers*; and in the connection in which it is employed it suggests the idea of *smallness*, as in Numbers XIII. 33: "And there we saw the giants, the sons of Anak, which came of the giants; and we were in our own sight as grasshoppers, and so we were in their sight." It became in the late Hebrew a collective name for the locust tribe (see Speaker's Commentary). It is thought to have been especially applied to the species *Acridium peregrinum.*

There is a third kind of locust quite common in the East, the *Acridium lineolum.*

One of the insects that the Israelites were allowed to take for food was the "Bald Locust" of our English Bible—the SALAM of the Hebrew. The latter term means *a consumer.* This insect is believed by Wood to have been a *Truxalis*, a kind of locusts with enlongated heads suggestive of baldness.

* Kirby and Spence's Entomology, Letter VII.

Besides those words translated *locust*, *bald locust* and *grasshopper*, in our versions, there are others variously rendered which are yet believed to have signified locusts, either of different kinds or in different stages of growth

CHARGOL, the "beetle" of Lev. XI. 21, 22, is believed to have been some kind of locust for it is numbered among the insects that "have legs above their feet to leap withal." In connection with this, Wood, in his Natural History of the Bible, expressed a belief that there are no people that eat beetles; but in this he was mistaken. Dr. Hartwig says :—

"The Goliath beetles of the coast of Guinea are roasted and eaten by the nativese who, doubtless like many other savages, not knowing the value of that which they are eating, often make a *bonne bouche* of what an entomologist would most eagerly desir. to preserve."—*Polar and Tropical Worlds*, p. 592.

Of words that are supposed to denote the locust in an immature state, we have: —

CHASTIL, *the devourer*, translated "caterpillar" in 1 Kings, VIII. 37, 2 Chron. VI 28; Psalm LXXVIII. 46; Isaiah XXXIII. 4; Joel I. 4, and II. 25.

YELEK, *the feeder*, translated "caterpillar" in Ps. CV. 34, and Jer. IV. 14 and 27; and *cankerworm* in Joel I. 4 and II. 25, and in Nahum III. 15, 16.

Dr. Thompson gives a graphic description of a procession of these "caterpillar, locusts." He says :—

"Their number was astounding, the whole face of the mountain was black with them. On they came like a living deluge. We dug trenches and kindled fires, and beat and burned to death 'heaps upon heaps,' but the effort was utterly useless. Wave after wave *rolled up* the mountain side, and poured over rocks, walls, ditches and hedges —those behind covering up and bridging over the masses already killed. . . . It was perfectly appalling to watch the animated river as it flowed up the road and ascended the hill behind my house. . . . For four days they continued to pass on towards the east, and finally only a few stragglers were left."—*The Land and the Book*, p. 417.

This account will perhaps help us better to understand what is meant by "palmer-worm." In considering this a double difficulty faces us—the meaning of the original word GAZAM : the meaning of the English word *palmer-worm*. The latter certainly does not mean the *Ypsolophus pometellus*, Harris, of our Canadian lists.

GAZAM or GEZEM, the "gnawer," is rendered in the Septuagint *kampe* from *kampto*, to bend (as a caterpillar in motion). In the Vulgate it is translated *eruca*, and in the German *reupe*.

In Joel, I. : 4, we read "That which the palmer-worm (*gazam*) hath left the locust (*arbeh*) hath eaten" "Literally," says Pocock, "That which the *licking* (locust) hath left the devouring (locust) hath eaten."

The Seventy understood by GAZAM *something that progressed with undulations.*

The knowledge of the Eastern locusts and their ravages was no doubt spread amongst the English people by returned Crusaders and other pilgrims from the Holy Land. How would such men tell of a scene such as Dr. Thompson witnessed? They would probably speak of the immature locusts as caterpillars and describe their progressive movements as undulations. And the common people associating things described with things that were familiar to them would probably think of the devouring "processionary caterpillars"* of Europe which, like the "army-worm" of this continent, do incalculable injury.

At the close of the Crusades hordes of masterless, dissolute men, in passing through Europe on their return, must have devoured and wasted all they came upon, and yet were they proud of the cross and palm-branch, the tokens of their service. In irony, it may be—remembering the ravages of these men—the common people came to speak of

* *Cnethocampa processionea* and *Clisiocampa neustria.*

gregarious, wandering caterpillars as *palmer*-worms; and so the English translators found a word ready coined and well fitted to represent *gazam*, the "waster," in *kampe*, the "scuffler."

It is surprising what unsatisfactory definitions of such words as palmer-worm are given even in dictionaries of some note. In the "Dictionarium Brittanicum of N. Baily ('Philologus')," printed by J. Cox in MDCCXXX, we find "Palmer-worm, *a caterpillar with many feet.*" How many feet? Philologus seems to have thought that caterpillars had an indefinite number of such appendages. He evidently was not an entomologist. In "Reid's Etymological Dictionary" the explanation of palmer-worm is *a worm covered with hair.* What a wide field does this present for the student of languages to speculate in! He might say, Does the explanation denote a lizard, like the "slow-worm (*Anguis fragilis*)," but having a hirsute covering, or a serpent, like the "pretty worm of Nilus" that "kills and pains not,"* or a true worm belonging to the Entozoa or the Lumbrici?

Perhaps the simplest accurate definition that can be given to "palmer-worm" is *a wandering and destructive larva.* This would tally both with the English word and the original.

That locusts should abound in Palestine was natural. The inhabitants were a pastoral people. Around the cities were small tracts of cultivated land, but the country at large was wilderness. In the undisturbed soil the locusts would deposit their eggs in safety, and their progeny would grow and increase. The Francolin or Red Partridge might devour some of them; and dwellers in the wilderness like St. John the Baptist might make of them their bread, sweetening it with "honey out of the stony rock"; some of the insects might even be taken as delicacies for the feasts of kings, for in the British Museum is a sculptured scene of feasting brought from Nineveh, in which attendants are bearing locusts strung upon sticks in the manner that small birds were served in later times at the banquets of the Norman nobles. But such inroads would make but little impression upon their hosts, and at length they would arise in their strength—God's great army—directed by Him "who maketh the clouds His chariot and walketh upon the wings of the wind."†

Many stories are told of calamities brought by locusts. These are specimens, and they have a bearing upon what has already been said:

"From 1778 to 1780 the whole empire of Morocco was so laid waste by swarms of these insects that a dreadful famine ensued. Mr. Barrow, in his travels, states that in the southern parts of Africa the whole surface of the ground might literally be said to be covered with them for an area of nearly 2,000 square miles. When driven into the sea by a north-west wind, they formed upon the shore, for fifty miles, a bank three or four feet high; and when the wind was south-east the stench was such as to be smelt at the distance of 150 miles. Major Moore observed at Poonah an army of locusts which devastated the whole country of the Mahrattas, and most likely came from Arabia. Their columns extended in a width of five hundred miles and were so dense as to darken the light of the sun. It was a red species (not the common *Gryllus migratorius*), whose bloody color added to the terror of their appearance."—*The Polar and Tropical Worlds*, p. 589.

But no merely human account can approach the sublimity of the inspired description of a flight of locusts given by the prophet Joel—a description marvellous for the richness of its sustained metaphor and the splendor of its hyperbole.

The prophet sounds the alarm:

"JOEL II.: 1. Blow ye the trumpet in Sion, and sound an alarm in my holy mountain: Let all the inhabitants of the land tremble: for the day of the Lord cometh: for it is nigh at hand.

"2. A day of darkness and of gloominess, a day of clouds and of thick darkness, as the morning spread upon the mountains: a great people and a strong: there hath not been ever the like, neither shall be any more after it, even to the years of many generations.

* *Antony and Cleopatra*, Act V., Scene II. †Psalm CIV., 3.

Then he tells of the damage :

3. A fire devoureth before them : and behind them a flame burneth : the land is as the Garden of Eden before them, and behind them a desolate wilderness, yea, and nothing shall escape them.

He portrays the foe :

4. The appearance of them is as the appearance of horses : and as horsemen, so shall they run.

5. Like the noise of chariots on the tops of the mountains shall they leap, like the noise of a flame of fire that devoureth the stubble, a strong people set in battle array.

He speaks of the terror they excite :

6. Before their face the people shall be much pained : all faces shall gather blackness.

He describes the assault :

7. They shall run like mighty men : they shall climb the wall like men of war : and they shall march every one on his ways, and they shall not break their ranks :

8. Neither shall one thrust another : and they shall walk every one in his path : and when they fall upon the sword, they shall not be wounded.

9. They shall run to and fro in the city : they shall run upon the wall, they shall climb up upon the houses : they shall enter in at the window like a thief.

Then he recapitulates :

10. The earth shall quake before them : the heavens shall tremble : the sun and the moon shall be dark, and the stars shall withdraw their shining :

11. And the Lord shall utter His voice before His army : for His camp is very great : for he is strong that executeth His word : for the day of the Lord is great and terrible : and who can abide it ?

And then he gives the lesson :

12. Therefore also now, saith the Lord, turn ye even to Me with all your heart, and with fasting, and with weeping, and with mourning :

13. And rend your heart and not your garments, and turn unto the Lord your God : for He is gracious and merciful, slow to anger, and of great kindness, and repenteth Him of the evil.

Irresistible indeed is He who holdeth all things in His keeping, who can marshal the base things of the earth to confound the mighty, and things that are despised to bring to naught things that are. The nations well may tremble when He gathereth His great army, the locust, the caterpillar and the palmer-worm, to make the fruitful lands barren for the wickedness of them that dwell therein.

Mr. Harrington said that he was much interested in the paper which had just been read. Residents of northern temperate regions like Ontario could form little idea of the vast numbers of locusts which visited south-eastern Europe, and parts of Asia and Africa. Dr. Sharp, in a volume of the Cambridge Natural History, stated that in bulk the insects in existence in the world exceeded all other forms of animal life put together, and mentioned in illustration a swarm of locusts that was seen passing over the Red Sea in November, 1889. It was estimated to extend over two thousand square miles, and taking the weight of each individual locust at one-sixteenth of an ounce, the whole swarm was calculated to weigh the enormous amount of 42,850 millions of tons ! The steamship from which it was observed, was sailing beneath the swarm at the rate of twelve miles an hour in the opposite direction and took between seven and eight hours to pass from under it.

Mr. Law spoke of the light thrown upon God's dealings with man by Mr. Fyles's paper and expressed the pleasure with which he had listened to it.

The President next called upon the Directors to report upon the insects of the year that had been worthy of note in their respective localities.

Mr. Harrington, the Director of Division No. 1, gave the following account of the season at Ottawa :

NOTES ON THE INSECTS OF THE YEAR 1897.

By W. Hague Harrington, F.R.S.C., Ottawa.

The climatic conditions obtaining during the past winter were evidently unfavorable to many insects. Intense cold during periods when there was but a scanty snowfall, alternating with decided thaws, caused extensive injury to many species of plants, and must have, in some degree, similarly affected insect life. The unfavorable winter was followed by an unusually wet spring, with frequent and violent rain storms, which undoubtedly destroyed myriads of our winged foes and friends, whose brief lives are frequently prematurely ended by heavy showers and storms. As a result, apparently, of this inclement weather there was, in the vicinity of Ottawa, a marked scarcity of the larger hymenoptera, especially of bees and wasps, the number and strength of whose colonies are dependent upon the survival of the fertilized females, and their ability to provide food for the first brood. This scarcity of macro-hymenoptera was clearly noticeable all summer ; very few of the larger ichneumonidæ, etc., being observed, except species which, like Thalessa, are parasitic upon wood-eating larvæ, and are thus not affected materially by unfavorable weather. Even in autumn, when the Spiræas and Goldenrods generally swarm with Crabro, Andrena, Halictus and many allied genera, comparatively few species and individuals were observed. The minute parasitic forms were obtainable in moderate numbers, but many species usually abundant were not met with, especially such as appear in the early summer.

As regards the occurrence of injurious insects there is but little of importance to mention. The copious rains, while destroying many insects, produced such a vigorous plant growth, that the foliage became too luxuriant to be much injured by any ordinary manifestation of insect life. The ravages of leaf feeding insects were therefore but seldom noticeable, and the foliage during the summer maintained an unusual freshness and plentitude. The only noticeable exception to the general scarcity of phytophagous insects was the appearance of great numbers of the tent caterpillars (*Clisiocampa*) Fig 19, which were more abundant and destructive than for many years. Early in spring their webs were seen disfiguring the neighboring woods, and occasionally the city shade trees, and as the larvæ increased in size, the unsightly webs became still more conspicuous among the defoliated branches. Many kinds of trees suffered from this infestation, but the most extensive operations were upon poplars, of which large areas were in some districts so defoliated as to have the appearance of having been scorched by fire passing rapidly over them. During July the newly emerged moths (Figs. 20 and 21) appeared in countless thousands, and in the city were a source of much annoyance, and some little personal discomfort. They swarmed so at night around the electric arc lights,

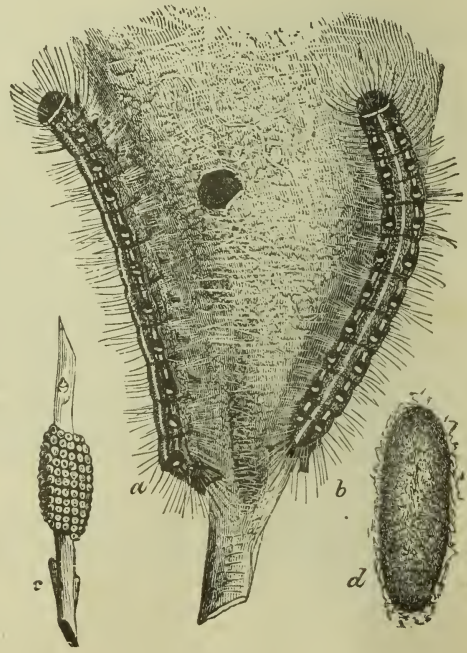

Fig. 19.

that the air seemed literary filled with them, and in their flight they dashed against pedestrians most unpleasantly. The pavements were almost covered by those which kept falling to the ground, and at every footstep a most unpleasant crunching of moths was

Fig. 20, Male Moth.

(*Clisiocampa Amerieana.*)

Fig. 21, Female Moth.
(*Clisiocampa Americana.*)

experienced. Upon illuminated buildings, especially upon shop windows, they fluttered and crawled in myraids, and they dashed into every open window or doorway. The plague lasted for some days, during which an immense number perished in the arc-lamps and in other ways. The tent caterpillars are among those insects but little affected by climatic changes. The clusters of eggs (Fig. 19, c.) encircling the twigs are protected by a waterproof varnish-like secretion, and the caterpillars as soon as hatched proceed to spin the web which serves to protect the colony against the weather's vicissitudes, and to some extent from various enemies. Their parasitic enemies, however, are numerous and watchful and find opportunities to infest many of the caterpillars, so that the increase of the species is checked and eventually stopped, and an unusual abundance one year may be followed the next season by a comparative scarcity.

Dr. Bethune, the Director for Division No. 2, was next called upon to report :

NOTES ON THE SEASON OF 1897.

By the Rev. C. J. S. Bethune, Port Hope.

Collectors of insects throughout the Provinces of Ontario and Quebec have, with few exceptions, pronounced the season of 1897 an "off year" as far as the capture of specimens was concerned. The scarcity of many common species may no doubt be largely attributed to the character of the preceding winter, which was remarkable for its sudden changes from mild weather to extreme cold and the frequent thaws which occurred. These great and rapid alternations of temperature are usually very fatal to any insects whose winter quarters are exposed or near the surface of the ground. But not only was the winter a trying one for insect life, the spring was for the most part cold and wet, and summer, coming very late, brought little fine or hot weather ; with the exception of some ten days of intense heat during the early part of July, the season was characterized by a series of heavy rains and frequent storms. Seldom, therefore, has there been a season when the climatic conditions were so unfavorable for the healthy development of most kinds of insects, and seldom a season when the entomologist has had so little to record.

The most serious outbreak of the year was that of various species of Aphides (Fig. 22), which appeared in countless numbers on all kinds of trees and plants, and in many cases wrought serious damage. Currant bushes seemed to suffer the most, and before the summer was over had lost all their leaves. Cherry, plum, apple and other fruit trees were injuriously affected, and in the flower garden roses, herbaceous plants and annuals were severely attacked. The cool, damp weather that prevailed during the summer was especially favorable to the multiplication of these tiny creatures, and so numerous did they become that in the month of October and on sunny days in November the air was filled with winged specimens to the great discomfort of everyone out of doors and to the especial annoyance of bicyclists, whose eyes

Fig. 22. Winged and wingless forms of Aphis—much magnified.

became filled with them. This superabundance of aphides was widespread over large areas in Ontario, and extended to several of the neighboring States, much damage being done by them in New York, Ohio and Michigan.

In the month of May the larvæ of the Eye-spotted Bud-moth (*Tmetocera ocellana*) Fig. 23, were very abundant on plum trees in this neighborhood, and did a considerable amount of damage. This tiny insect has often been noticed in our annual reports and is no doubt familiar to most fruit growers in this Province and Quebec. It attacks the opening buds of apple, pear and cherry as well as plum trees, by eating through the leaves and forming a habitation for itself in the tender foliage, which it draws together and lines with silk. In this protecting case it continues to grow and consume the surrounding leaves, and often destroys in this way a whole cluster of blossoms or young fruit. When abundant, as it was this year, it does a very considerable amount of damage. The caterpillar is of a dull greenish-brown color, with a few short hairs on its body, proceeding from minute warts; the moth (Fig. 23) is a pretty little creature, ashen-gray in color, with a broad white band of irregular outline across the fore wings, and a black eye-like spot formed, when the wings are closed, at the outer margin of the band. From this it evidently derives its specific name. The insect can, no doubt, be kept under control by an early spraying of the trees with Paris green in the usual manner, and by plucking off and crushing the clusters of leaves containing the caterpillars.

Fig. 23. Eye-spotted Bud-moth and larva.

Last year I mentioned the reappearance of the Apple-tree tent-caterpillar (*Clisiocampa Americana*, Harris). In the latter part of May this year, I found several of the tents, or webs, on apple trees and promptly destroyed their inmates. During the month of June the moths were somewhat numerous, coming into the house at night and bouncing about the lights in their usual blundering manner. We may expect that this troublesome insect will again become abundant and cause great damage to fruit trees unless their owners are on the alert in the spring and at once destroy all egg-bracelets (Fig. 19, *c*) that they can find, and the nests of caterpillars in their early stages before they scatter over the trees. Wild cherry and plum trees should especially be watched, as they form a favorite breeding ground for the insect.

While the web-forming caterpillars of the spring are thus on the increase, it is very remarkable that the Fall web worm (*Hyphantria textor*) should have been scarce last year and entirely absent this year about Port Hope. Though no observations have been made, it seems evident that the destruction of this insect is due to the work of parasites, as it has been a gradual process, extending over more than one year. If the extermination had been caused by climatic influences—by the alternate freezing and thawing during the winter—it would have been a sudden destruction, the work of a single season. A similar disappearance of a common species has taken place in the case of the Tussock moth (*Orgyia leucostigma*). I did not see a single caterpillar of this species in my garden this year and observed only one moth. In Toronto, where it was so very destructive last year, it was noticeable here and there throughout the city and some trees were partially defoliated by it, but there was no widespread injury and consequently no public alarm occasioned by it. During the preceding winter the Park Commissioner, under instructions from the City Council, destroyed an enormous number of the cocoons of this insect, the sum of $1,000 having been spent in paying boys for collecting them. As all the cocoons collected were destroyed without discrimination, the wisdom of the proceeding is somewhat doubtful; myriads of useful parasites must have been put an end to as well as the pupæ of the noxious moth. It would be well in future cases of the kind to entrust the collected material to an entomologist with instructions that he should keep all parasitized cocoons till the summer following and permit the inmates to escape, and burn all the rest. Dr. Howard, United States Entomologist at Washington, has recently published a most valuable and interesting pamphlet entitled, "A Study in Insect Parasitism," in which he gives an account of a severe attack by the tussock moth on the shade trees of Washington in 1895. Very large numbers of the cocoons were collected and it was found that over ninety-eight per cent. of them were parasitized, only two per cent.

being free from the attacks of these destroyers. In 1896 the tussock worms were few in numbers, as might have been expected from such wholesale destruction, and did little injury to the trees, but this year they have increased in numbers again owing to the destruction of the parasites themselves by others which prey upon them—secondary parasites, as they are termed. Thus was verified the old rhyme :

" Big fleas have little fleas to bite 'em.
And so on ad infinitum."

The " Army worm " (*Leucania unipunctata*) which was so abundant and did so much damage throughout this Province and the neighboring States last year, was, as Mr. Moffat predicted, conspicuous by its absence this year. As far as my own observations are concerned, I did not see a single caterpillar and not more than half a dozen of the moths, nor have I heard of any injury being done by the insect in any part of the country. This immunity is undoubtedly owing to the friendly work of parasites, especially the Tachina flies mentioned in the Report for last year.

The Grape vine Flea- beetle (*Graptodera chalybea*) [Fig. 24], has been very destructive of late years to the foliage of the Virigina Creeper (*Ampelopsis quinquefolia*). Where spraying with Paris green was not resorted to several times during the season, the vines

Fig. 24.

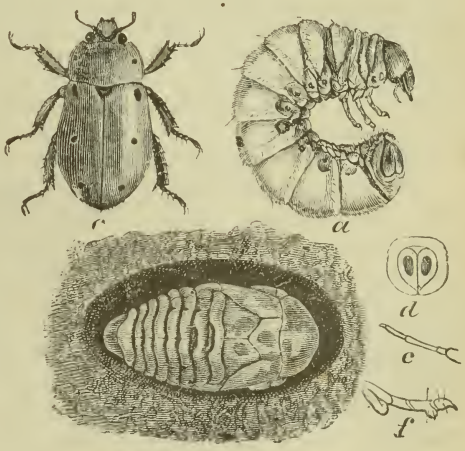

Fig. 25.

were completly stripped of their leaves before the end of August. Strange to say, a grape-vine against a fence only a few yards from some badly affected creepers was not attacked at all.

Among the interesting records of the year may be mentioned the capture of a specimen, for the first time at Port Hope, of the Spotted Pelidnota (*P. punctata*, Linn.) [Fig. 25], which feeds upon the grape-vine. I have never before met with this insect east of Toronto, but Mr. Evans tells me that he has taken it at Trenton. A specimen of *Papilio Marcellus* was again seen in the town park on the 24th of July—the same locality where it had been observed last year. Several species of *Plusia* have been common throughout the summer, visiting flowers in the day-time and attracted indoors by light at night, and have continued until late in the autumn; *P precationis* and *simplex* [Fig. 26], were the most abundant, and several of the rare *P. biloba* were captured, one as late as November 5th, when it was found sipping nectar from the few hardy flowers left in the garden.

Fig 26.

Dr. Fletcher upon being called upon by the Chairman, gave a full and interesting account of the appearance of the

San Jose Scale in Ontario, and the measures that had been taken to counteract it (See his paper on this subject, page 78). He stated that the tent caterpillars were so abundant at Ottawa, as mentioned by Mr. Harrington, that they actually starved themselves out by stripping the foliage of the trees that they infested. He did not think that they would be as numerous next year in consequence of the destruction of large numbers by parasities and the fact that many of the females were infertile and laid no eggs. The larch saw-fly had re-appeared in Eastern Ontario, but the currant saw-fly had been quite infrequent. Cut worms also were not so abundant as usual; for them the best remedy is a mixture of bran, sugar and arsenic, which should be placed, a teaspoonful in amount, at the base of the corn-hills, or at intervals between the rows where seeds have been sown in the spring. He found that the cut-worms would eat this mixture just as readily when dry, as when moistened with water, and with equally effective results. The fall web-worm was not nearly so numerous as usual at Ottawa, but the aphides, as mentioned by Dr. Bethune, was excessively abundant and injurious. The leaf-hopper of the grape had been abundant in the east; it could be controlled most readily with kerosene emulsion. The horn-fly, which of late years had been such a plague to cattle, had now almost disappeared as an injurious insect, and was not so numerous as the Stomoxys, the common biting stable-fly.

The invasion of Ontario by the San Jose Scale was the next subject brought up for discussion. Dr. Fletcher spoke on the subject and read extracts from a letter he had received from Mr. Martin Burrell, of St. Catharines, and exhibited a copy of the poster which had been issued from the Central Experimental Farm at Ottawa, by direction of the Minister of Agriculture. The poster had been widely distributed to post offices, agricultural societies, etc., throughout the country and had attracted much attention. Both the Dominion and Ontario Governments were doing all they could to prevent the spread of the insect. He strongly advised that all purchases of fruit trees should be made from Canadian nurseries where the Scale had not made its appearance.

Dr. Fletcher then continued his remarks upon the insects of the year, upon which he had been speaking before the adjournment the preceding evening. The pea moth, which had been very injurious throughout the country during the last few years, he had at length succeeded in breeding, and had brought specimens for exhibition at the meeting. He had also bred the apple fruit-miner, which bores in all directions through the fruit; specimens of this fruit were exhibited. *Selandria media*, which bores into the top of rosebuds, had been successfully reared and its life history worked out. He then gave an account of the rearing of *Erebia discoidalis* and *Brefos infans*.

Mr. Harrington asked whether all trees infested with the San Jose Scale should be destroyed. Dr. Fletcher replied that a badly infested tree is not worth preserving. Experiments have been made of spraying with pure kerosene instead of the kerosene emulsion, but there was very great danger of killing the trees as well as the insects upon them.

THE WORK AGAINST THE GYPSY MOTH, 1897.

By A. H. Kirkland, Malden, Mass.

The committee having in charge the work of exterminating the Gypsy moth, in its annual report for 1896, recommended that the legislature appropriate the sum of $200,000 for the work of 1897. After several hearings before the legislative committees, in February the sum of $150,000 was appropriated. This sum being available comparatively early in the season a large force of men were set at work destroying the egg-clusters and preparing the worst infested woodlands for the summer operations. Over 1,000,000 egg-clusters, each probably containing from 300 to 500 eggs, were destroyed, 300 acres of infested forest land were cut over or thinned of trees, the ground

cleared and rubbish burned. By the time the eggs hatched the greater part of the burlaps had been placed on the trees. Spraying with arsenate of lead was commenced as soon as the leaves developed and was continued until about the middle of June. The poison mixture was applied at the rate of 20-150 gal. water, and about three tons of ingredients for making arsenate of lead were used in this work. The season proved a very unfortunate one for spraying operations. In May there were, I think, twenty days on which rain fell, and in June sixteen. In many cases this nullified the effect of the poison to a great extent and necessitated respraying. But even under these conditions from 60 per cent. to 80 per cent. of the larvæ in infested sprayed woodlands were destroyed.

Spraying with the arsenate of lead has this year shown itself as one of the best and cheapest methods for controlling the increase of the Gypsy moth. The extremely wet season favored a rank growth of foliage ; this gave the insects abundance of shade, and later a great part of the large caterpillars refused to come to the burlaps, but remained clustered in tree tops. This necessitated the expensive operation of climbing a large number of trees. The season seemed also very favorable to the growth of caterpillars aside from food considerations. The abundance of tent caterpillars and canker worms, as well as the Gypsy moth, during the past summer confirmed this view. Thorough attention to the burlaps, however, as the caterpillars matured, together with the climbing of trees and destruction of large numbers by hand, made a great inroad into the ranks of the insect. Active operations were not relaxed until all the nests had been laid, and large numbers of pupæ and few moths were destroyed by hand, thus preventing the deposition of a great many egg-clusters. In the summer work from 200 to 366 men were employed. By the time the moth ceased laying our funds ran short, 125 men were discharged and the wages of others reduced. Later, to diminish expenses still further, the entire force was laid off for two weeks. At present writing, a careful search is being made of some outlying districts, while in the inner towns a force of men is at work treating nests. As soon as the leaves have fallen the work in the outlying towns will be prosecuted, so far as means permit.

Results of the Year's Work.

The results of the year's work may be summarized briefly as follows : The increase and spread of the Gypsy moth has been well controlled, and there has been less stripping of trees throughout the whole infested region than ever before. In the outer towns marked progress has been made towards extermination. The number of outlying colonies has never been so small as at present, and the infestations of the territory included within the border of the infested region were never so well known. The number of insects taken this year in the existing outlying colonies is much smaller than that of 1896. For example, in one of the Brookline colonies about 15,000 larvæ were destroyed in 1896, where but 191 were found in the same place the past summer. While much good work has been accomplished in the outer towns, it is apparent that the moth has increased near the centre of the infested district. The results of a hasty inspection indicate that the numbers of the moth have increased in Malden and vicinity.

Considerable areas of woodland in the large Metropolitan Park system are known to be infested, but their condition, on the whole, is better than that of last year. The destruction of the eggs previously mentioned prevented the increase of the insect in the woodlands. Owing to the amount of travel through the parks this infestation will menace the surrounding region, until funds permit the prosecution of exterminative work in the parks.

What is Needed.

So far we have been unable to burn the candle at both ends. With insufficient means we cannot carry on exterminative work over the whole region. Either the outside or inside territory must be neglected to a certain extent. To restrict the borderline of infestation has seemed to be a matter of vital importance to the success of the

work, and we believe that the chief efforts must be devoted to the outer towns, and in the present state of finances, controlling measures are all that can be used in the inner towns. What is needed is a good financial backing for a few years, then we shall be able to reduce the sise of our request for funds as the work ceases to be one of insect destruction and becomes more and more one of inspection.

That never since 1892 have we been able to carry out our complete plans is a continual source of discouragement. Mr. Forbush and Prof. Fernald have expended their best energies in this work. The non-salaried committee conducting the work have given freely of their time and attention. Conditions have been carefully studied and plans made, only to be hampered by lack of funds. We believe that the best possible use has been made of resources which have been placed at our disposal. If any of our friends or critics will show us how to do two dollars' worth of work for one dollar, we will then show them how to exterminate the Gypsy moth with appropriations of the size made in the past. There seems to be a growing feeling throughout the state, on the part of tax payers, that the people of this Commonwealth in protecting themselves from this insect are protecting as well the adjoining states, and, in fact the whole country. That this argument is a just one there can be no doubt, and should the insect be allowed to multiply in this region, the through traffic in freight and passengers, in a short time would probably distribute the Gypsy moth over the greater part of the country. Whether this consideration of the matter from the tax payers' standpoint will tend to reduce the size of the appropriations for our work this year is problematical. Two things are certain, we need more funds than we have yet had, and we need to just as great an extent the moral support of all who are interested in the eradication of one of the worst foes to agriculture and horticulture that has ever reached our shores from a foreign country.

ELECTION OF OFFICERS.

The meeting then proceeded to the election of officers for the ensuing year, with the following result (see page 2.)

It was moved by Dr. Fletcher and seconded by Mr. Evans, and resolved, that the library and rooms committeee be instructed and empowered to deal with matters pertaining to the library and collections, such as adding books and specimens, providing cases, &c., and to secure the proper heating, lighting and cleaning of the rooms.

The treasurer, Mr. J. A. Balkwill, read the following report of the receipts and expenditure for the year ending August 31, 1897:

REPORT OF THE TREASURER.

RECEIPTS.	
Balance on hand, September 1st, 1896..$	530 93
Members' fees	389 85
Pins, cork, etc	60 32
Government grant	1,000 00
Sales of "Entomologist," etc	133 37
Advertising	17 50
Interest	20 80
	$2,152 77

EXPENDITURE.	
Annual meeting and report..$	219 08
Salaries	350 00
Insurance	28 08
Pins, cork, etc	47 00
Library	59 60
Rent	117 77
Printing	587 42
Expense acct. postage, etc	168 30
Balance on hand	575 52
	$2,152 77

We, the auditors of the Entomological Society of Ontario hereby certify that we have examined the accounts of the treasurer and find them correct, and that the above statement is in accordance therewith.

London, October 8th, 1897.

R. W. Rennie, Jas. H. Bowman, } Auditors.

The librarian and curator, Mr. J. Alston Moffat, read his annual report as follows :

REPORT OF THE LIBRARIAN AND CURATOR.

At the last annual meeting of the Society, negotiations were in progress with the directors of the Y.M.C.A. for a room in their new building ; these having been successfully completed, the property and business of the Society were moved thereto.

At a meeting of the local board it was authorized to engage assistance and have the removal accomplished with the least delay possible, as soon as the room was ready for occupation. Preparations were commenced, and with the assistance of Mr. Balkwill all the books and papers were packed into boxes of a convenient size for lifting, loaned by Secretary Saunders for the purpose, in sufficient numbers that all emptying and refilling during the transfer was avoided, proving a great convenience and saving of time. After considerable delay, final decision was arrived at to begin moving on Monday, the 16th November, and by the evening of the 19th everything was in the new room, but in terrific confusion. The transfer was made without loss or injury of any account and during most favorable weather.

The cabinets and book cases have been—according to my judgment—placed to the best advantage possible, consistent with the form and dimensions of the room, and to the procuring of the most accommodation for the work of the Society and its material on hand.

With the more conveniently situated location has come a large increase in the number of visitors, whilst much surprise and admiration has been expressed at the extent and beauty of the collections.

According to a resolution passed at the last annual meeting, the 27 volumes of the Annals of the Entomological Society of France have been bound and placed in position.

Besides those that are bound annually, a number of valuable publications that have been accumulating for the past three years were approved of by the President and bound, and thus made available to the members ; also a third series of the Butterflies of America, by W. H. Edwards.

The bound volumes received from governments and public institutions during the year were the following:

The annual report of the Geological Survey of Canada for 1894.
" " " " " 1895.
" " Department of Agriculture, Ontario, for 1895.
" " Bureau of Industries, Ontario, for 1895.
The report of the N.Y. State Entomologist for 1896.
The Smithsonian report for 1894.
" " 1895.

The 48th annual report of the Regents of the New York State Museum in 3 volumes, containing amongst other important matter, a description of the edible and poisonus fungi of N.Y., illustrated by 43 colored plates.

The proceedings and transactions of the Royal Society of Canada, for 1896.
The report of the California State Board of Horticulture for 1896.
The report of the Fruit Growers' Association of Ontario for 1896.
The eighth annual report of the Missouri Botanical Garden for 1897.
The United States National Museum report for 1893.
" " " " 1894.
The seventeenth annual report of the U.S. Geological Survey, in three parts, 1895-6.

The total number of volumes added to the library during the year was 88.

The full number now on the register is 1,506.

The number of volumes issued to local members was 33.

The large number of 29 species, new to the native collection of lepidoptera added thereto by the generosity of Mr. Bice, from his captures at electric lights during the season of 1896, and those he has contributed in the season of 1897, that are already identified, with a few northwest micros received from Mr. Hanham and Dr. Fletcher, and determined by Prof. Fernald, have by that much increased the power of the Society to deal with material sent to it for identification; but much more requires to be done in the same direction, before it is in a position to meet the demands made upon its assistance from distant provinces, with credit to itself and satisfaction to those concerned.

A fine specimen of the "Tarantula," *Mygale Hentzii*, was received from Mr. B. E. Couldery, of Belleville, Ont., through the good offices of his nephew, Mr. A. C. Couldery, one of our members. A very opportune addition to the collection, when so much curiosity is excited in the community by newspaper reports of its being brought to this latitude in consignments of tropical fruits.

A further gift of Santo Domingo insects has been received from Miss Davida Ronguie, in which are some particularly interesting and attractive specimens, from that but little investigated locality.

On motion it was ordered that the thanks of the Society should be given to Mr. Bice, Mr. Hanham, Dr. Fletcher, Mr. Couldery and Miss Ronguie for their kind contributions to the Society's cabinet.

Mr. Dearness read the following report of the delegates who were appointed to attend the meeting of the British Association at Toronto:

REPORT OF THE DELEGATES TO THE TORONTO MEETING OF THE BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

Your delegates to the meeting of the British Association, held in Toronto, from the 18th to the 25th of August, have the honor to report that they duly discharged their commission.

The Association, besides its interesting public lectures and meetings in the evenings and its numerous brilliant social functions mostly held between 4 and 6 p.m, transacted its more serious work in ten different sections, working in sessions, usually from 10:30 a.m. to 3:30 or 4 p.m. These sections were respectively:

A.—Mathematical and Physical Science, which for much of its work subdivided into the departments of Mathematics. Physics and Meteorology.

B.—Chemistry.

C.—Geology.

D.—Zoology.

E.—Geography,

F.—Economic Science and Statistics.

G.—Mechanical Science.

H.—Anthropology.

I.—Physiology.

K.—Botany.

The daily number of addresses in each of these sections varied from five to fifteen, so that every day there were from sixty to a hundred addresses delivered or papers read. These were for the most part highly technical and approached the line of further advancement in the several subjects. The sections of Anthropology and Geography had by far the largest general attendance.

Subjects of a strictly Entomological character were placed on the programme of section D (Zoology) of which Professor Miall, F.R.S., was President. One of your delegates, Rev. Dr. Bethune, had the honor of being elected on its Executive Committee, where his name appears in such distinguished company as that of Dr. Anton Dorhn, Prof. C. S. Minot, Dr. L. O. Howard, Prof. C. Lloyd Morgan and Dr. Theodore Gill.

The Entomological papers read were :

1.—Mimicry as evidence of the truth of Natural Selection, (with lantern illustrations), Prof. E. B. Poulton.

2.—Economic Entomology in America, Dr. L. O. Howard.

3.—The Statistics of Bees, (an inquiry into the time occupied by the successive journeys of workers), Prof. F. G. Edgeworth.

4.—Theories of Mimicry as illustrated by African Butterflies, (with lantern illustrations), Prof. E. B. Poulton.

5.—The Army-Worm in Ontario in 1896, Prof. J. Hoyes Panton.

6.—A supposed new Insect structure, (with lantern illustrations), Prof. L. O. Miall.

Seven Canadian Committees were formed to investigate or prosecute scientific problems of special application to the northern part of this Continent. One of these was to investigate the organic life of the Pleistocene Beds of Canada ; another to secure the establishment of a Biological Station in the Gulf of St. Lawrence ; a third to study the Biology of the Great Lakes.

The Treasurer's Report showed a membership of 1,362 persons, and grants for the purposes of scientific study and research of $6,500.00. One of these is a grant of one hundred pounds sterling for an "Index generum et specierum Animalium,"

Canadian subjects naturally received much attention, but it was a pleasant surprise to hear that in the estimates of the General Committee a much larger sum of money had been voted than usual, in order to further the pursuit of investigations in Canada and to assist the above-mentioned Canadian Committees.

Respectfully submitted.

J. Dearness }
C. J. S. Bethune } Delegates

A STUDY OF THE GRYLLIDÆ (CRICKETS).

By William Lochhead, London.

The crickets are easily distinguished from the other families of the Orthoptera by their long hind legs fitted for jumping, their long antennæ, and their wing covers which are flat above and bent abruptly down at the sides. The wing covers of the males are modified for the production of musical sounds, and the females in most genera are provided with long, stout ovipositors.

Although possessing these characters in common, yet as a whole, the crickets are a heterogeneous group. For example, the mole-cricket (Gryllotalpa) is large, often one and a quarter inches long, and provided with powerful fore tibiæ fitted for digging ; while Nemobius and Anaxiphus are quite small, often less than one-quarter inch long ; the tree-cricket (Oecanthus) is delicate in structure compared with the common black crickets.

From an economic standpoint the Crickets are not nearly so injurious to vegetables as the grasshoppers and locusts, and for this very reason have not been studied as carefully as they might be. The snowy tree-cricket appears to be the only member of the family which has taken to evil habits. The eggs are deposited in the branches of certain plants such as the raspberry, blackberry, plum and peach, which are often destroyed in consequence of the boring and weakening of the fragile stem. These beautiful crickets have also been known to feed on ripe fruits.

It is possible to separate the genera of the family by the following method :

A.—Crickets with broad fore tibiæ.

B.—Antennæ long and setaceous.

Fig. 27. Wing of Œcanthus angustipennis, female.

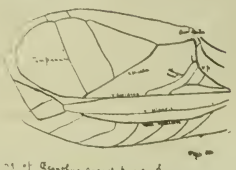

Fig. 28. Wing of Œcanthus angustipennis, male.

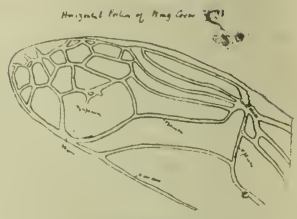

Fig. 29. Horizontal portion of wing-cover of Nemobius fasciatus, male.

C.—Fore tibiæ with four spurs, *Gryllotalpa.*

CC.—Fore tibiæ with two spurs, *Scapteriscus.*

BB.—Antennæ rather short and filiform.

C.—Body smooth ; head horizontal, *Tridactylus.*

CC.—Body velvety ; head vertical, *Rhipiptoryx.*

AA.—Crickets with slender fore tibiæ.

B.—Hind femora stout.

C.—Apical spurs on hind tibiæ five and equal, *Anaxiphus.*

CC.—Apical spurs six and unequal.

D.—Last segment of maxillary palpi nearly same length as penultimate, *Gryllus.*

DD.—Last segment of maxillary palpi twice as long as penultimate, *Nemobius.*

BB.—Hind femora rather slender, *Oecanthus.*

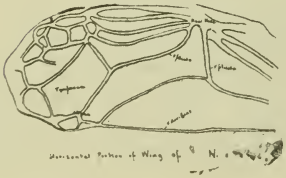

Fig. 30. Horizontal portion of wing cover of Nemobius vittatus, male.

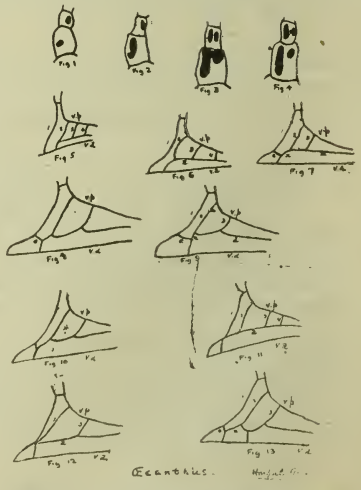

Fig. 31. Antennal marks and Harpa areas of Œcanthus.

Venation of the Wings.

H. de Saussure and J. Pungur have worked out a nomenclature of the veins in this family. That portion of the wing cover which assumes a vertical position on the side of

the body is traversed by one large vein with its branches, the *Vena Radialis*, (Figs. 27-28). This vein sends out a large number of branches towards the outer border of the wing but none towards the inner. In the case of much shortened wing covers this vein is very much stunted and often only the branches are visible. The edge formed between the vertical and horizontal portions of the wing cover is composed mainly of the *Vena Ulnaris Anterior*; the other branch *V. Ulnaris Posterior* (Fig. 27), which is easily seen in the female is hard to detect in the male. The *Vena Dividens* is a well defined vein running along the outer border of the horizontal portion of the wing cover and anastomosing with the branches of the *Vena Plicata* which traverses the horizontal field (figs. 27-30).

The Vena Plicata in the female runs directly backwards giving out four to six branches which anastomose with one another forming a net work (Fig. 27). In the male the Vena Plicata runs directly, then bends at the first quarter of its length at a right angle toward the inner border where it forms the *Anal Node*, (Figs. 28-30). The part from the bend to the Node is the stridulating instrument. From the Node the vein continues in an oblique direction again to the outer border where it unites with the V. Dividens to form a knot—*the stigma*. In this way the V. Plicata bounds a triangular harp-shaped area in which several (0 to 5) undulating cross veins run—*oblique veins*. On the outside of the oblique part of the V. Plicata there is a confusion of veins which partly come from the Anal Node and partly from the V. Plicata so that in the last third of the wing there is a roundish area, the *Tympanum* or *Mirror* sometimes crossed by one or two cross veins. Behind the mirror lies a network of veins.

Gryllus.

Scudder in his materials for a Monograph of the N. A. Orthoptera enumerates six species, namely: *luctuosus*, *abbreviatus*, *angustus*, *neglectus*, *niger and Pennsylvanicus*. Following Scudder's descriptive remarks I have compiled the following synoptic table:

Species.	Color of Elytra.	Length of Elytra.	Length of Ovipositor.	Hind Femora.
			in.	in.
1. Luctuosus	black or brownish		.70	.45
2. Abbreviatus	dark, bordered with light brown.	covering abdomen	.74	.44
3. Angustus	like No. 2 but more slender		.64	.38
4. Neglectus	black or jet black	as long as abdomen	.56	.40
5. Niger		longer than neglectus	.45	.44
6. Pennsylvanicus	like neglectus		.45	

It will be apparent that the distinctions are based chiefly on the length of the ovipositor of the female which I found to be extremely variable. Moreover no method of identifying the males has been given. As far as the color is concerned it is of no value as a guide to species since it, too, is very variable. Saussure admits (Melanges Orthop. p. 317) that the species seem to grade into each other, and "it is impossible to define the limits of each. The accidental shortening of the wings already sufficiently embarrassing in itself seems often to become complicated with a shortening of the ovipositor. The color is very variable and it is impossible to settle on any character with certainty which can separate the species." The length of the ovipositor is made the chief character in distinguishing the two species of Saussure and Beutenmüller. I find in my collection all lengths from 10 to 21 mm., so here it is impossible to draw a limit.

Saussure gives the names *abbreviatus* and *luctuosus*. Under the former he places the varieties *neglectus* and *Scudderianus*, and under the latter he places the variety *Pennsyl-*

vanicus. Beutenmüller gives the names *abbreviatus* and *Pennsylvanicus*. Under the former he places the variety *angustus* and under the latter he places the varieties *luctuosus*, *niger* and *neglectus*.

An effort was made to separate the species of Gryllus by the aid of the wing venation but it was impossible to find variations which were constant. The number of oblique veins varies from three to five. The diagonal vein or vena plicata bifurcates to form the mirror which is more or less rounded. A transverse vein crosses the mirror. In all specimens examined the structure of the mirror remains practically the same; the transverse vein in some cases is rather faint. Beutenmüller states that *abbreviatus* has a much larger head and is more clumsy than *Pennsylvanicus*, but I fail to see any differences. One form *luctuosus* has long hind wings which project like tails behind the wing covers. This character is peculiar to both sexes. I see no reason why this character is not sufficient to delimit this form as a distinct species. We may then refer all the other varieties of the region to one species *abbreviatus*.

Fernald describes *abbreviatus* as follows: Black, elytra fusco-testaceous; veins testaceous; wings wanting; ovipositor as long as body.

The same author describes *luctuosus*: Black or brownish; elytra fusco-testaceous or black; wings extending to the end of the abdomen; ovipositor as long as the femur and half the tibia.

Nemobius.

From the study of the tympanal areas of wing covers of the males of Nemobius I am unable to find any constant variation in the venation, so I am obliged to place all the members under one or two species by reference to plates. It will be seen that the harp area is traversed by only one oblique vein, that the tympanum is sometimes quadrate, sometimes more irregular, often with veins penetrating it and ending blindly. The degree of development of the apical part of the wing cover varies even in the same variety. The extremity of the wing cover is not prolonged but widely rounded, and the tympanum is thrown far back so that the apical area is very short and is composed usually of but one row of cells. The vena plicata bifurcates to enclose the tympanal area which moreover encloses two, sometimes three cells. (Figs. 29-30.) Saussure is unable to separate our forms by any constant variation in the tympanum and my studies confirm his conclusion.

As in Gryllus there is a form with long caudate wings. I would be in favor of limiting the species *fasciatus* to this form. The remaining forms would then fall into the species *vittatus*—the smaller forms making the variety *exiguus*.

Œcanthus.

The specimens of Œcanthus collected about Ithaca, N.Y. and Windsor, Ontario, present many variations in venation, color, shape of wing and surface markings. They were collected during August, September and October, and the great majority of them were caught on Ambrosia artemisiæfolia (ragweed) and Euphorbia corollata (white spurge). A few were taken on grape vines, orchard trees and sumach. In color the specimens ranged from snowy white to almost black.

I have made an attempt to classify the species of Œcanthus according to the venation of a portion of the wing cover of the male. This is the portion called the *harpa* by Brunner. As will be seen by reference to a drawing of the wing cover of a male the vena plicata during the first quarter of its course forms the file or rasp. Extending in an oblique direction from the file are two or more veins more or less undulating which connect with the vena dividens. The file and oblique veins constitute the harp. Evidently the function of the oblique veins is to make tense the large vein to which they are attached.

The chirp of Œcanthus is a sexual call of the male to the female. It is natural to suppose that the females recognize the peculiar call of the males of the same species and

cannot be lured by the calls of a different species. If such be the case then the peculiar sounds and calls must be produced by harps differing a little in structure, perhaps in the number of oblique veins or in the tenseness of these veins, that is whether undulating or straight.

The classification of the species is somewhat difficult. Several entomologists prefer to place all our native members in one species while some would make three or four. This question will remain in dispute till the life history of the genus has been thoroughly worked out and experiments have been made upon interbreeding.

Charles A. Hart of Champaign, Illinois, in an article in the Entomological News Vol. 3, 1892, page 33 divides the Œcanthi by means of black markings on the first two segments of the antennæ. These markings are very distinct and appear to be quite constant, and should they be discovered to be of functional importance are of great value as they are discernible by the naked eye, and easily outlined with the aid of an ordinary lens. In *Niveus* (Fig. 31, 1,) the markings are two black circular spots, one on underside of first and second segments.

In *Angustipennis*, (Fig. 31, 2,) the markings are a curved black line on first segment and a black oval spot on second.

In *Nigricornis*, (Fig. 31, 3 and 4) on the first segment there are a black longitudinal line, and a black spot exterior to it with similar markings on second segment. In some cases the markings are confluent at the upper part of the first segment.

Figure 31, 5 shows the venation peculiar to the harp of Niveus. The number of oblique veins varies from three to five, only the first two meeting the vena dividens. These undulate considerably and meet vena dividens at an acute angle. Oblique veins three, four and five extend parallel to one and two, but end in a second longitudinal vein (*d.*)

The venation of Angustipennis, (Fig. 31, 6) is remarkably like that of Niveus but there is a difference in oblique vein two. In Niveus it seems to extend from the vena plicata to vena dividens, but in Angustipennis it ends at the longitudinal vein (*d*) which is continued down to vena dividens.

The venation of *Nigricornis* (Walker) is decidedly variable, yet a study of the variations as in figure 31, 7-13 reveals a type which embraces all the forms. By far the largest number have the venation as shown in figure. By a reference to figure 31, 7-13 it will be seen that an additional cross vein has been developed between the oblique veins one and two, and which is marked (*e*) on figures. The migration of veins has been somewhat remarkable; in some cases a straightening has taken place so as to make one vein out of two as in figure 31, 11, where cross vein (*e*) and (*x*) portion of oblique vein two have been united into one line. In some cases (*e*) and (*x*) have become more inclined to each other as in figure 31, 10, while in other cases the oblique veins (1) and (2) have converged and united with the disappearance of veins (*e*) and (*x*) as in figure 31, 12. In figure 31, 8, (*e*) and (*x*) have begun to straighten; in figure 31, 9 oblique vein two has straightened itself. Usually there are only three oblique veins but occasionally a fourth is found as in figure 31, 5, 6 and 11.

Keys for the Determination of the Species of Œcanthus.

I. Males.

A. Wing covers with a cross vein between the oblique veins 1 and 2 of harpa —*nigricornis.*

AA. Wing covers without a cross vein between the oblique veins 1 and 2 of harpa.

B. Second oblique vein extending to vena dividens—*niveus.*

BB. Second oblique vein terminating at longitudinal vein between V V. plicata and dividens—*angustipennis.*

II. Females.

A. Wings extending beyond the tip of ovipositor.

B. Pronotum with a single mesal brown band—*angustipennis.*

BB. Pronotum without a mesal brown band—*niveus.*

BBB. Pronotum dark or with three bands—*nigricornis.*

AA. Wings not extending beyond the tip of ovipositor—*nigricornis.*

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A paper on *Drasteria erechtea* by Prof. F. M. Webster, illustrated with some very beautiful drawings, was read by Dr. Bethune.

A vote of thanks to the Treasurer and Secretary for their labours in the interests of the Society, was moved by Dr. Fletcher, seconded by Mr. Fyles, and carried unanimously.

Mr. Harrington, seconded by Mr. W. E. Saunders, moved a vote of thanks to Mr. Dearness the retiring President, for the interest he had taken in the affairs of the Society and his labour on its behalf. Carried unanimously.

During the meetings many rare and interesting specimens were exhibited by those present, among which may be mentioned a large number of moths obtained at electric lights by Mr. Bice of London, and the following, collected in the neighborhood of Quebec

by Mr. Fyles and other members of the Quebec branch: *Phyciodes nycteis, Terias lisa, Sannina exitiosa, Spilosoma congrua and cunea, Rheumaptera basiliata, Tetraphora testata*, and *Conops sagittarius*. Mr. Fyles also reported the capture of *Anarta melaleuca* and *Melipotis limbolaris*.

The meeting then adjourned, after a very profitable two day's session, during which much enjoyable time was spent in the comparison of specimens, and in examining the many interesting books and cabinets belonging to the Society. All who were present expressed their pleasure at the new quarters of the Society, which are so much more convenient, as well as brighter and more comfortable than the former rooms.

THE VALUE OF SYSTEMATIC ENTOMOLOGICAL OBSERVATIONS.

By J. Alston Moffat, London. Ont.

Francis Albert Rollo Russell, Esq., Vice-President of the Royal Meteorological Society, &c., &c., has this to say upon the influence of weather on insect pests:

"The effect of a particular kind of season on insect pests is worthy of more attention than it has hitherto received. The importance of attacking in time and as far as possible destroying the insect life which, if neglected, inflicts incalculable damage on crops and gardens, has scarcely been realized, owing to the blight being generally regarded as a necessary evil, not to be foreseen or prevented. The development of insect pests is generally favored by dry weather. Stunting of the growth, and over maturation of the sap of plants induce early changes in the maturing and structure of aphides; the insects multiply without the interference of the ordinary destructive influences of bad weather, and delicate maggots, etc., which are generally drowned in very large numbers by storms of rain, emerge unharmed. At the same time it may happen that corn and other crops may be enabled by earlier hardening of the case, stalks, etc., to protect themselves against attacks which in wet years would bring serious damage. In some countries, and in respect to some crops, it is customary to arrange the date of maturity with special regard to the protective power of the plant and the period of expected attacks from insects. The whole subject is at present too little under scientific observation, and great benefit might result if the following branches of inquiry were systematically investigated: (1) The influence of different kinds of weather in developing insect pests; (2) the time of appearance of crop insects in different seasons in relation to the weather, and the time at which crops are most open to attack in different seasons, according to the weather; (3) the treatment of the ground in drought with a view to destroy threatening pests in their early stages, and, in general, the conduct of agricultural operations with regard to the probable development of particular pests resulting from particular kinds of weather; (4) the issue of forecasts of insect prevalence, derived from a careful study of the habits of various species of insect pests, and of the weather of present and previous seasons."

Everyone knows and admits the powerful and direct connection that exists between the weather and the crops.

That the weather has a powerful influence on the propagation, maturation, multiplication, migration and consequent spread of insect pests, is known only to those who have given the matter some consideration. That some insects are in the habit of appearing periodically is a truth well established by observation, and that the weather must affect these appearances can readily be inferred.

The weather of an extensive territory is often quite diverse in the different portions of that territory, and we can form but very little idea of the influences that are at work, or where they may be at work, in producing the particular kind of weather existing at any given time, in any given locality.

Lieut. Maury, U.S.N., in his magnificent work "The Physical Geography of the Sea," gives his reasons for believing that the great bulk of the precipitation on this continent is evaporated from the sea of the southern hemisphere. The meteorological

observations inform us at times that a violent storm in the Gulf of Mexico is making itself felt in the Gulf of St. Lawrence. Such statements as these assist us in forming some estimate of the far reaching influences that may be affecting the weather of our particular locality.

The forecasts of the weather for the succeeding twenty-four hours, which we have become accustomed to regularly consult, and in good measure to rely upon, and which have proved to be of such immense value to multitudes in their everyday movements upon land or water, are not a matter of guesswork as some seem to suppose, but the condensed result of a vast amount of information gathered together into one central office from numerous distant stations, where it is examined and systematically arranged on purely scientific principles, before the probabilities are issued for the benefit of those living in the different regions into which the country has been divided.

The governments of various countries, realizing the advantage that would accrue to their people from a foreknowledge of what the weather would be for even one day, have established, at very considerable expense, stations all over their countries with suitable instruments for registering the atmospheric conditions and changes, with a competent person in charge to note these and transmit them by telegraph to the central office at stated times. The qualified meteorologist in charge of the central office or weather bureau receives these dispatches from all the separate stations far and near, and has to arrange, compare and condense the information thus obtained. Having been thus placed as it were upon an elevation from which he can survey the whole atmospheric movements that are going on all over the country at one glance, and being familiar with the laws that govern these movements, he has to make his observations from what they are at the present, as to what they are likely to be during the next twenty-four hours in the different regions into which the country has been divided.

For instance, he receives from a station hundreds of miles away information that a storm of a particular kind is raging there, the wind blowing in a particular direction, at the rate of so many miles an hour, he has to calculate by the rate it is travelling and its direction, at what particular time it will be likely to reach particular points along its course. But he may get at the same time information that hundreds of miles away in the opposite direction another storm is prevailing, which may throw the previous calculations completely out as he has now to take into consideration what influence the one will have upon the other, and if they unite what is the direction it will pursue, and whether with increased or diminished force. And so it is through the whole range of every condition and commotion of the atmosphere that exists at any particular place all over the country. Such a brief statement may help to show how thoroughly the weather bureau is under intelligent and scientific control, and that we may confidently rely upon its forecasts as proximately correct. And if the informing stations were increased in numbers, and the regions for which the probabilities are issued were reduced in dimensions they would be yet more reliable.

Now North America is getting to be pretty well dotted over with agricultural experiment stations, supported by government aid, for the benefit of the agriculturist and the general good of the country, and every well appointed agricultural station has an entomologist attached, whose duty is to report upon the depredations done by insects in his particular district, and the means taken to prevent or lessen the same, and bulletins are issued with more or less frequency giving the results of the work done by each, and the success obtained, partial or complete, or none as the case may be, and the probable reason for the same indicated.

Everyone who has the opportunity of seeing the quantity of literature of this description that is being issued from the various stations must be impressed with the industry exhibited in the investigations that are being made into the life and habits of insect pests, and the best means to be used in preventing their ravages. Now as each of these entomologists is in great measure working independently of all the others, and may not be informed as to the department that others are engaged in investigating until it appears in the bulletins of their respective stations, there cannot help but be a good deal of

duplicating of each other's work going on, and as the seasons are short for some departments of this kind of work, and as attention must be given to it while the opportunity lasts, if the work is to be accomplished at all, many of them may not find the time for reading all that is necessary to keep them informed of what others are doing in a similar line. This fact has recently been fully stated by one who is himself well to the front in this kind of work, when he remarked that with the regular daily work of his position to attend to, it was utterly impossible for him to read all the bulletins that came to his office, and he requested as a favor, that any having matters of special importance that they wished him to see, should mark their papers so that he might not run the risk of losing the benefit of it. This statement discloses both the weakness and the needs of the entomological work that is being done in connection with the agricultural experiment stations.

The highest results in any work can only be reached by united effort under the supervision of one directing head.

With the apparatus and methods of the weather bureau before us, it seems easy to indicate a remedy for the present waste of time and energy that results from each individual entomologist pursuing his vocation with reference almost exclusively to his own locality, and with little information as to what others may be doing at the same time.

It would appear then as if the pressing need of the present system to complete its efficiency is a central bureau of entomological intelligence, with a person in charge appointed solely for his suitability for the position, and whose whole time could be given to the work of supervision. With such a permanent, central office established for giving and receiving information upon all manner of entomological subjects, we can easily understand how it would tend to unite the widely separated entomologists on the staff of the different agricultural stations, making them realize that they were not working alone though separate, and that each being kept informed of what the others were doing would in a measure reap advantages from the other's labors. And when one considers how much has already been done, largely by individual labors, we can form some estimate of how much more might be accomplished by well directed united effort under intelligent guidance. And as the regularly appointed entomologists increase in numbers, the greater will become the need for such a central systematizing bureau to prevent a waste of energy in duplicating each other's work, and that these will increase rather than diminish is certain, as the value of their labors is only now beginning to be realized, and the expense of their maintenance is being returned to the community a hundred fold.

It would be an easy matter to indicate how such a bureau should be conducted, but its ordinary work would be largely controlled by circumstances and necessities, as the course of events required. But it would be known to exist for the express purpose of receiving and disseminating all sorts of information about the doings of insects all over the country, and the best means of combating or preventing their depredations. Thus, the person in charge being kept fully informed of what was going on in the insect world, far and near, might be able to give warning of danger to one locality from what he had been informed was going on in another; and in the case of migratory insects, only such a fully informed person could indicate effective means of dealing with them, and in such a case, the meteorological and climatic conditions are of the first importance. He might even be able to issue forecasts of the probabilities for the coming season. We know what correct guesses Mr. Scudder made about the spread of the imported cabbage butterfly, from scant information gathered with great labor. I took my first Colorado potato beetle at Hamilton, about three years in advance of the time calculated for its appearance in that locality, indicating that the calculations had been made upon insufficient data.

Then there would be bulletins issued from this central bureau, with more or less frequency, as the circumstances required, which every entomologist would be sure to read, as they would be expected to contain a summary of the latest intelligenee of what was being transacted by, for or against the insect community all over the continent, or the world for that matter, which could not fail to prove of the utmost interest and advantage to every student in that line, whether he is economic, scientific, or recreative, and would

keep each informed of what others were doing, and save in many instances an unnecessary expenditure of time and labor.

The information received at such a bureau need not be confined to that coming from the regularly appointed entomologists at the agricultural stations, but from every person who took an interest in the subject, and who had made an observation which he thought was worthy of reporting. Thus the sources of information would be increased, which are at present quite too few and widely separated. But we hope for a time when every town and district will have at least one intelligent observer to report for that locality. Then, how many curious, interesting and important questions of insect economy that long have, and still remain involved in mystery, will find a solution through the united systematic work of numerous observers? Thus, with those interested in the doings of insects at shorter distances apart, the east would be united to the far distant west, and the north with the south by means of this central bureau, and instead of our having bits of information about widely separated spots, as if they stood apart and alone, we would get an intelligent connected view of the various steps in the progress which unite the two extremes into one harmonious whole.

ON BUTTERFLY BOOKS.*

By Henry H. Lyman.

Having been asked by one of the members of our branch for advice on the books most necessary for one engaged in the study of the North American Lepidoptera, I have thought that this subject might be of sufficient interest to some of our other members as to render it not unsuitable for a short paper.

Hitherto I have always recommended anyone entering upon the study of North American insects to purchase Harris's Insects Injurious to Vegetation as the first and most necessary work upon the subject, and I recently noticed in a paper by Dr. S. H. Scudder, on "The Young Entomologist and what he wants," reproduced by the Montreal Witness, from the "Independent," that the writer gives the same advice saying, "the best single book is Harris's Insects Injurious to Vegetation."

If Harris's classic work no longer enjoys that unquestioned supremacy which it has held for so many years, the only work which may claim to rival it is Prof. Comstock's 'Manual for the Study of Insects," which has certainly some very valuable features, and is of course more modern and "up to date," though one may not agree with all the views set forth. I should certainly recommend both these works to everyone entering upon the study of entomology.

A smaller and much cheaper, but very useful work is Dr. Packard's "Entomology for Beginners." It serves as a general introduction to the science, treating of the "Structure of Insects," "Growth and Metamorphosis of Insects," "Classification," "Insect Architecture," "Injurious and Beneficial Insects," "Directions for Collecting, Preserving and Rearing Insects," with directions for dissecting insects, cutting and mounting microscopic sections of insects, and a list of the most important works on general entomology and the biology of insects, together with a glossary and index. Naturally with so much ground to be covered but little space could be given to the consideration of the different orders, thus only 24 pages are given to a review of the coleoptera, 20 to the diptera. 24 to the lepidoptera, 16 to the hymenoptera and 36 to the other orders.

To any one wanting a more extended guide for the collecting, rearing and preservation of insects, no better work can be recommended than Dr. Knagg's "Lepidopterist's Guide," which is issued at the moderate price of one shilling, and which though, of course, written for English collectors, will be found very useful by all, as its general directions and suggestions as to treatment are very generally applicable.

* Read before the Montreal Branch of the Entomological Society of Ontario, 8th December, 1896.

When we turn from general works to those dealing with a single order, either in whole or part, the choice is more difficult and no one book is sufficient.

To any one who has the money to spend and who is interested in the butterflies of the whole continent north of Mexico, no finer work can be recommended than the magnificent volumes of Mr. Wm. H. Edwards on the butterflies of North America with their 152 exquisite coloured plates, but unfortunately the price, aggregating $135 for the three volumes, places the work beyond the reach of the great majority of lepidopterists.

For the butterflies of the Eastern United States and the contiguous parts of Canada, Scudder's splendid work leaves nothing to be desired, as it is a complete manual on the most elaborate scale of the butterflies to be found in the region, with a great wealth of illustration, but unfortunately its price, $75, puts it also out of the reach of very many.

An excellent work, dealing with almost the same territory but comprising about one-fourth more species and published in 1886, at a moderate price, is French's "Butterflies of the Eastern United States." This is a very useful work of 402 pages and gives descriptions of 201 species. The nomenclature and classification follow those of Mr. W. H. Edwards. Short directions are given for collecting, setting, preserving and rearing specimens, and there is an acccentuated list and an analytical key. The preparatory stages where known are described with considerable detail, and the distribution is given in a general way. There is, however, a dearth of illustrations, especially in the Lycænidæ and Hesperidæ.

A less pretentious but extremely useful work is Scudder's "Brief Guide to the Commoner Butterflies of the Northern United States and Canada," published in 1893, by Henry Holt & Co, at the very moderate price of $1.25. The author has selected for treatment 84 species which he judges would be almost surely met with by an industrious collector in the course of a year or two years' work in the Northern States east of the great plains and in Canada, but such as he classes as "rare" or occurring only in restricted localities are omitted. This, I think, is a pity, as no one starts out to collect merely common things however beautiful, and we all long for the rare and valuable. Besides, several are omitted which occur over wide areas, such as Grapta Gracilis, which is found in the Adirondacks, the White Mountains, in the Muskoka region, on the Lower St. Lawrence and even to the extreme end of the Gaspe Peninsula, and also Colias Interior, embracing a similar but apparently still wider distribution.

One great charm that I found in the acquisition of my first entomological work, viz, Coleman's British Butterflies, was that it treated of *all* the species found in Great Britain, and so I felt confident that whatever I caught I would find treated of there, and it certainly seems to me that the few extra pages that would have been required for these species, even if their addition had slightly enhanced the cost of the book, would have been well worth the cost.

This book has no illustrations of any of the species, but though this is doubtless disappointing to the beginner, it has this advantage that when he has worked out the determination of any butterfly by the analytical key and the description he has a much more scientific knowledge of the species than if he merely named it by a superficial comparison with a good figure. The nomenclature, of course, is Mr. Scudder's own, the general adoption of which most of us, I think, would regard with disfavour. Otherwise the book has much to recommend it to the beginner.

Another work, of very limited scope but very beautifully illustrated, is Beutenmüller's "Descriptive Catalogue of the Butterflies found within fifty miles of New York City," published in the "Bulletin of the American Museum of Natural History," separate copies of which may still be obtained from the author at $1 each.

This work consists of sixty-eight pages and five plates, two by the Lithotype Printing Co. being especially fine. Ninety-three species are treated of and of these sixty-two are figured. Descriptions of the caterpillar and chrysalis are given where known,and the food plants and short notes on the life history. It is certainly to be regretted that this pamphlet is not more generally accessible.

"The Butterflies of Maine," published by Prof. C. H. Fernald in 1884, is an excellent pamphlet of 104 pages, describing the sixty-nine butterflies known to have been taken in Maine. It contains an accentuated list of the scientific names and the principal "common" names which have been given, and there is also an artificial key for the determination of the butterflies. There are no plates but there are thirty-five woodcuts illustrating a number of the species in one or more stages.

For the Sphingidæ, the most important work is Prof. J. B. Smith's Monograph, published in Trans. Amer. Ent. Soc. XV., 1888, and obtainable separately at $2. This work extends to nearly 200 pages and is very exhaustive in its treatment. There are ten plates, eight devoted chiefly to the genital armature and two chiefly to venation, but there are no figures of species. About 30 pages are devoted to tracing the classification of the group from the time of Linnæus in 1758 down to the publication of this monograph in 1888. The preparatory stages are not described, but where known may be found from the references, which are very complete. This, however, has the disadvantage of compelling the hunting up of these descriptions in other works, which one may be unable to do if a complete entomological library is not within reach.

"The Sphingidæ of New England," published in 1886 by Prof. Fernald, is an excellent pamphlet of eighty-five pages and six plates, illustrating ten species, with the larva or larva and pupa of most of them. Forty-two species are described, and there is an analytical key and the scientific names are all accentuated and the work is on similar lines to the same author's "Butterflies of Maine."

"Descriptive Catalogue of the Sphingidæ found within fifty miles of New York," by Wm. Beutenmüller, is another excellent work on the same plan as his work on the butterflies. It consists of forty-six pages and six plates, which figure forty-two species, while forty-six altogether are described in the text. With such a work no one should have any difficulty in determining his specimens. This work was published in the Bulletin of the American Museum of Natural History, and except for the few author's separates is unfortunately only accessible to those able to consult this work.

For the groups intervening between the Sphingidæ and the Geometridæ there is as yet unfortunately no approximately complete work, nor indeed any work other than check list or catalogue at a moderate price.

In July, 1872, Mr. R. H. Stretch undertook the publication of a work entitled "Illustrations of the Zygænidæ and Bombycidæ of North America." It was to be issued in parts, each of which was to contain a coloured plate. The work was intended to extend to thirty parts at $1 each, or with plain plates 75c. each. The genera and species were not taken up in consecutive order but irregularly as specimens could be obtained, and as the work was discontinued after the issue of the ninth part, with which the author closed his first volume, it is very incomplete, and while rather costly in the first instance has become more so from its comparative rarity.

Dr. Packard has begun the publication of a sumptuous work, "A Monograph of the Bombycine Moths of America, north of Mexico." The first volume, which is all which has so far appeared, treats of the Notodontidæ, and costs $15 in paper covers, or $16 bound in cloth, and is, therefore, a costly work. The part already issued is a quarto volume of 291 pages with forty-nine plates, ten maps and eighty-five cuts. Of the plates seven are of the moths, one being coloured and the others done by the heliotype process, thirty which are coloured illustrate the larvæ with great fulness of detail, ten are devoted to venation, one to other structural details, and one to three moths with the larvæ of two of them.

The eggs and cocoons or pupæ are not illustrated on the plates, but a number of pupæ are illustrated in the introductory part of the work.

For the Geometridæ the monumental "Monograph" of Dr. Packard, published by the United States Government as one of the volumes of its geological survey of the territories, should be in the hands of every lepidopterist who can afford the very moderate price, $4 I believe, at which it is, I suppose, still obtainable.

This magnificent work is in quarto form, consists of 607 pages and 13 beautifully engraved plates, six being devoted to venation, one to anatomical details, and the remaining six to the perfect insects and a few larvæ and pupæ. These six plates contain no less than 389 figures of moths, and thirty-six figures of larvæ and pupæ. The work embraced all species of this group known to Dr. Packard up to the date of its publication, and is indeed wonderfully complete.

For the Pyralidæ I know of no exhaustive work, but for the Phycitidæ the paper by the Rev. Geo. D. Hulst in the Trans. Am. Ent. Soc. XVII., 1890, and obtainable separately, I believe, for about one dollar, should be studied. This paper consists of 136 pages and three plates illustrative of structure and venation.

For the Crambidæ, Prof. Fernald's recent monograph of eighty pages, with its three plates of venation and structural details, and its six exquisite colored plates of the species is all that could be desired, but for the Tortricidæ there is no reasonably complete work at a moderate price. One of the earliest illustrated papers was that by the late Coleman T. Robinson, published in Trans. Am. Ent. Soc. II., 1869, which was intended to be the first of a series to include the whole of the species found in the U. S. This first paper illustrated with six beautifully colored plates, embraced descriptions of no less than seventy species, but the project was cut short by the untimely death of Mr. Robinson. Since that event the chief work issued on that group is that of Lord Walsingham, eighty-four pages, quarto, with seventeen colored plates, published by the trustees of the British Museum, but this is a somewhat expensive work, costing £2.

I do not know of any general work on the Tineina.

In regard to catalogues and check lists, there is no general catalogue of North American Lepidoptera. For a mere check list I would recommend that issued by Prof. J. B. Smith, with the assistance of Drs. Skinner, Hulst, Fernald and Riley, which is sold at $1.00.

For the butterflies Edwards's "Revised Catalogue of Diurnal Lepidoptera," issued in 1884 is to be recommended, though Dr. Strecker's catalogue, issued in 1878 at the cost of $2.00, though having certain defects, contains much useful information and more complete references.

For the Sphingidæ, Zygænidæ and Bombycidæ, using the latter term in its older sense, there is no American catalogue, but they are, of course, embraced in Kirby's world-wide catalogue of Sphinges and Bombyces, with the exception of some of the groups, such as the Ægeriadæ, which he excludes, but this is an expensive work costing £2 4s.

For the Noctuidæ we are indebted to Prof. J. B. Smith for a comprehensive catalogue of 424 pages, which is obtainable for $2.50.

Other works might be mentioned with commendation but the selection has been purposely restricted to those which are most indispensable.

Of books on the other orders of insects I am not competent to speak, but for anyone who is primarily interested in the economic relations of butterflies or other insects no works can be more highly recommended than "Insects Injurious to Fruits," by Dr. Wm. Saunders, and Prof. J. B. Smith's "Economic Entomology."

It is, doubtless, impossible to do much in the entomological line without some books, but by a judicious selection ten or twenty dollars may be laid out to purchase a very fair selection of the most useful works for a beginner, and then other works could be added as one's interest in the subject developed and one's means would admit.

SOME HOUSEHOLD INSECTS.

By Rev. C. J. S. Bethune, Port Hope.

So many enquiries are repeatedly made respecting common insects that frequent houses and cause annoyance to the inmates, or damage to household goods and provisions,

that it has seemed desirable to give some account of those most frequently complained of, and suggest some methods of dealing with them. Hitherto very little has been published upon this class of troublesome insects, and not much has been known about their life histories; but last year the deficiency was satisfactorily removed by the publication at Washington of a bulletin on "The Principal Household Insects of the United States," by Dr. Howard, Entomologist in Chief of the Department of Agriculture, and his assistants, Messrs. Marlatt and Chittenden. In the following pages we shall freely draw upon this work, as nowhere else can the same accurate information be obtained, and by no other writers have the life histories of these insects been so carefully studied and the details so clearly and admirably set forth.

Cockroaches.

Most houses in towns and cities are infested with cockroaches to a greater or less extent, and even isolated dwellings in the country are sometimes inhabited by an unwelcome colony of these creatures. I have known them to be introduced into remote places by means of the trunks of visitors, or packages of groceries received from some distant city. Mr. Fyles (15th Annual Report, 1884, p. 43) relates the occurrence of large numbers at Chaudiere Curve, a wayside station, nine miles from Point Levi, P Q, where luggage is transferred from the Grand Trunk to the Intercolonial Railway, and *vice versa*, and where the insects were evidently brought by immigrants from Europe. They usually frequent kitchens and pantries and are especially abundant about the stove or fireplace on account of their fondness for heat. For this reason, as well as for the sake of the abundant food supply, they are often present in great numbers and become a perfect nuisance in bakeries. They are also excessively numerous and troublesome on board ship, the moisture and heat of the vessels being particularly favorable to them. In the daytime they are rarely seen, as they always avoid the light, and conceal themselves in crevices, behind baseboards, under boxes or barrels, etc, wherever in fact they can squeeze their flat, thin bodies, and escape observation. If disturbed they scuttle off with great rapidity to the nearest hiding-place and can rarely be captured or destroyed. It

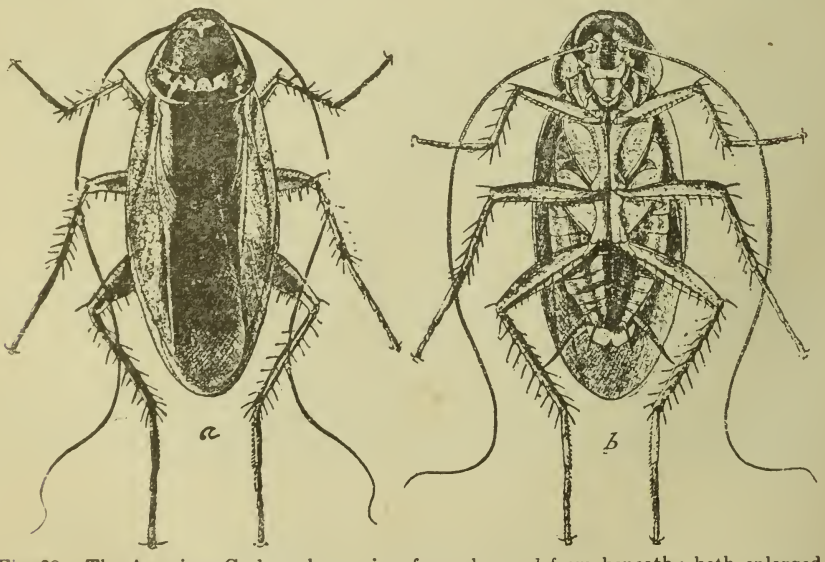


Fig. 32. The American Cockroach; *a* view from above; *b* from beneath; both enlarged one-third (after Marlatt).

sometimes happens that a large colony has established itself in a kitchen for months without being discovered, till a sudden entry with a light after the usual hours has revealed their presence.

Cockroaches belong to the family Blattidæ, of the order Orthoptera, which includes crickets, grasshoppers, locusts, etc. This family consists of a very large number of species, nearly a thousand having been named and preserved in collections, and it is estimated that about four times as many more are in existence in the world, chiefly in tropical countries. The great majority of them live out of doors and are vegetable feeders, and some attain to large dimensions. I have a specimen from Mexico, whose wings expand five inches, and larger species than this are known. Happily, but few species have become domesticated, and in North America there are only four that can be regarded as household pests. These are the American Cockroach (*Periplaneta Americana*), the German (*Ectobia Germanica*), the Oriental (*P. orientalis*), and the Australian (*P. Australasiæ*) As far as my limited experience goes, the first named, the American Cockroach (Fig. 32) is the common species in Ontario. Full grown specimens are about an inch in length, of a light brown color, and furnished with ample wings in both sexes. It is a native of this continent, having originated in the warm regions of the south and gradually spread northward ; it is especially abundant in the Middle and Western States, its place being taken in the Atlantic States by one or other of the imported species.

The German Cockroach (Fig. 33) is more familiarly known under the name of the "Croton Bug," from its association with the Croton waterworks system in the city of New York. It had, no doubt, been introduced into the city long before, but had not attracted general attention till the extension of the waterworks and the immense

Fig 33. The German Cockroach ; *a* first stage ; *b*, *c*, *d*, second, third and fourth stages ; *e* adult ; *f* female with egg-case ; *g* egg-case enlarged ; *h* adult with wings spread. All natural size, except *g*. (After Riley).

multiplication of piping in houses enabled it to make its way from one building to another without difficulty, and the dampness and heat of hot water pipes afforded it the most favorable conditions for living and increasing. As its name indicates, it is a European species, being particularly abundant in Germany and the adjacent countries. It has, however, been carried by commerce and emigrants to all parts of the world, and is now spreading so rapidly in England, owing probably to the immense importation of goods "made in Germany," that Miss Ormerod tells us it is supplanting the familiar English species, known as "the black beetle." It is much smaller than the other domestic species, rarely exceeding five-eighths of an inch in length, very light brown in color and distinctively marked on the thorax with two dark brown stripes. It is more active and wary than the larger species and much more difficult to get rid of; it also multiplies much more rapidly, the breeding period being shorter and a greater number of eggs being produced at a time.

The Oriental cockroach is the common species in England, where it is known in the household by the name of "the black beetle." It is supposed to be of Asiatic origin, and to have spread through Europe several centuries ago. It is very dark brown, almost black, in colour, shining, and much stouter than the other species. The wings of the male are shorter than the body and in the female are so abbreviated as to render her practically wingless. It is notably gregarious in habit, the individuals living together in colonies in the most friendly manner. This species was brought in early days to the British settlements in North America and is very common now in the Eastern States ; it has also spread far inland, and has been found even in New Mexico

The fourth species, the Australian, resembles very closely the American cockroach, but may readily be distinguished from it by the bright yellow band surrounding the prothorax and the yellow dash from the shoulder on the sides of the upper wings. It is very abundant in Florida and some of the southern states, but is not likely to become acclimatized in Canada. A specimen was sent to me last summer by a lady in Toronto who had found it among some bananas. It is the only living specimen that I have seen in this country, and evidently came with the fruit from the tropics.

The structure and life history of the domestic cockroaches are thus described by Mr. Marlatt: "They are uniformly dark brown or dark coloured, a coloration which corresponds with their habit of concealment during daylight. They are smooth and slippery insects, and in shape broad and flattened. The head is inflexed under the body, so that the mouth parts are directed backwards and the eyes directed downward, conforming with their grovelling habits. The antennæ are very long and slender, often having upwards of 100 joints. The males usually have two pairs of wings, the outer somewhat coriaceous and the inner ones more membraneous, and once folded longitudinally. In some species the females are nearly wingless. The legs are long and powerful, and armed with numerous small bristles or spines. The mouth parts are well developed, and with strong biting jaws, enabling them to eat all sorts of substances.

"The cockroach in its different stages from egg to adult shows comparatively little variation in appearance or habits. The young are very much like the adult, except in point of size and in lacking wings. In their mode of oviposition they present a very anomalous and peculiar habit. The eggs, instead of being deposited separately as with most other insects, are brought together within the abdomen of the mother into a hard, horny pod or capsule which often nearly fills the body of the parent. This capsule contains a considerable number of eggs, the number varying in the different species, arranged in two rows. When fully formed and charged with eggs the capsule is often partly extruded from the female abdomen and retained in this position sometimes for weeks or until the young larvæ are ready to emerge. The capsule is oval, elongate, or somewhat bean shaped, and one of its edges is usually serrate. The young are in some instances assisted to escape by the parent, who with her feet aids in splitting the capsule on the serrate side to facilitate their exit. On hatching, it is said, the young are often kept together by the parent and brooded over and cared for, and at least a colony of young will usually be found associated with one or two other individuals.

"They pass through a variable number of moults, sometimes as many as seven, the skin splitting along the back and the insects coming out white, soft, but rapidly hardening and assuming the normal colour. Their development is slow, and probably under the most favourable conditions rarely is more than one generation per year produced. The rate of growth depends largely upon food and temperature, and under unfavorable conditions the time required for development may undoubtedly be vastly lengthened. The abundance of cockroaches is, therefore, apparently not accounted for so much by their rapidity of multiplication as by their unusual ability to preserve themselves from ordinary means of destruction and by the scarcity of natural enemies."

They will eat almost anything, animal or vegetable, and especially the food materials found in store rooms and kitchens. They will also gnaw boots and shoes, the cloth and leather binding of books, which they sometimes damage very seriously, the paste or sizing used being apparently the chief attraction. In a house that I occupied a few years ago they were very numerous in the kitchen and scullery, and often made their way up to my study on the floor above. One night when I was writing, a specimen climbed up on my inkstand and began to drink the ink. After watching it for some time I killed it, and found the body was completely filled with ink! Evidently nothing comes amiss to them in the way of food.

But besides the loss they occasion by their consumption of supplies, they are almost a greater nuisance from the disgusting odour they leave on everything that they touch, and which cannot be got rid of without vigorous washing with soap and hot water.

Dishes of food left uncovered at night are often utterly ruined in this way by the morning, and their contents have simply to be thrown away.

Remedies.—A clean kitchen, with well-scoured sink and no damp places or neglected dark corners, will usually be fairly, if not entirely, free from these creatures, as the conditions are not favorable to their multiplication. But if they should become established, it is necessary to wage an active warfare against them. First we should recommend a thorough "house cleaning" of the kitchen, pantries and parts adjacent, moving everything under which they could possibly squeeze their flat bodies, and killing all that can be found; then apply powdered borax to all cracks and crevices in the floors, skirting boards, wainscots or walls. This will usually be found effective, and the cockroaches will disappear; but if not fully exterminated at once the powdered borax should be applied again after a short interval. It is, happily, a clean substance, and its use is attended with no unpleasantness.

Another remedy that is highly recommended is the use of Pyrethrum insect powder. This must be fresh and applied liberally to all places frequented by the insects. It is, however, much more expensive than borax, and involves more trouble, as the cockroaches are usually only partially paralyzed by it, and require to be searched for in the morning and destroyed in the fire. If the infested portion of a building can be made air-tight, the insect powder may be burnt and the fumes will penetrate into every crevice and destroy the creatures in their hiding places; but this plan can rarely be carried out effectively. Instead of burning insect powder, bisulphide of carbon might be evaporated with still more deadly effect; but this is too dangerous a remedy to be employed in a dwelling house.

A simple mode of trapping them has been found very useful. Any deep vessel or jar may be used. Place against it a number of sticks bent over so as to project a very little way into the interior; half fill the vessel with stale beer, for which the insects have a special fondness. In the morning great quantities of dead and dying specimens will be found, which have climbed up the sticks and dropped into the liquid within. By frequent use of a trap of this kind the number of cockroaches on the premises may be very satisfactorily reduced.

House Ants.

Next to the cockroaches, the insects mostly complained of by housekeepers for their depredations upon the domestic stores are what may be called the "House Ants," as distinguished from those that live out of doors and rarely come into dwellings. The

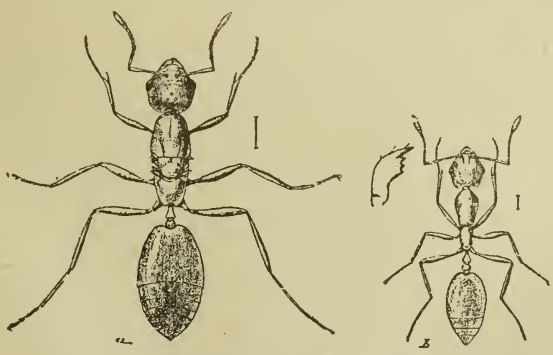


Fig. 34.—The red ant (Monomorium pharaonis): *a*, female; *b*, worker—much enlarged. (After Riley.)

species about which I receive the most enquiries, and which has been very troublesome in my own house in the summer time, is the little reddish-yellow ant (Fig. 34) (*Monomorium pharaonis*, Linn). Another species, about equally common and troublesome is the little black ant (*M. minutum*, Mayr.) The former makes its nest in the house itself as a rule, finding a suitable place under the flooring or in the wall behind the plaster; it sometimes selects for its abode a place near a hot water pipe and in such cases con-

tinues its activity throughout the winter. The black species has its nest out of doors and finds its way in through the crevices of a window frame or some other tiny opening. Both species are annoying, not so much from the amount that they make away with, as from their habit of getting into articles of food, especially sweets of any kind. Frequently the sugar bowl, when brought to table, is found to be swarming with them, or the pot of jam or marmalade that was opened for one meal is full of smothered specimens as well as lively ones when brought out of the cupboard for the next.

It is unnecessary here to enter into any description of the marvellous life-history and habits of ants. Many most interesting books have been written upon their highly organized societies and their remarkable intelligence, among these may be mentioned the works of Dr. McCook and Sir John Lubbock. We are only concerned now to know enough about these tiny species to enable us to deal with them effectively. The individuals that cause the annoyance are all neuters, or workers; the males and females do not appear upon the scene. Should the nest be discovered, there will be found within it one or more females, and a quantity of larvæ and pupæ, which from their white colour and shape are popularly supposed to be eggs. At a certain season of the year, which varies with different species, there may be seen issuing from the nest, apparently in a tremendous state of excitement, a swarm of winged ants, which speedily take flight and from their numbers in the air frequently prove a great nuisance to those whose persons may be covered with them. These winged individuals are males and females, whose marriage takes place in the air. The males soon perish and the females which escape their natural enemies, birds, toads, etc, remove their wings and begin the work of forming new colonies, producing an immense quantity of eggs.

It is evident that the destruction of the workers that come into the house will not exterminate the colony to which they belong. It is therefore all important, if possible, to discover the nest. This may often be done by following the line of advancing and retiring workers till they are traced back to their abode. If at all practicable, without injury to the house, the nest should be destroyed by pouring into it some coal oil or boiling water; where this cannot be done, it may be possible to inject a small quantity of bi-sulphide of carbon, but care must be taken not to have any light near for fear of an explosion, and to air the apartment thoroughly afterwards. In the case of the little black ant, it is often much more difficult to find the nest in consequence of its being out of doors, but when found its destruction is usually an easy matter as it may simply be drenched with coal oil. Failing the discovery of the nest, the only effective mode of getting rid of the nuisance is to entrap aud destroy the ants as fast as they appear. This can readily be done by taking a wet sponge from which the water has been squeezed and sifting fine sugar into it; lay it on a plate or saucer where the ants are in the habit of congregating, and in half an hour or so it will be found full of ants; drop it with its living contents into boiling water and get rid of one host of invaders; repeat the operation from time to time and in a few days the ants will cease to be troublesome. They will, however, appear upon the scene again after some time, when the same process will have to be repeated; but it requires but little time and the expenditure of no large amount of patience.

While housekeepers complain of these tiny ants, gardeners often make enquiries regarding the destruction of the much larger species which disfigure lawns by the great mounds they construct over their nests. A very easy and expeditious method is to be found in the use of bi-sulphide of carbon. Last summer I completely exterminated three colonies on my lawn in the following manner: I purchased a two ounce vial of the bi-sulphide, and at dusk in the evening, when the ants had returned home from their foraging expeditions, I poured about a third of it down the principal openings into the nest and at once covered the whole with a sheet of brown paper. After about ten minutes I set fire to the paper, which caused a series of explosions to take place within the nest. The next morning not a single ant was to be seen, and the mound was easily flattened down. The scorched grass soon recovered, and in a week or two not a trace of the unsightly nest remained. The other two nests were destroyed during the same evening and in a similar manner.

Mosquitoes.

No insect causes so much annoyance and actual suffering to the human race as the Mosquito. It is everywhere prevalent in the summer time and in many localities is so excessively abundant as to be an intolerable pest. Though only active in warm weather it seems that no amount of cold will destroy it. It occurs in prodigious numbers in our Northwest Territories, and, if the travellers' tales from the Yukon and Klondike may be credited, it swarms within the Arctic Circle in such myriads that human beings can hardly live under its overwhelming and incessant attacks.

Though so common an insect and so obtrusive in its onslaughts upon entomologists as well as upon ordinary mortals, it is a remarkable fact that almost nothing was known about the American species till they were recently studied by Dr. L. O. Howard, of Washington, and the results of his observations were published in the volume mentioned at the beginning of this paper. Writers have been content to quote the descriptions given by Réaumur of a European species, which he studied at Paris one hundred and fifty years ago, and have taken for granted that his careful and accurate records made in France are applicable, without verification, to the numerous species that inhabit North America. That the species are numerous, notwithstanding the general practice of speaking of "the Mosquito" as if there were but one kind from the Atlantic to the Pacific, is shown by the fact that Mr. Coquillett has determined twenty distinct species in the collection of the National Museum at Washington, and there is good reason to believe that not half the existing species are represented there.

Fig. 35.—Female mosquito (*Culex pungens*), side view—much enlarged. (After Howard.)

Dr. Howard has made *Culex pungens* (Fig. 35) a species common at Washington, the subject of his special studies, and we may present here a condensed account of his history of its life as being typical of any species with which we may be troubled. The eggs are laid on the surface of water in masses containing from 200 to 400. As seen from above, the egg-mass is gray brown; from below silvery white, the latter appearance being due to the air film. The eggs laid during the night began to hatch at two o'clock in the afternoon of the same day during warm weather towards the end of May, but in cooler weather they sometimes remained unhatched until the second day.

The larvæ (Fig. 36) issue from the under side of the egg masses and are extremely active at birth. In general they pass through apparently three different stages, reach maturity and transform to pupæ in a minimum of seven days When nearly full-grown their movements were more carefully studied as they were more easily observed than when newly hatched. At this time the larva remains near the surface of the water, head downwards, with its respiratory siphon, which takes its origin from the eighth abdominal segment at the exact surface and its mouth filaments in constant vibration, directing food into the mouth cavity. Occasionally the larva descends to the bottom but never remains below the surface for more than a minute at a time. In ascending it comes up with an effort, with a series of jerks and wrigglings with its tail, but descends without difficulty, its specific gravity seeming to be greater than that of water.

The pupa (Fig. 36) differs from the larva in the great swelling of the thoracic segments, and in this stage the insect is lighter than water. It remains motionless at the surface and when disturbed does not sink without effort, as does the larva, but is only able to descend by a violent muscular action. It wriggles and swims as actively as the larva, and soon reaches the bottom of the vessel or breeding-place. As soon as it ceases to exert itself, it floats gradually up to the surface of the water again. The air tubes no longer open at the anal end of the body, but through two trumpet-shaped appendages on the thorax, from which it results that the pupa remains upright at the surface, instead of with the head downward. This reversal of position enables the adult insect, which issues from the thorax, to support itself on the floating skin while the wings are expanding.

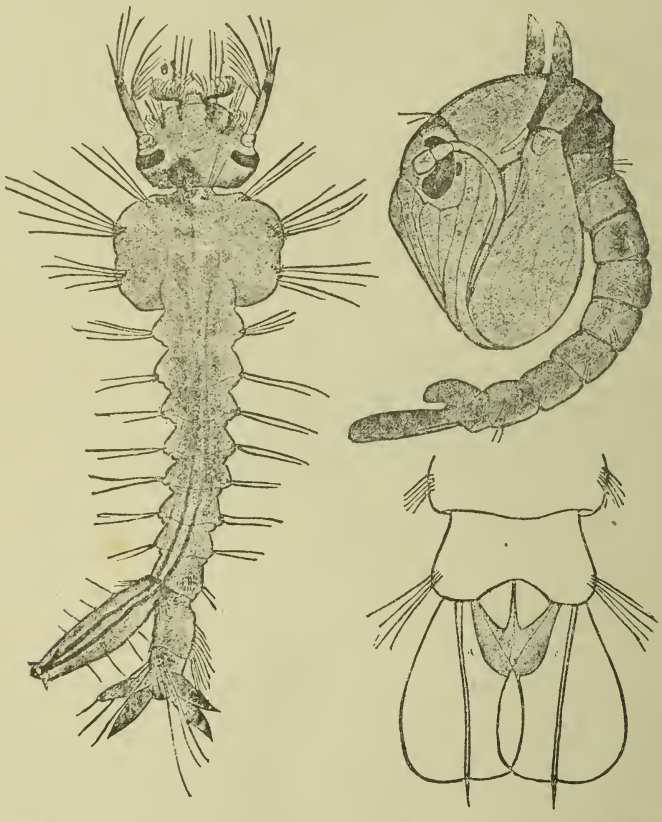


Fig. 36.—Full grown mosquito larva (*Culex pungens*) at left; pupa at right above, its anal segment below—all greatly enlarged. (After Howard).

The shortest time observed for the life of the insect from the laying of the egg to the emergence of the winged mosquito was ten days, during hot weather at the end of June; but the length of time which is required for a generation may be indefinitely prolonged if the weather should be cool. The extreme shortness of this June generation is significant, as it accounts for the fact that swarms of mosquitoes may develop upon occasion in surface pools of rain water, which may dry up entirely in the course of two weeks, or in a chance bucket of water left undisturbed for that length of time.

The insect passes the winter in the adult winged state and frequently resorts to cellars and out-houses for the purpose. The degree of cold seems to make no difference to their successful hibernation, as may be understood from their abundance in the extreme north.

It is a well known fact that the adult male mosquito does not necessarily take any nourishment, and that the female cannot depend upon the blood of warm-blooded animals for its food. Mosquitoes undoubtedly feed normally on the juices of plants, and not one in a million ever gets an opportunity to taste blood. When we think of the enormous tracts of marsh land into which warm-blooded animals never penetrate, and in which mosquitoes breed in countless numbers, the truth of this statement becomes apparent.*

Remedies.—To prevent the annoyance of mosquitoes in houses, particularly in bed-rooms, it is a good plan to burn a small quantity of pyrethrum powder, about enough to cover a fifty cent piece, heaped up in the shape of a cone and lighted at the top; this will suffice for an ordinary sized bed-room. The fumes penetrate to all parts of the room and stupify the insects for some time. Should they revive, the operation may be repeated. Of course the door and windows should be closed for the time being in order to prevent the escape of the smoke from the burning powder. A quiet night may also be secured by killing all the mosquitoes that are to be found resting on the walls and ceiling of the room. The latter may be reached by tacking the lid of a small tin box to the top of a sufficiently long stick and putting into it a spoonful of coal oil. If this cup is shoved under a mosquito on the ceiling it will at once try to escape, and in its efforts fall into the coal oil and end its existence.

A far more important matter, however, is the destruction of the larvæ, or the abolition of their breeding-places. In our Annual Reports for 1892 and 1893, papers by Dr. Howard were published in which he gave most interesting details of his experiments with coal oil for the destruction of mosquito larvæ. It need, therefore, only be mentioned here that the method consists in pouring a thin layer of coal oil over the surface of the water in which the insects are breeding. The larvæ and pupæ, we have seen, live almost entirely at the surface of water and cannot remain beneath for more than a minute at a time. The coal oil will at once fill up their breathing tubes and cause immediate death. Large numbers also of the female mosquito will be destroyed before their eggs are laid, as it has been found that the coal oil does not deter them from trying to deposit their eggs on the surface of the water. This method, of course, can only be employed in the case of pools of stagnant water of no very large dimensions. When the breeding-place of the mosquitoes is too extensive to admit of this treatment, their numbers can be kept in check by the introduction of small fish into the waters. But the most fruitful places for the production of these pests on a large scale are swamps and marshes. Nothing but their drainage, which may prove a profitable undertaking for other purposes, will suffice for a cure. Rain water barrels and similar receptacles, which are common about houses in the country, produce swarms of mosquitoes during the summer and these readily find their way into the rooms so close at hand. All such vessels for holding water should be kept closely covered, especially at night, when the female mosquitoes resort to them for the purpose of laying their eggs.

Fleas and Bugs.

The consideration of the blood-thirsty mosquito leads one on to think of other insects that have similar evil propensities and that sometimes become a torment to suffering humanity. Fleas are now rarely met with in the older settled parts of Canada, though they were common enough thirty years ago; occasionally, however, a house may be found to be infested with them. Dr. Howard states that the species most frequently sent to the Department at Washington from cities in the Eastern States proved to be the cosmopolitan flea of the dog and cat (*Pulex serraticeps*), and not, as was supposed, the human species (*P. irritans*). This accounts for the rarity of these pests in well-ordered houses where the dogs and cats are kept clean.

*For many interesting particulars regarding mosquitoes, see a paper by Mr. J. A. Moffat in the 24th Annual Report, 1893, page 43.

Fleas (Fig. 37) belong to the order Siphonaptera, a name derived from the sucking apparatus of the mouth and the absence of wings in the adult insect. The body is oval and greatly compressed, allowing the insect to move freely between the hairs of the animal upon which it lives; it is also very hard and smooth, enabling the creature to slip away from between the fingers of its captor or the teeth of a dog. Its escape is also facilitated by its long and powerful legs, which enable it to leap an immense distance when compared with the size of its small body. Its eggs are laid between the hairs of the infested animal, but are not fastened to them, so that when the animal moves about or lies down they are shaken off to the floor or ground. The larva, which is very minute and rarely seen, except by those who search for it for purposes of study, lives upon the animal and vegetable matter contained in the dust to be found in the cracks of floors or the sleeping-places of animals. The frequent sweeping and scrubbing of the rooms in well-ordered households is, no doubt, an effectual preventive of their development.

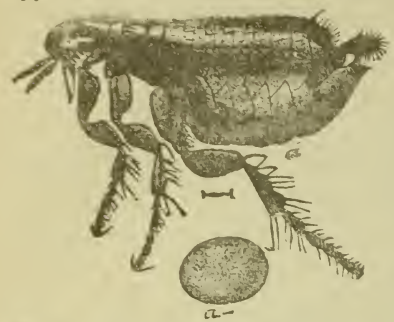


Fig. 37.—Adult flea (*Pulex serraticeps*): *a*, egg, both much enlarged. (After Howard).

Remedies.—Should a dog or cat be found to be infested with fleas it should be thoroughly dusted with insect powder, and its sleeping place turned out and cleaned. Any bedding it has lain upon should be burnt and fresh material such as straw or shavings, be supplied and frequently renewed. The kennel should also be washed inside with some coal oil or benzine. If any rooms in a house are infested, the carpets or rugs should be taken up and thoroughly beaten and shaken out of doors and the floors scrubbed with hot soap and water. An ingenious plan for exterminating the lively adults was adopted by a Professor in one of the buildings of Cornell University. He tied sheets of

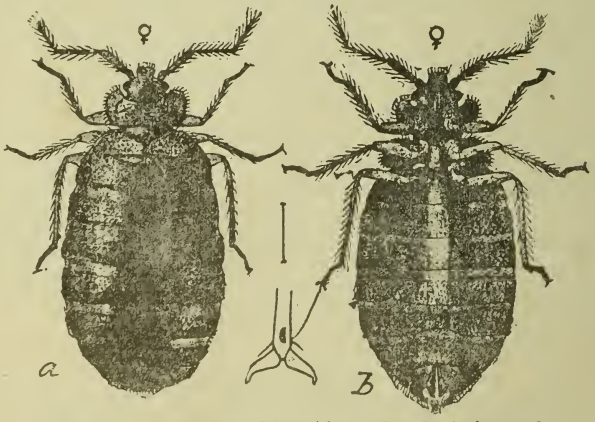


Fig. 38.—*a* Female bed-bug (*Cimex lectularius*)gorged with blood; *b* same, from below—much enlarged (after Marlatt).

sticky fly-paper, with the sticky side out, around the legs of the janitor of the building and kept him walking for some hours up and down the floor of the infested room. Nearly, if not all, the fleas jumped on his ankles, as their invariable habit is, and were caught by the fly paper!

The Bed-bug (Fig. 38) is, unhappily, a well-known pest all the world over, and though usually confined to houses of the meaner sort where cleanliness is not regarded as a virtue, it frequently finds its way into well-ordered households, to the great dismay and horror of the inmates. It belongs to the order Hemiptera, which includes the true bugs, a race of insects provided with a piercing and sucking beak, and usually furnished when fully grown with two pairs of wings, the first pair of which are thickened at the base like

the wing-covers of beetles, but only covering about half the back, the remainder being thin and membranous. The bed-bug, however, is destitute of wings, otherwise it would probably be a far more common pest than it is ; in colour it is reddish brown ; the body is round or oval in shape and very flat, so that it can easily crawl into cracks or crevices in furniture, walls or floors. The writer has on several occasions been compelled to deal with these disgusting creatures, when occupying for the first time some premises that had been previously inhabited by dirty, careless people. Once it was a cottage containing four or five rooms that was intended as a dwelling for a laundress and her family. It was found to be swarming with bugs. The windows, doors, etc., were stopped up and made as air-tight as possible, and then powdered sulphur was set on fire in an iron vessel in each room and left till the following day. This was repeated two or three times ; the house was then thoroughly scrubbed and the walls freshly papered. It was a great satisfaction to find that the method adopted was perfectly successful and not a single bug was afterwards seen. In the case of furniture, especially wooden bedsteads, the best plan is to apply benzine or coal oil to all joints and crevices which may harbour the insect, and repeat the operation till there is no doubt of its extermination. The benzine may be forced into the crevices by means of a fine syringe, or with a small paint brush. The liberal use of hot soapsuds to all woodwork is also of very great value.

Among other household insects one of the worst pests is the Clothes Moth, a full account of which was given by Dr. Fletcher in our Twenty-third Annual Report, 1892, page 53 ; it is unnecessary therefore to deal with it here The Cheese or Meat Skipper, a serious trouble at times in the larder, has also been recently discussed by Miss Mary E. Murtfeldt in the Twenty-fourth Annual Report, 1893, page 98.

Library pests are not a serious trouble in Canada so far as I am aware, but in more southern and damper climates they are often very destructive. It was highly gratifying to learn a few months ago that the annual reports of the Entomological Society of Ontario had been the means of saving the public library at Hamilton, Bermuda, from a threatened destruction. During the winters of 1892 and 1893 I had the pleasure of spending a few weeks in those delightful isles, and on each occasion was kindly welcomed by Mr. F. T. Frith, the librarian. He was much distressed by the abundance of a "book worm" which was doing much damage to the bindings and the inside of the backs of many of the volumes in his charge. The insect was evidently a species of *Lepisma*, commonly called "the silver fish," from its peculiar form and scaly body. At the time I recommended the use of insect powder as a possible preventive, though it could not be very conveniently used without the risk of soiling the books to some extent. As a result of my visits our annual reports have been regularly sent to the Bermuda library, and Mr. Frith now tells me that he has carried out with complete success a method of destroying the insect that he learnt from these pages. In the Twenty-fourth Report, 1893, page 94, there is an article on "Fumigation with bisulphide of carbon for the complete and rapid destruction of the insects which attack herbarium specimens, furs, woollens, etc" and a description is given of a fumigating chest for the purpose. Mr. Frith adopted the plan and had several wooden chests made, lined with zinc, carefully soldered at all joints. Around the upper edge of the box a gutter of zinc was made and filled with water, into this falls a flange of metal from the lid and thus the box is perfectly sealed and no air or vapour can pass through. In these boxes he placed as many books as they would hold and on the top of them an open vessel of bisulphide of carbon. The liquid soon evaporates and the vapour, being heavier that atmospheric air, gradually penetrates to the bottom. The books were left in the chests for a day or two, and then they were replaced by others, until the whole of the library was gone over. The operation has proved thoroughly successful and now no obnoxious "book-worms" are to be seen, whereas formerly scarcely a volume could be opened without finding one of these creatures. Thus has the Entomological Society of Ontario saved from destruction the public library of Bermuda !

ON THE ENTOMOLOGICAL RESULTS OF THE EXPLORATION OF THE BRITISH WEST INDIA ISLANDS BY THE BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

By L. O. Howard, Ph. D.

The extremely interesting and important work which is being done under the auspices of the British Association for the Advancement of Science, in the way of an exploration of the fauna and flora of certain of the West India Islands, has attracted a great deal of attention in this country. The comparatively large sums of money at the disposal of the British Association enable it to carry on many lines of investigation of greater or less importance. To working zoologists, however, the Association has never done anything of greater importance than the present investigation.

In 1887 the first appropriation of £100 was made by the Association. In 1888 the committee in charge of the work co-operated with the sub-committee of the Government grant committee of the Royal Society, and an additional appropriation of £250 was made. That year, as a preliminary step, a bibliography of the published writings on the fauna and flora of these islands was published in the Report of the British Association. In 1889 Mr. F. du Cane Godman, who has done so much good by his survey of the fauna and flora of Central America, co-operated with these committees by sending Mr. Herbert H. Smith, the well known American collector, at his own expense, to St. Vincent. The Association this year made a further grant of £180. In 1890 Mr. Smith had already collected and sent in 3,000 insects from St. Vincent, and the announcement was made that Mr. Godman had continued his employment and sent him to Grenada. At the close of the year 1891 investigations had been made in Dominica, St. Lucia, Barbadoes, St. Vincent, the Granadines, and Grenada. In 1892 the reports upon the insect material began to be published. Practically the material in hand in entomology consists of Mr. Smith's collections, covering a period of two years or more in the islands of St. Vincent and Grenada. These islands are respectively the next to the northern-most and the southern-most of the group known as the Windward Islands—St. Vincent lying directly south of St. Lucia, and Grenada forming the bottom of the chain of the lesser Antilles, bounding the Caribbean sea. Grenada lies only about seventy-five miles from Trinidad, and Trinidad, as is well known, possesses practically a South America peninsula fauna. The careful survey of the results of the collections upon these islands, therefore, should reveal many interesting facts regarding the distribution of species, the most important of which will be the determination of the continuation of the Central American fauna, which holds, as we know, in the main, for the larger West India Islands, running from Yucatan and Honduras through Cuba, Jamaica and San Domingo. Does this fauna persist down through the lesser Antilles, or do we have in these extreme islands a fauna more similar to that of the closely adjacent coast of South America, or is there a coast fauna common to these islands and the entire coast-line of South and Central America ?

In these investigations the British committee has shown an energy and catholicity of spirit very much to be admired, and which is quite in common, it seems to me, with the general trend of British scientific work. The smallness of their own home island and the thoroughness with which the insects are known has driven British entomologists to all quarters of the globe in search of new material. The British systematists in entomology to-day are concerning themselves with collections from all sorts of out-of-the way places. Wherever the British traveler goes (and the British are famous travelers), a collection of insects is apt to result, and there is usually in England some worker who is ready to undertake the description of the new forms. This is particularly the case with the larger and better known orders, Lepidoptera and Coleoptera. Outside of these groups the committee has found it desirable to ask the assistance of foreigners, both on the continent of Europe and in America. The material has been thus distributed in the hands of many entomologists and the work of describing and classifying goes merrily on. Already, although as previously stated, it was only in 1887 that the investigation was first begun, papers have been published by Lord Walsingham on the Microlepidoptera ;

by Simon on the spiders; by Bruner von Wattenwayl on the Orthoptera; by Uhler on the Hemiptera; by Forel on the ants; by Matthews on the Trichopterygidæ and Corylophidæ; by Peckham on the Attid spiders; by Kirby on the dragon-flies; by Gahan on the Longicorns; by Champion on the heteromerous Coleoptera; by Williston on the Diptera; by Waterhouse on the Buprestidæ, and by Ashmead and Howard on the parasitic Hymenoptera. There are papers in preparation by Blandford on the Scolytidæ; by Butler and Hampson on the Heterocera; by Champion on the Elateridæ; by Gahan on the Phytophaga and Lamellicornia; by Kerremans on the Buprestidæ.

I have been much interested in examining all of the papers which have been so fa published on the insect collections I have seen them all, except Dr. Williston's "Dipter of St. Vincent," which, although just published, has not yet reached me, and a paper by Warren, on "New Genera and Species of Geometridae," in which, I learn from the Zoological Record of 1894, no less than 170 new genera have been proposed. The remaining papers cover a rather large field, including groups of Coleoptera, Lepidoptera, Hymenoptera, Heteroptera, Hemiptera, and Arachnida, although in no one group have the entire results appeared.

A brief summary shows that exclusive of the two papers just mentioned, 1472 species have received consideration up to the present time. Of these 789 are new to science while 683 have previously been described. These 1472 species are distributed in 836 genera, of which 75 are new. What a notable contribution to science we have, even at the present time!

In attempting to summarize the conclusions of the different authors in regard to the character of the fauna considerable difficulty is experienced. In many of the groups descriptive work is not enough advanced to allow accurate generalizations and in others certain of the workers have seemed indifferent to the broad interest attaching to this side of the investigation. In Mr. Champion's work upon the Heteromera it is stated that all of the genera except four are common to Central America, and all except eight have been found in South America. Ten are common to Central America, but he states, in general, that taken as a whole, the material studied by him shows a considerable affinity with the fauna of the northeastern parts of South America. The number of endemic genera are very few and the endemic species closely allied to the South America forms. As a result of Uhler's studies of the St. Vincent species he shows that the collection of Homoptera "is an assemblage of forms, mostly small and neat, which offer a striking contrast to the large and showy insects that inhabit the regions of the South American continent, a few hundreds of miles away. It is not, however, to this nearest part of the continent that we must look for the source of distribution from which this assemblage was derived. The Mexican character of the fauna seems unquestionable." In his consideration of the Heteroptera of Grenada he says that "the hemipterous fauna is Central American. It is largely composed of forms which belong to the borders of the tropics, rather than of such distinct tropical ones as inhabit the South American continent." Lord Walsingham, in his consideration of the micro-Lepidoptera, says that the forms are decidedly American, ranging northward to the southern and western portions of the United States and southward as far at least as Brazil; "the majority, however, certainly belong to the truly Central American fauna." In this sentence however, Lord Walsingham speaks of the West Indies as a whole, when, as a matter of fact, of the forty-six species which he describes from St. Vincent, thirty-eight were new while two had previously been found in Brazil, four in the United States, one in Venezuela and two were cosmopolitan. Of the species studied by Mr. Simon from St Vincent, about eighty per cent are new, although a considerable number of the novelties were known by him from his own collecting to occur in Venezuela. Of the old species all had previously been found in northern South America, Central America, or southern United States. Only two, in fact, range into the United States. Mr. Gahan simply indicates "a pretty close relation between the West Indian fauna and that of tropical America." Dr. Williston writes concerning the Diptera that most of the forms were minute and consequently belong to groups that have been but little studied from South to Central America. The relationships he considers to be decidedly South American.

Of the parasitic Hymenoptera described by Mr. Ashmead and myself the condition is much like that mentioned by Dr. Williston. The study of the South and Central American forms is not sufficiently advanced to enable any definite conclusions. Mr. Ashmead is of the opinion that the general character of the collections in the families which he has worked up is Central American, but it is only fair to say that the only South American collections which can be compared are those made in the interior of Brazil by Mr. H. H. Smith.

And this introduces what is probably the pith of the whole question of distribution. We must have full collections from the coast of North and South America, as well as full collections from the interior, with elevations carefully noted, before we can speak authoritatively. It has been suggested that the coast fauna of the entire Caribbean Sea is practically the same and that the tableland further to the interior is also practically the same. That many Central American forms extend through the chain of West India islands is undoubted, but whether the entire character of the fauna from one end of these islands to the other is Central American, yet remains to be proved. The opinions which I have quoted show the uncertainty which yet exists, but it is to be hoped that with the publication of the other papers, and the consideration of the entire results, there may be some satisfactory outcome.

It is gratifying to observe that American systematists are receiving deserved recognition at the hands of the British Committee. No less than eight American entomologists have been or are engaged upon the collections. It is a pity, however, that investigations of this character, so pregnant in possibility of valuable results, cannot be undertaken under American auspices. Our lack of thorough knowledge of the faunas and floras of the many interesting regions within our own domain is apparent to all workers. Our own Association is too poor to make successive grants of the magnitude of those made by the British Association, but the subject is one which should be agitated by all of us. Explorations are being made by the general government and by educational institutions, but in general, although the plants and the larger animals receive a fair degree of attention, the minute creatures, and particularly the insects, are, in the main, neglected.

PROTECTIVE RESEMBLANCES.

By J. Alston Moffat, London, Ontario.

That the harmonizing of living beings to their surroundings in nature is protective in its influence, does not admit of a doubt, and those who have had the greatest opportunity for observing life in its native conditions are those who are most impressed with the fact. Tropical countries are those where examples of it are most numerous, and probably more striking than in temperate and more northerly regions, for one good reason at least, that life there is more abundant and diversified; and in insect life especially is this the case. Writers upon the subject draw their most surprising examples of it as a rule from southern sources, yet many instructive illustrations of the same principle can be found in our own country. Everyone that has engaged in the health producing and delightful recreation of collecting and observing the habits of insects during a ramble over mountain and meadow, through wood and marshes, or along a lake shore, can give of his own experience instances of how completely his senses were imposed upon by appearances. A familiar example is the Geometrid larvæ that resemble closely the branch of the tree on which they rest, some of them standing out at an angle from the branch like a bit of broken twig, that requires close observation to make sure that it is not what it appears to be. Or Catocala moths, that are so much like the bark of the tree upon which they are at rest that even a trained eye does not always detect them. When collecting them in the day time I have switched a tree, started one and watched it alight upon another, then got within four feet of it and many a time failed to discover it, although I knew it must be right before my eyes, and had to start it again before I could get another sight of it. So closely at times does the animate resemble the inanimate.

Loitering in a bit of open wood on a hot day, with the mind more active than the body, my eye was arrested by the unusual appearance of a particular spot upon a moss-covered tree. My mental reflection was : How much that bit of moss has assumed the appearance of a moth. I looked closely. It seemed to be a bit of moss only ; I gave it a punch with the end of my cane when a desirable specimen of *Agrotis prasina* fell to the ground, ruined.

Having made the discovery that many of the fall moths rested during the day in the shrivelled leaves remaining attached to the trees and bushes, and that a sharp stroke with a stick would bring them to the ground as if dead, I struck an oak branch, something dropped. I recognized nothing but bits of tinted leaves on the ground, and was on the point of moving on when it occurred to me that it fell too heavily for a bit of leaf, then I looked intently, stooped down and examined closely, when I detected the form of a moth,and such a beauty as I thought I had never seen before ; my first specimen of *Xanthia togata,* arrayed in golden yellow and purplish brown, blending into and harmonizing perfectly with the tints of the decaying vegetation around it.

The first *Cryptolechia Schlægeri* that I came upon, with its pure white patches and dark and light gray mottling, resting conspicuously on the upper surface of a dark green leaf, and its wings so tightly rolled around its abdomen that the thorax and head formed a lump at the one end, whilst it tapered off to a sharp point slightly turned up at the other, I found it utterly impossible in the "dim religious light" prevailing under the leafy dome of a virgin forest, to decide whether it was the dropping of a small bird or an insect. So to settle the question I jarred it into my open umbrella when it rolled down the side without showing the slightest signs of life and I had concluded to dump it on the ground, but when it reached the level it gave a hitch to regain its feet, and it was dumped into my collecting bottle. *C. Schlægeri* was always a rather scarce moth with me ; one and two in a season was usually the limit of my captures, and sometimes a season would pass without my seeing one. Upon one occasion I thought myself in great luck ; I had not been long at one of my hunting grounds when I espied the now well known object in its usual attitude on the surface of a leaf. I secured it and very soon I got another ; whilst looking around I detected at a little distance the indication of a third. I thought to myself, they are plentiful to-day, so moving towards it I was in the act of enclosing it, when my opinion changed. Oh ! That's it, is it ? Ah, well, it can stay there ; it was the reality this time, not the resemblance.

Strolling in a beech wood one sultry day, and feeling oppressed with excessive heat and want of success I sat down upon a fallen tree. Whilst contemplating the surroundings my attention was arrested by what appeared to be some dried beech leaves attached to a fallen branch that was lying about four feet in front of me and about eight inches from the ground. They were of the same bleached-brown color as the leaves that covered the ground everywhere around. They were partially erect, and seemed to be but loosely attached to the dead branch, as they trembled with every passing zephyr, and they had a decidedly ragged appearance. I could not see anything that held them to the branch, there was no spider web visible, yet they remained suspended. I looked and I wondered, and the more I looked the more I wondered, until at last curiosity overcame my disinclination to exertion, I rose and examined, when I found that I had got a perfect specimen of *Cressonia juglandis.* The deceptive appearance was so complete that it had never entered my mind to suspect it to be a living creature of any kind.

These are a few examples illustrative of how resemblance can be protective to the lives of insects against the raids of collectors, but there is a condition that has to be associated with it to render it perfectly effective, and that is complete motionlessness. Let any insect resemble the substance upon which it is resting ever so closely but move, it has exposed its individuality and its doom is sealed. Life is associated in the human mind with motion. In this case the parallel between man and the lower animals is exact. A large proportion of the carnivora prefer to secure their food in a living state, and for that purpose wait to see it move before seizing it. Travellers inform us that lions and tigers of the jungle will not spring upon a motionless object, and that safety

in an emergency may be secured by feigning death. There are families of birds that take their food only on the wing. A fly is perfectly safe within three inches of a toad's nose if it remains still, but let it attempt to secure safety by flight and it instantly ceases to be an independent portion of animate nature. This gives some indication of how important a matter it is for the safety of insect life that they should remain perfectly still.

But there is another important question that has to be taken into consideration in this connection, and that is the condition of the eyesight, and there is a wide diversity in the zoological world in this matter, from that of the most perfectly developed, to where it is a point in dispute if they have any at all. Yet the ordinary vision of every portion of it is nicely adjusted to its needs. That man's eyesight is not all that he would like is made abundantly plain by his invention of the telescope and microscope, and his constant effort to improve and extend their powers, and that the vision of many of the lower animals does not even reach his is undoubted. The question has often been discussed whether insects have any consciousness of form and color. I am quite certain that a humming bird does not know a man from a post if he remains perfectly still. I have had a Pewee come in contact with the hand that was holding a bottle against a tree in its eagerness to secure a Catocala fluttering within, seemingly wholly unconscious of my presence. Many a time when resting in the woods has a ground squirrel come out of its hole close by me. It seemed to realize at the first glance that there was something unusual there, but whether there was danger in it or not it could only discover by investigation, so with that object in view it would come cautiously toward me and would approach so close that I have thought it would climb upon me if I could have kept perfectly still, but my breathing would excite its suspicion. We have the testimony of sportsmen that it is movement that excites alarm in game and makes it seek safety in flight, not the form of the hunter. Hence the utter worthlessness for the purpose intended of those hideous objects we see erected in fresh sown grain fields, and called "scarecrows." They lack motion, or it is of a rythmical order, and observation soon leads to the conviction that there is no danger in their presence, then familiarity breeds contempt. So then motion is regarded as a sign of life throughout the whole animal world, whether it be in the securing of proper food on the one hand, or as a warning to escape from the feeders on the other, and motionlessness is one of the best means of defence against those that are seeking life to take it, and in the insect world it plays a most important part.

But if insects have very defective eyesight as judged by our standard, they have a complete advantage over us in the faculty of scent. Their power of locating their mates is well known and phenomenal. One example more. Being in an open wood on an early November morning with a light fall of snow on the ground, I saw two moths about forty feet in front of me and about thirty feet apart flying towards each other. I hastened forward to see what they were. They passed out of sight behind a tree about four feet from me; I stepped round it, one of them flew away, the other was secured by the wingless female of an Anisopteryx. And it is quite reasonable to suppose that this faculty is of advantage to them in other respects, such as in securing their food and in deciding upon the correct location for ovipositing. There are certain ichneumons that confine their attention exclusively to some particular kind of larvæ. If they have no power to distinguish between the form and color of the various kinds of caterpillars, then it must be by scent that they are guided in their choice, whilst movement on the part of the larvæ would enable them more readily to locate the object of their search.

There is now the question of how much can be learned from observation and experience. We know how much man is indebted to it for his knowledge and wisdom. Practice will enable one person to detect an object where one without it would see nothing; it also sharpens the faculties to distinguish between things that differ, and to the very last he is gaining knowledge by means of it. Many of the lower animals can be educated to some extent in a similar manner, and many of them have been brought to exhibit a wonderful degree of intelligence in that particular direction to which they are naturally inclined, and there can be little doubt but many of them in a state of nature acquire considerable knowledge in their life time, how best to conduct their

affairs in the condition in which they find themselves placed. The ground squirrel gave unmistakable evidence of being possessed of memory, which is the foundation on which education is built, hence it is capable of being instructed up to the limits of its faculties. How far short-lived insects that come into the world thoroughly under the control of a few desires which they devote their whole time and energies to the gratification of, and whose faculties at the moment of their birth are complete for all the requirements of their existence, do, or can acquire further knowledge by experience for the better ordering of their lives, is a good deal of a problem yet to be solved. I am aware that there is a doctrine of "cumulative mental inheritance," but into that I do not enter. A peripatetic professor gave a lecture upon the "occult sciences." At least, said a reporter, that is what he was advertised to lecture upon, but it is doubtful if there was one in the audience that knew what he was talking about. But then, added the reporter, it is doubtful if the lecturer had the slightest advantage over the audience in that respect.

NOTES ON THE SEASON OF 1897.

By J. Alston Moffat, London, Ont.

The weather here during the past summer was of a decidedly unusual character The spring opened finely, but May and June were uniformly cool with frequent rains, vegetation progressed steadily but very slowly. July maintained its character for heat, a succession of excessively hot days in it, with heavy showers throughout the month. August was uniformly cool with less rain, and some light frosts at its close; whilst the first part of September was warm, it closed with killing frosts, and the month was excessively dry throughout. Such conditions had a marked effect on insect life, retarding and confusing the appearance of many species, whilst it would no doubt be the means of destroying numbers of them. The ordinary cut-worm moths were present to some extent, but none of them were reported here as being noticeably destructive. The army-worm seems to have retired again to its usual obscurity; but there were plenty of the moths about the lights late in the season, to keep the breed alive, and be ready to produce a future outbreak when the conditions are specially favorable. The frequent rains seemed to have a disastrous effect upon the web-worms, as at no time during the season were their offensive-looking tents at all conspicuous. During the early part of September I noticed the clover-leaf weevil, *Phytonomus punctatus*, Fab, in considerable numbers on the streets of London, indicating that someone's clover had been suffering in this neighborhood. Whilst on a visit to Essex, I saw in the collection of Mr. E. N. Laing a Tobacco sphinx, *Protoparce carolina*, Linn, which he had reared from the caterpillar, and as tobacco is now being grown quite commonly in that region as a regular commercial crop, this species may yet become abundant. In a school collection made not far from London, under the superintendance of the teacher, Mr. J. W. Atkinson, and exhibited at the Western Fair, I saw a specimen each of *Megalostoma* (*Colias*) *cæsonia*, Stall (Fig. 39), and *Terias lisa*, B.L. What a splendid thing it would be for our country if every school teacher was an interested collector in some department of natural history, as his example would give a respectable standing to the habit of observing and taking an interest in those simple objects of nature that are strewn so profusely around us, with all the educational, elevating and refining influences associated with it, and which is such an inexpensive means of securing untold enjoyment to those who engage in it. Natural history is now being taught in our schools; to what profit is not apparent. It is set as a task which

Fig. 39.

has to be learned to pass an examination, and when this is accomplished it is thrown aside as having served its purpose. It may be true, and very likely is, that "Naturalists" like "Poets" are born, not made; yet I have known parents to prohibit their children indulging a strong inclination to collect natural history specimens, which they greatly admired and in which they took much pleasure, for fear that it might interfere with their school lessons. And by the time they had left school they had lost all taste for natural history. A young lady whose father is known in his locality as an artist and a geologist, and whose brother stands very high in financial circles, but has also gained for himself a name in geology, told me that she was once at a bazaar when her uncle, her mother's brother, said he would pay for anything she liked to take from a particular table. She choose an odd-looking shell in the rough. He scouted the idea, and wanted her to decide upon something that he thought was of some value. But no; she wanted nothing but that shell; and she wanted it very badly. Then handling and looking admiringly upon her treasure she thoughtfully remarked: "We inherited that propensity." From your father's side, I remarked. Oh! she exclaimed, laughingly, there is nothing of that sort whatever on our mother's side. I knew a woman whose boy was given to collecting natural history specimens, and would take them to his mother and would speak of their beauties or peculiarities, and she would look and listen with apparent interest, but she confessed to me that she could see nothing of what he was talking about in them. She did not let him know. She knew they were to him a great source of innocent enjoyment, the treasures which his heart instinctively turned to, and which drew him to his home, and made it exceedingly pleasant for him to stay there; and she was pleased. Wise woman, if unfortunately defective in her perceptive faculties. A personal collection is what is wanted to give interest and permanence to the study of natural history. Whilst others derive benefit from looking at it, it may help to induce them to begin one also.

Elaborate discourses have been given upon "How to study Natural History." Some of them well calculated to crush out all aspirations in that direction, as they land you at once in a tangle of unintelligible phraseology. We have, I dare say, all heard the directions for, how to cook a hare: "First, catch the hare." To any one who has a desire to obtain some knowledge of the natural sciences in any of its numerous branches I would say, first collect your specimens. That is, such as are conveniently obtainable, which excludes astronomy and seismology. Then examine your specimens, when you will probably learn something about them that you did not know before. This may induce you to look at them again, to discover yet something more. Taste can be cultivated, and the faculty of observation is sharpened by exercise. Then you will likely want to collect more, as your curiosity may have become excited; curiosity leads to inquiry. Enquiry when judiciously exercised leads to knowledge. Knowledge when obtained is gratifying, and in time the pursuit of it becomes a perfect pleasure. And the more you know the easier and pleasanter it becomes to acquire more. Then keep that up, a little now and a little again, and very soon you will find it such a delight that, no matter what your condition or occupation may be, you will find some time and opportunity to indulge in it. And if you are endowed with capacity, endurance and perseverance you may attain to the very highest position in your department; but do not expect to begin there; it is not the rule at school to begin with mathematics and work down to the alphabet.

A professor of natural history in a prominent educational institution wished to obtain transparent wings of insects, such as the Neuroptera or gauze-wings, to make lantern-slides of to throw enlarged upon a screen. These I was much pleased to provide him with, and interesting and beautiful objects some of them made. He also wanted the sting of a bee. It was winter. I said I could give him dried specimens, but he might find it difficult to secure a perfect one from such; but from a fresh specimen it could be easily obtained. How? he inquired. Just squeeze the abdomen and it could be cut off perfect, root and all. And where is it situated, in the mouth? Oh, no, I replied, at the other end. But a mosquito's is, is it not? That man knew a good deal about many things, but he must have commenced to learn about where the people usually leave off. We find many men who seem to have forgotten that they ever were boys; but one would be almost ready to believe that the professor had never been a boy.

My own work during the season has principally been, delightedly observing the results of Mr. Bice's collecting at electric light. I have thought it would be an excellent method of determining the time of appearance of different species; and if they were single or double brooded. I was somewhat surprised to see *Scoliopteryx libatrix* appear in the spring, as I had always regarded it as a strictly fall moth. The specimens were too fresh, and rather late in the season to have hybernated. *Nomaphila noctuella* I have often wondered about. It appeared about the first thing in spring, in a sadly worn and dilapidated condition; clearly indicating that it had been sporting in the grass during the warm days of the previous autumn, and continued without intermission to the end of the season. Mr. Felt, *Can. Ent.*, vol. 25, p. 131, says: "There seem to be three broods a year." But I suspect that the broods must overlap, as they were never wholly absent. In mid-summer they were unusually plentiful, with an endless variety of ornamentation; from a uniform light-brown with numerous dark brown dots, to a yellowish-brown with three heavy dark brown transverse bands on their long narrow front wings.

In the September number of the "Entomologists' Record" is a note on "The Attractiveness of Light," signed W. Grover, Guildford, dated July 9th, 1897, in which, after relating that he had found some colored lights more attractive than ordinary light, enquires "Why is light attractive to the males only of so many species?" This was an idea new to me, although we had been having some experience on that very line without suspecting the cause. In the early part of September, the males of *Tolype velleda* (Fig. 40) were in great abundance, and those of *laricis* in goodly numbers. Mr. Bice had a pair of *velleda* of last year's take, but he wanted females of *laricis*. He knew that the female *laricis* was light like *velleda*, but smaller, and he wanted me to give him the distinguishing marks of female *laricis* when at rest, as he was tired taking male *velledas* in a futile attempt to get the female of the other. This I found it very difficult to do; I could separate them by the antennae and the form of the abdomen, but to give a recognizable discription of the front wings to separate the two, I did not at the time seem capable of doing. So I requested him to get me a lot to see what I could make out of them. He then brought me a bottle full, so I began pinning, spreading and drawing out their antennae, which they keep completely out of sight under their shoulder pads. After filling two setting boards and finding only male *velleda*, I began to get tired. So I pinned the male *laricis*, then turned up to view all the rest, when I noticed two differing from the others in the whiteness of the upper surface and deeper scollops in the dark outer band, so I pinned and spread them and found they had bristled antennae and rounded abdomens, which confirmed my expectations that they were female *laricis*. Being under the impression that the females would appear later, I took Mr. Bice a specimen and pointed out to him how he might recognize female *laricis* when at rest, but he saw no more of them. I also requested him to get me a lot of female *velleda* to go with the males I had spread; he secured one, and could get me no more, when they totally disappeared shortly after. The rule in this case was not absolute, but it seems to point in the same direction as Mr. Grover's experience; and it is well to be warned in such matters what one has to expect, but the query remains, why is it so? It is known that female insects as a rule are less active than males; and in this case it would be quite excusable for such a portly, richly-robed dame, to refuse to join the revelers by night and dance around a light-pole; yet some of them did, but it may be placed to the credit of the sex that they were not the noblest of their kind.

Fig. 40.

Mr. Bice has again secured quite a number of fine moths new to the Society's collection. Those that I have thus far been able to identify are a single specimen of *Thyatira pudens*, Guen. This seems to be a very rare insect in this country. The large spots on the front wings are a silvery white with the faintest tinge of pink. In Guenee's colored figure, plate 3, fig. 1, they are altogether pink. A single specimen of that large and handsome geometer *Selenia kentaria*, G. & R., and perhaps the first

reported from Canada. It is much deeper in the reddish-brown of the underside than is represented in Mr. Grote's colored illustration, fig 5, plate 1, vol. 1, Trans. Amer. Ent. Soc. Phila. A single specimen of *Aplodes rubromarginaria*, Pack. Also one of *Plagodes Kentzingaria*, Pack. One of *Gortyna speciosissima*, G. & R., a particularly attractive species, illustrated on plate 7, fig. 52, vol. 1 Trans. Am. Ent. Soc., Phila. Also a sphinx new to Canada, *Dilophonota obscura*, Fab. Dr. J. B. Smith directed me to his description in the "Transactions of the American Entomological Society, vol. 15, page 157, where it is clearly defined. He gives the habitat as, "Pa.(?) Texas, Mexico, West Indies, South America." Then adds, "Easily recognized by the small size, gray primaries and unbanded abdomen. Specimens of this very rarely range northward, and a specimen in my possession was said to have been taken in Pennsylvania. I do not know the source whence I obtained it and I cannot vouch for the locality. It is a southern form." All these were most generously surrendered by Mr. Bice to the Society, and form a valuable addition to its collection. He also took several specimens of that curious little snout moth, *Gaberasa ambigualis* of Walker, the *Tortricodes bifidalis* of Grote. It has a split in the front wings of the males, fringed like an incipient feather wing. The first one I saw puzzled me greatly, not knowing but it might be only a freak of nature, instead of a characteristic of the species. An appeal to Dr. Smith put me straight, when he also informed me that the wings of the female were entire. Both sexes were taken by Mr. Bice. Mr. Grote at first described the females as a separate species, whilst at the same time strongly suspecting that they were but the different sexes of one species. There are a number of Mr. Bice's captures yet to be determined.

NOTES ON THE SEASON OF 1897.

By Rev. Thomas W. Fyles, F.L.S., South Quebec.

The "Notes on the Seasons," published in the Annual Reports of the Entomological Society, of Ontario, will, I think, be found useful to the rising entomologists of our own day, and, in the future will afford material that may be worked into a complete history of the insects of Canada. In this belief I contribute to the store my memoranda on things that have come under my observation during the past summer.

The season was a remarkable one; the early summer was cold and wet, then came a period of intense heat, which was succeeded by a bright, mild autumn prolonged into November.

Brephos Infans, Moeschler.

On the 24th of April members of the Montreal Branch invited me to join them for an excursion in search of *Brephos infans*, Moesch. We went to a birch wood some distance from Montreal, and soon had the pleasure of seing *infans* on the wing. It flies amid the tops of the birches, making an occasional descent to lower foliage. These descents are the entomologist's opportunities; but, as the insect has a rapid and uncertain flight, they can be captured only by a lucky stroke, or a well sustained effort.

I left the business of catching to my companions, for, as we advance in years, we lose—to use the words of Alexander Smith—

> "——the wild-deer from the blood,
> The falcon from the eye."

I sat on a stone and watched my friends dash through puddles formed by melting snow and amidst the scrub on the outskirts of the wood, admiring their zeal.

The expedition was a successful one, and, from a female captured on the occasion, Mr. Dwight Brainerd obtained eggs, from which both he and I succeeded in bringing larvæ to the pupal stage. His notes regarding them will be found in the November number of the *Canadian Entomologist.*

The larvæ I reared were about a week later in their changes than those raised by Mr. Brainerd. This was owing, no doubt, to the difference of climate between Quebec and Montreal. At Quebec the eggs hatched on May the 8th. The larvæ moulted on May the 13th, May the 21st, and June the 2nd, and pupated June the 20th. This species spends probably eight months in the pupa.

Ctenucha Virginica, Charp.

On the expedition above referred to I obtained larvæ of *Ctenucha Virginica*, Charp. which had just aroused themselves from their winter's sleep, and were feeding on the wild grasses in the wood. This is a description of them at the time :

Head reddish brown, sides and back set with pencils of black hairs, a sub-dorsal row of tufts of whitish hairs springing from a white line, spiracular line white ; moulted April the 26th.

After Moult, head chestnut red with black face. A frill of white hairs round the head. Distinct black tufts along the back, sub-dorsal lines pale yellow with yellowish tufts, white spiracular line with tufts of whitish hairs, legs red ; moulted May the 21st.

Full Grown Larva, one inch in length, head chestnut-red with black face, mouth organs white, a dorsal line of black tufts bordered on either side with a line of yellow tufts, sub-dorsal line yellow, spiracular line white, between them a line of black tufts, under parts black, legs red.

One larva was almost white—the tufts on its back were yellowish.

Of three that I took particular notice of :—

The 1st spun up May the 28th, and the moth appeared June 25th.
The 2nd " June 9th " " July 7th.
The 3rd (the pale one) spun up June 30th, and moth apeared July 18th.

Newly caught females of *C. Virginica* laid eggs which hatched on July 25th. The larval stage of this species therefore extends over a period of ten months or more.

The Case-bearer of the Birch.

In the beginning of May, as soon as the leaves of the birch were fairly opened there appeared upon them the curious habitations of a species of Coleophora. The following is a description of the larvæ producing them :—

Head brown with a pale V-like mark—opening towards the front—and a few white bristles, shield on second segment brown divided by a pale line, small shield on third segment and anal plate brown, claspers brown, general body color brownish-salmon, darker on the back ; length on the 24th of May, two-tenths of an inch.

The larval case at first appears as a closely-woven, elongated capsule with little brown tufts in it. The occupant, when it finds this habitation too narrow, selects at the edge of a leaf a portion bordered with two or three serrations. This it hollows out by eating away the parenchyma. Then it works its way in, cuts off the selected portion, and proceeds to unite the free edges, thus making a new tent. It fills up all awkward insterstices with a fine web. Under the microscope the veins and stomata of the skeletonized section of leaf thus appropriated present a beautiful sight.

In feeding the larva bites a round hole in the cuticle of the leaf on one side, and then eats away the parenchyma as far as it can reach on every side without leaving its case entirely.

The larvæ ceased feeding in June, and the moth appeared on July 9th. This is a description of it :—

Colour, pale silvery ash, a tinge of reddish-brown on the after part of the primaries, secondaries narrow, ciliate on both sides, eyes black, antennae beautifully ringed—brown and white, fringes slightly tawny, tibiæ of hindmost pair of legs clothed with long hairs, expanse of wings half an inch, length of antennae three-twentieths of an inch. Length of body, one-fifth of an inch.

Spilosoma Congrua, Walker.

I took a female of this species at the Gomin on the 29th of June. It laid eggs on the 10th of July, and these hatched six days afterwards. The larvæ fed on pig-weed, dandelion and plantain. I succeeded in bringing the whole batch to the pupal stage, and took full notes of all their changes. As soon as the appearance of the moths enables me to complete the life history of the species I will send the particulars to the *Canadian Entomologist* for publication. I may say that the larvæ are very different in all their stages from those of *H. textor*, and seem to indicate that *Congrua* should come in the genus *Arctia*.

Unfortunate Selandria Larvæ.

On the 7th of July I found on a young ash at St. David's a number of milk-white larvæ with black, shining heads, and black feet (*S. varda*, Say?) They were about three-fourths of an inch long. Next day they moulted, and, after the moult, seemed smaller than before. Their colour was changed to pale lead-colour above and a pale yellow beneath. The head was dark brown above, the face yellow. The legs also were yellow. They fed no more, but became inert and dropped to the ground. The cause of all this became apparent when, on the 23rd of the month, there came from them a number of Tachina flies.

Captures in August.

On the 6th of August, passing through the Fort Woods at Levis, I found a bush of *Spiræa salicifolia* Linn. in full bloom. It was thronged with insects. Without moving from my position I captured *Sannina exitiosa*, Say (Fig. 41), *Conops sagittaria*, Say, *Anthrax fulviana*, Say, *Perilampus ceruleus*, Say, *Philanthus bilunatus*, Oress, *Eumenes*

Fig. 41. Female moth on left, male on right.

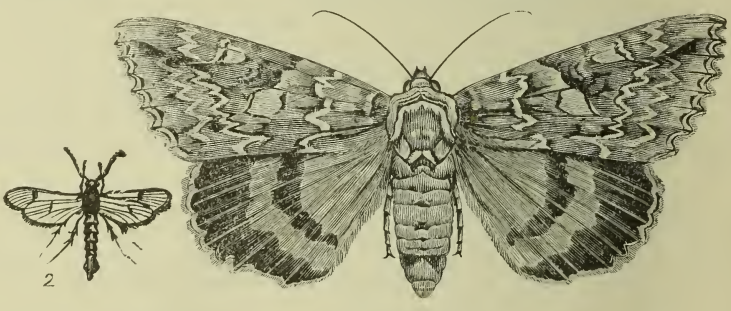


Fig. 42.

fraterna, Say, *Gorites phaleratus*, Say, *Exetastes rufo femoratus*, Prov., etc., etc.—a great haul! Moths of *Gelechia gallæ-diplopappi*, Fyles, appeared from the 8th to the 15th. *Catocala parta*, Guen. (Fig. 42) was very abundant at the end of the month.

Blisters on Poplar Leaves.

On the 9th of August I found blisters on poplar leaves. Each blister was about half an inch across. It contained a larva which changed to a chrysalis before I could describe it. The chrysalis was attenuated and about three-twentieths of an inch in length. On the 28th of the month it produced a lovely little moth. In length of body this was only one-eighth of an inch. Its wings expanded three-twentieths of an inch. The fore-wings were golden brown, and had a set of creamy white patches bordered inwardly with black, and running transversely from either side to the middle of the wing. The hind wings were narrow but deeply fringed. The palpi were white and feathery, the eyes black, the legs were white and had feathered tibiæ. This I concluded was the *Lithocolletis populiella* of Chambers.

More Saw-Fly Larvæ.

On the 9th of August, the light shining on a leaf of *Populus tremuloides*, revealed to me a number of cuts, each about one line in length, on the under side of the leaf. I knew them to be vacated saw-fly cuts, and immediately looked for the young larvæ. On several leaves near by a number of round holes were seen, and looking closely into these I found in every one a black larva extended along the edge inside the opening. When disturbed the larvæ threw up their tails in true Nematus fashion. They grew rapidly, and in the night of August the 14th they threw off their dusky covering, and presented themselves in a splendid new garb of dark navy-blue with black dots, and with large yellow spots in a line with the black spiracles. The head was glossy black. The legs and underside were of a neutral tint. The length of the full-grown larvæ was seven-tenths of an inch.

On August the 20th the larvæ descended and spun loose brown cocoons under the leaves in the bottom of their cage. I obtained from these, on the 8th of September, some very handsome saw-flies, of which the following is a description :—

Length of body, three-tenths of an inch ; expanse of wings, seven-tenths ; length of antennae, two tenths.

Head black, but with clypeus, hypoclypeal plate, labrum and palpi yellow. Clypeus emarginate rather short. Eyes round and prominent, black. Ocelli black. Cheeks rounded and protruding. Antennae with a somewhat moniliform scape ; the second, third and fourth joints rather long and nearly of equal length, the other four smaller and slightly tapering ; the whole one coloured—black.

Tegulæ and pronotum flavescent ; lateral lobes of scutum dark chestnut-red ; the rest of the thorax and the base of the abdomen black. The abdomen, for the most part, is of a clear, chestnut-red without dorsal markings, but the cerci and ovipositor are black and the last joint is clouded.

The first and second pairs of legs are flavescent throughout. The hind pair have the tibia—except the knee, which is yellow—and the tarsus black. The tibiæ are thickened, and the tarsi end with extended claws.

The wings are beautifully clear, and in some lights iridescent. Their venation is remarkably distinct, and is of the normal type.

Saw-Fly Larvæ on Cornus.

In the beginning of September there were handsome larvæ in great numbers feeding upon *Cornus stolonifera* Mich. and *C. alternifolia* Linn. When they first came under my notice they were curled, helix-like, under the leaves, lying in clusters. The head was glossy black, the body pale yellow ; but down the back were eleven rectangular patches resembling buckles, blue black with yellow centres. There was also a terminal patch, rounded, and of the same colour. The creatures had just changed their skins. They moulted again on the 14th of September. The empty skin was held by the claspers and stood upright. The head-case and second segment were split, and the rest of the skin was intact. The larvæ after the moult were more highly coloured than before. The rectangular markings on the back were deep navy-blue, and the inner mark and dividing lines were pale blue. The yellow of the rest of the body was of a deeper shade. They moulted again on the 30th of the month, and at intervals in October they retired into the earth. I found specimens on the Cornus bushes after the frosts came.

Captures in September.

On the 1st I took *Plusia brassicæ*, Riley (Fig. 45. *a*, caterpillar ; *b*, cocoon ; *c*, moth), and *Petrophora testata*, Linn, at the Gomin. On the 3rd I found *Feltia venerabilis*, Walker ; *Agrotis redimicula*, Morris ; *Plussia brassicæ*, Riley, and *Drasteria erechtea*, Cramer (Fig. 44), on panicles of *Solidago nemoralis*, Ait., in the open fields. On the 11th

Orgyia nova, Fitch, was flying in the sunshine at the Fort Woods, and *Cleora semiclusaria*, Walker ; *Plagodes fervidaria*, H. & S.; *Petrophora truncata*, Hbn. (second brood), *and P. diversilineata*, Hbn. (Fig. 45), were plentiful on the boles of spruce trees. On the 22nd *Epirrhita dilutata*, Bork, was out at the Fort Woods. On the 24th *Callocampa curvimacula*, Morris, was abundant at sugar, and *C. parta* was still out but much worn.

Captures in October.

October the 15th was very mild. The thermometer stood at 64° on my verandah at 8 p.m. *Xylina georgii*, Grt., was abundant at sugar. On the 20th of the month a fine, fresh specimen of *Pyrameis Atalanta*, Linn, was taken on the streets of Levis. On the 23rd the wind was in the south, and the day bright and balmy. *Teras ferrugana*, Schif,

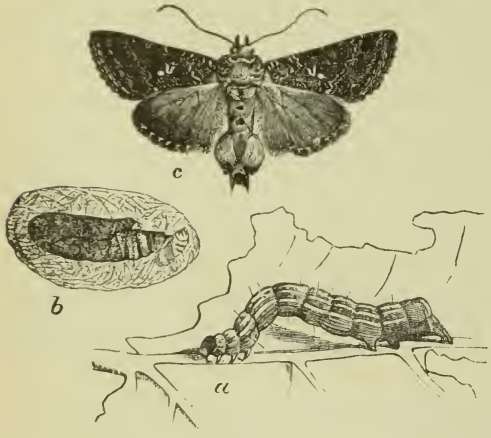


Fig. 43.

Fig. 44.

Fig. 45.

was plentiful among the sallows, and *P. fervidaria* was still out. On this day I found the full-grown, onisciform larvæ of *Syrphus ribesii*, Fab, feeding upon *Schizoneura lanigera*, Hausm. They spend the winter in the larval stage, and go into pupa early in the spring. The flies appear in April.

And now the winter storms are come, and we must be content—like schoolboys in their contemplation of the holidays—to think for half the dreary time of entomological pleasures past, and to anticipate in the other half pleasures to come, cheered in the meanwhile by the monthly visits of the *Canadian Entomologist*. May no unkind blizzard detain the mails that convey it !

A FEW NOTES ON THE SEASON OF 1897.

By Arthur Gibson, Toronto.

The season of 1897 in the neighborhood of Toronto was, entomologically speaking, a comparatively poor one, as far as "good things" were concerned. Indeed, most of the commoner lepidopterous insects, especially the butterflies, were rather scarce, and those which are usually scarce were in most cases not to be seen at all.

The season of 1896 was a very good one in this district, several species of lepidoptera having been observed and taken for the first time in this locality.

During the past season the only diurnals which I know of as having been taken in this neighborhood, and which are really worth mentioning are :

Feniseca Tarquinius.—One specimen observed at Forks of Credit on 1st July.

Lycaena Comyntas.—Very rare, only a few specimens taken, one of which I took on 26th June.

Lycaena Scudderii.—Fairly plentiful on and about 15th June, but very local around the food plant,—Lupin.

Pieris Napi.—Two or three specimens of a variety of this butterfly were taken on the 24th May, the only specimens observed.

Last season, on the 1st July, the variety Oleracea-aestiva was very common at the Forks of Credit, but on paying a visit there on the same date this year, not a single specimen was to be seen. In fact, very few butterflies of any species were noticeable.

Papilio Cresphontes.—A worn specimen of this butterfly was taken on the 24th September, at Weston, a few miles from Toronto, by Mr. Donald Wilby.

Collecting by electric light was also very poor this season. I do not know what has come over the Sphingidæ. For the last four seasons they have been very scarce. In 1893 as many as seventeen different species were to be taken, and most of these species were fairly common, while some of them were very plentiful. Deilephila Chamaenerii

Fig. 46.

(Fig. 46) especially was very common in 1893. Even around the electric lights in the heart of the city numbers of specimens of D. Chamænerii were to be taken. During the last two seasons I have not seen a single specimen of this sphinx. Actias Luna was frequently observed this season, and as many as ten specimens were taken on the 27th May. Regarding the other moths which come to light, they were in most cases very scarce.

"Sugaring" also was poor, up to July 1st hardly a specimen being attracted to the sugar. After that date, however, several good noctuids were taken, but up to the present time I have not got them identified.

NOTES ON THE SEASON OF 1897.

By C. E. Grant, Orillia.

The season of 1897 was not a very good one from an entomological point of view, though, as is often the case in such seasons, some good captures were made here in Orillia, of which I made some notes.

Brephos infans was taken by me this year on April 11th for the first time in thirty years. Others were seen at a later date, but were too wild to capture. The locality was a road through a birch woods.

Thecla laeta —One specimen of this rare insect was taken by my friend, Mr. James Walker, in a cedar swamp not far from a running stream ; the specimen was a female in good case. As the insect was taken on a cedar bush, it would have been interesting to know if this is the food plant of this species. I believe it is not known. I intend, if all is well, to thoroughly search this locality next May for a duplicate. The date of capture was May 12th.

Melitæa Harrisii.—Three specimens of this species were taken in the first days of July beside the railway track passing through a piece of low land. This insect is rare here.

Papilio troilus.—Took my first Orillia specimen of this butterfly on Asclepias in the month of August.

Lycæna comyntas.—This is also an addition to our fauna. The one I took this year was in a clover-patch at the side of the railroad. Date August 4th.

Colias philodice variety *nigra.*—On the afternoon of August 12th I was watching a large number of *C philodice* disporting themselves in a clover field when I was suddenly aware of the presence, amongst them, of a butterfly, which I was sure I had never seen before. I was much puzzled at the time as to what genus it belonged to. After a hard and long chase, and I am afraid to the detriment of the gentleman's clover, I captured it, and

Fig. 47

on examination I at once recognized it from the painting in "Edwards's Butterflies" in one of his places of Philodice. Of course it was not an exact reproduction, the bases of the wings on the underside being darker olivaceous, and the upperside being covered with long greenish hair near the bases, producing a pretty effect ; it was altogether a handsome insect. Philodice was remarkably abundant this season, and the female in great variety. The albino specimens were nearly as numerous as the yellow type, and differed greatly in markings from each other.

Megalostoma cæsonia (Fig. 39).—I searched in vain for this eccentric butterfly this season, which last year was moderately common, but did not see a specimen. It will probably be due again in thirty years, as it is about that length of time since I captured it in my father's garden when a boy.

I had good success among the Sphingidæ, and captured no less than nineteen different species ; most of these were taken at flowers in June and July, from one to three of each, with the exception of *Triptogon modesta* (Fig. 47), which was found at the base of a poplar, newly emerged from cocoon, and some which were taken at light ; the abundance of *Smerinthus excæcatus* (Fig. 48) was remarkable, eight specimens coming into the house one evening in July, attracted by an incandescent light.

The long cold rains that succeeded the hot spell in the beginning of July apparently were too much for most of the destructive cut worms, as their imagoes did not appear (with the exception of *Agrotis telifera*, Fig. 49,) in any numbers. *Hadena devastatrix* and *arctica* and *Leucania unipuncta*, the army worm moth, were almost scarce—in 1896 *unipuncta* was so plentiful that I have killed over 500 on one post, on which I had placed my sugar for other victims ; they were a perfect nuisance, coming in clouds before dark, and this occurred in June and again from the end of July through the season ; notwithstanding this fact, the army worm was not reported as troublesome in our county, though I believe Ontario county was infested to some extent.

Fig. 48.

Fig. 49.

The following noxious insects were reported as plentiful around Orillia :

The tent caterpillar, *Clisiocampa Americana*. Fig. 19, also its confrere (*sylvatica*) the former, however, only lives in the neglected orchards, but the moth was extremely abundant.

The canker worm (*Anisopteryx pometaria*).—I never saw such quantities of this insect in the imago state as this year; in October it was to be found, male and female, on every roadside fence—with it was also conspicuous *Hybernia tiliaria*, the November moth, Fig. 50.

Carpocapsa pomonella, the apple codling moth,—this insect, though not often seen as an imago, is always plentiful here, but spraying the trees has had a wonderful effect in controlling this pest, and those orchards that are sprayed regularly *every* year produce as sound fruit as is to be found anywhere.

Fig. 50.

Fig. 51.
The male Tussock Moth.

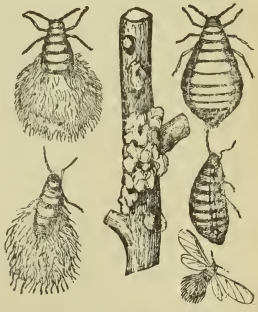


Fig. 52.
The Woolly plant-louse of the apple (*Schizoneura lanigera*).

Orgyia leucostigma, the tussock moth (Fig. 51), is evidently on the increase in Canada, from observation made here by myself. It seems that each year it is rather more plentiful. *Orgyia antiqua*.—This insect appeared in numbers this fall. I bred several females and whilst they were confined in the cage the air for yards around was literally full of the attendant males.

It was reported to me in the month of July that a great number of the maple trees in this town were apparently dying. As Orillia is one grove of these trees, the appearance of a pest was viewed by many of the inhabitants with great alarm. I examined a good many trees. I supposed at first that the borers *Clytus speciosus* or *Tremex Columba*, were the cause, but I could only account for the flagging energies of some of the limbs from the fact that nearly all the trees showing distress were largely covered in places with a woolly louse (*Schizoneura*), Fig. 52, which very much resembled the alder louse. I was not certain of the species, but I recommended kerosene emulsion, which I believe finished them, as the complaint ceased.

To a person who has always been imbued with a love of nature, to whom the war of the elements, the peaceful starlight night, the songs of the birds, the growth of a plant, the chirp of a cricket, the song of the Cicada, or the sight of an insect, alike send a thrill of pleasure through his mind and bring back a flood of pleasant recollections, I say to that person who has learned to love these things, it is almost impossible to understand how it is that so few people seem to obtain any pleasure from studying nature. To many there is no enjoyment but in business, and there are others who are always complaining that they do not know what to do to kill time. Just fancy this with the book of nature open before them and half, yes, nine-tenths, of its wonders unknown To those in business who have very little time to spare (I myself am one of these), I would say that no more pleasant relaxation can be found, when once the science of entomology, botany, or their kindred sciences, is known sufficiently to interest one to further pursue it. I am satisfied that if the study of these things was brought before the young in the proper way, it would make the youth of this country more manly, more diligent in business, more cultured and gentlemanly, and that the crime records would decrease correspondingly. This may seem a rash statement, but I claim that any one who has learned to study and love the works of nature will seldom do a deed of violence, when in tender years an occupation is found with all the elements of amusement, free from the taint of vice. The famous Dr. Johnson once said, when he heard of a man committing suicide: "He would never have done so if he had known how to hem a pocket handkerchief," implying that the want of an occupation induced the crime. And so likewise the study of entomology would keep the minds of those who take to it in pleasant occupation, which would increase, instead of tailing as most other amusements do, as one by one the truths of nature were revealed; and I have every reason to believe that the interest would increase until the senses are benumbed with age, and this can be said of few earthly pleasures. The lack of interest is surely in the want of the first elements of knowledge of these sciences; but I trust that now entomology, from an economic point of view, is being studied, and the farmers and fruit growers of this country are awakening to the fact that to hold their own with their neighbors who have studied entomology, they must do so too —that ultimately the young will be taught it and the sciences of entomology and botany will form part of the curriculum of our public schools.

THE SAN JOSÉ SCALE.

(*Aspidiotus perniciosus*, Comstock.)

By James Fletcher, Dominion Entomologist, Ottawa.

In our annual report for 1894 there appeared a short article upon the San José scale. As there stated, the unexpected discovery in the Eastern United States and British Columbia of this scourge of the Pacific coast orchards made it all important to draw the attention of Ontario fruit growers to the subject, so that they might become familiar with the appearance of the insect and be prepared to promptly adopt active measures to eradicate it should it, as was thought more than probable, appear in our province. During the same year a further article was also published in the *Farmers' Advocate*, urging fruit growers to be on their guard against the introduction of the San José scale with nursery stock.

Since that article was written it has been seen how well founded were the fears that this dreaded enemy might spread to Canada and be a cause of loss in our fertile fruit districts.

The San José scale, it is thought, was introduced into California about 1870 ; but it was not noticed as a serious enemy until 1873, when it was discovered to be in great numbers on fruit trees at San José, Cal., a fact which has given to the insect its popular name. Its original home is not certainly known, but Japan is suspected.

As far as can be learnt, it had not been scientifically described until 1880, when Prof. Comstock treated of it in his annual report as Entomologist to the United States Department of Agriculture. Dr. L. O. Howard tells us that Prof. Comstock designated it by the specific name *perniciosus* because he considered it the most pernicious scale insect known in the country. "It swarmed in countless numbers upon the trees in certain orchards, and infested all the deciduous fruits grown in California except the apricot and the Black Tartarian cherry. In the course of twelve years the insect spread through all the fruit growing regions of California, through Oregon and into the State of Washington. It is known as the worst insect pest of deciduous trees on the Pacific coast and has caused great pecuniary loss. Many crops of fruit have been ruined and thousands of trees have been killed."

The above was written by Dr. Howard in April, 1893, since which time a great deal more than was then known has been learnt concerning this insect and its capabilities as an enemy to the fruit grower. It has been introduced into the east and, contrary to expectations, has shown that the climate of the Eastern United States is sufficiently well suited to its requirements for it to have developed so rapidly and with such deadly effects upon the trees infested that it has now become of national importance. It is at the present time acknowledged to be by far the most serious insect enemy of fruit trees which has ever been studied by practical entomologists. Owing to its very inconspicuous appearance and to the fact that it passes the winter attached firmly to the bark of fruit trees, it has been distributed widely and unwittingly by nurserymen with young fruit trees and now occurs in almost every State of the Union. It has also spread up into Canada, where it has been found on two or three occasions in British Columbia and has also established itself at a few places in the peach districts of Ontario. The first specimens of this insect received from an Ontario orchard were from the vicinity of Chatham in Kent county. This was in January, 1897. Very soon afterwards it was discovered that there were other orchards near Niagara and St. Catharines which had been similarly infested through fruit trees imported from the United States. The last discovered occurrence of this insect was made quite recently near Kingsville in Essex county, where three centres of infestation were found on one fruit farm, involving upwards of 300 trees. The above are all the authentic instances of the occurrence of the San José scale in Ontario which I have been able to learn of, although at various times during the summer several reports of infested orchards have been received. Upon investigation, however, these have proved to be occurrences of some other scale insect. In addition to several kinds of scale insects which were sent in for identification under the supposition that they were the San José scale, many other insects in no way resembling a scale insect were sent. From the many kinds of these belonging to various orders, it seems advisable to state that the San José scale is not an easily seen insect, resembling a beetle, a fly or a spider, nor has it well developed wings and legs, but it is a minute creature which can be detected only by the closest search and even then requires some skill and experience to recognize it as an insect. Among the objects which have been enquired about were many things quite unlike scale insects, but there were others which certainly do present very much the same appearance. Among these were certain minute fungi found on dead wood, and particularly the small corky excrescences known as lenticels which occur upon the young bark of many trees, as the apple, pear, birch, black walnut, etc. Their different nature may, however, be generally ascertained easily by the fact that they cannot be removed from the bark without tearing the tissues, while scale insects may be easily moved by gentle pressure as with the finger nail.

In view of the almost unanimous demand by fruit growers for protective legislation against this enemy, it became of much moment to find out as soon as possible what was the true state of affairs in the province with regard to its actual distribution and establishment in our orchards.

On June 10th a well attended meeting of fruit growers was convened at the orchard of Mr. Charles Thonger, near Niagara, when the subject was discussed at length. The necessity for everyone concerned being able to recognize the scale was brought out at this meeting and steps were immediately taken to supply an evident lack of knowledge on this point among Canadian fruit growers. Prof. J. Hoyes Panton, of the Government Agricultural College, at Guelph, prepared and issued promptly an excellent concise bulletin, which was widely distributed by the Hon. Minister of Agriculture and Arts, and at the same time a large illustrated wall poster, 2ft. 3in. by 1ft. 8in., was prepared by the Dominion Entomologist at Ottawa for putting up in Post Offices, Railway Stations, School Houses, Public Halls and other much frequented places. This was illustrated with figures of an infested pear and a piece of an infested branch, natural size, and also enlarged figures of the female insect and her scale. Warning was given that the San José scale was already in Canada and that if it were allowed to spread, great loss would surely be the result. The best way to identify the insect was given, together with advice as to the proper remedy and the way to apply it in case anyone should be unfortunate enough to find this public enemy on his trees.

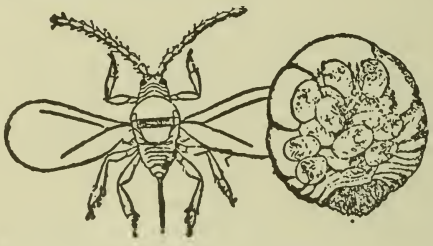


Fig. 53. Female scale, with a male adult to the left, greatly enlarged.

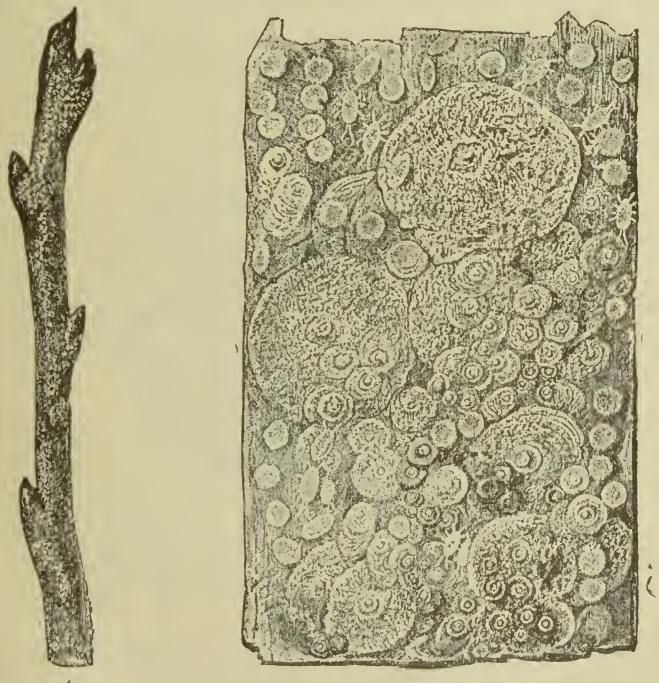
These sources of information were distributed widely amongst fruit growers living in those districts where the San José scale was likely to occur. In addition to the above measures, by instruction of the Hon. John Dryden, special attention was paid to this subject by Mr. W. M. Orr, the Superintendent of Spraying Experiments, and every effort was made to find out to what extent orchards were infested. Whenever the scale was found, active measures were at once put in force to secure its eradication. Collections were made of the scale upon various fruit trees and show cases were exhibited in the more important autumn exhibitions, which were attended by Mr. Orr, who was untiring in his efforts to explain to visitors the nature of the insect and warn all against neglecting it. In every instance where this pernicious insect has been found on trees in Canada the owners have done their utmost to destroy it, sparing no expense of labor or material. All were easily convinced by the fatal effects of its presence on their trees that this was no ordinary insect pest they had to fight against.

What is the San Jose' Scale? The San José scale is a very small (about one-tenth of an inch in diameter), round, flattened and inconspicuous scale insect, that is, a sucking insect like the well-known Oyster-shell Bark-louse and the Scurfy Bark-louse, covered by a waxy scale which, as we find it on trees, is the only part visible except in the early larval stage, when scale insects, for a few days, have the power of walking.

The exact identification of this species is a matter of some little difficulty, for there are at least two other scales occurring on fruit trees in Canadian orchards, the Putnam Scale *(A ancylus*, Put.*)*, and the Forbes Scale *(A. Forbesi*, Jnsn*)*, which superficially so closely resemble the San José scale as to render it necessary for a specialist who has studied the matter before hand, to examine the mature females under the microscope and that after boiling in caustic potash, before the difference can be made out. Moreover, both of these scales occasionally may be found in vast numbers upon an infested tree, but the exac

identification is, nevertheless, a matter of great importance because it has been found by experience that neither of these scales causes very serious injury to fruit trees as compared with the San José scale. This is chiefly due to the fact that they seldom spread from tree to tree with anything like the rapidity of the last named species. Indeed, the occurrence in very large numbers of a scale insect upon a tree cannot always be taken as conclusive evidence that the species is a dangerous one, for it has frequently been noticed that scale insects may be present in enormons numbers upon a special tree, even killing it, and yet not be found at all upon trees of the same sort growing close by. In the case of the San José scale, on the other hand, if other trees are reasonably near, it is almost certain that they will soon become infested, and when a severe case of infestation is found, one of the first things looked for when considering whether the pest is actually the San José scale or one of some other species which superficially resembles it closely, is to notice whether the surrounding trees are infested also.

This important difference of habit in spreading and the much more fatal effects upon the trees from the presence of the San José scale, make much more stringent measure necessary to secure its eradication than with many other species, even frequently rendering it advisable, or imperative, to destroy many trees, or even whole orchards. This being the case, the very great advantage is obvious of being perfectly sure as to the identity of an infesting scale insect before valuable trees are condemned to destruction.



A. *B.*

Fig 54. Appearance of scale on bark ; *a*, infested twig—natural size ; *b*, bark as it appears under hand lens, showing scales in various stages of development and young larvæ.

The following description of the San José scale and its life history are taken from the annual report of the Entomologist and Botanist of the Dominion Experimental Farms for 1897 :

How to know it.—The general appearance of the bark of infested trees is dirty, scurfy and grayish in color, as though dusted with ashes. The scales usually are found in enormous numbers, frequently overlapping or occurring altogether on the top of older scales ; they may be found throughout the summer of all sizes, from the newly

hatched mite-like larvæ to the full-grown insects. In severe cases of infestation this massing of the scales produces a scurfy appearance of the bark, which when once seen is easily recognized. On young twigs and fruit and leaves, there is usually a well defined purplish ring surrounding each scale, and although this purpling effect is produced by a few other scales, such as the Putnam scale (*A. ancylus*, Put.), it is particularly characteristic of the San José scale, and even upon large branches, although invisible at the surface, may be found by cutting away some of the bark.

The scales of the males and females differ somewhat in shape.

Female:—Scale very thin, almost circular in outline, much flattened; size ranging from one-twentieth to one-eighth of an inch in diameter white at first, becoming grayish or blackish, and later much blackened by the fungus *Fumago salicina*, so common on trees attacked by many kinds of bark-lice and plant lice. In the centre of the scale is a small dark or yellowish nipple-like elevation surrounded by a distinct circular darkened depression, which, as pointed out by Prof. Webster, is one of the best distinguishing marks between this scale and some closely allied species.

Male:—Scale about half the size of that of the female, rounded-oblong, with the nipple-like elevation nearer one end than the middle.

Life History.—The winter is passed by the partially grown insects beneath their scales. With the return of warm weather next spring growth is resumed, and the males reach maturity a few days before the females. They are extremely small two-winged flies, and when examined under a magnifying glass are found to have orange-yellow bodies, iridescent dusky wings and black eyes. The minute creatures have no mouths,

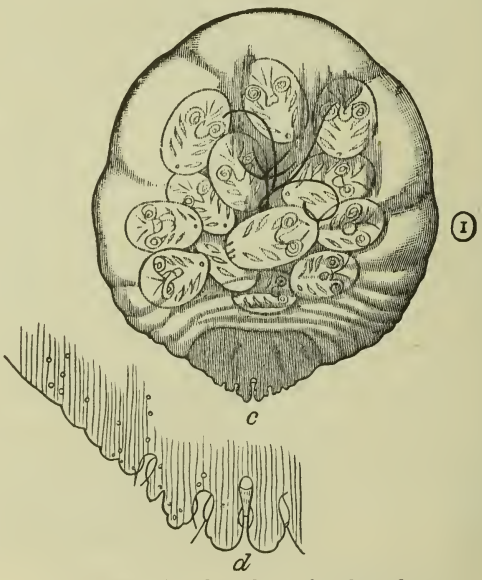


Fig. 55. Female scale much enlarged.

so can take no food; consequently, having fertilized the females, they very soon die. The date when the females become full grown and begin to produce young varies, of course, with localities and climate. In Arizona the young larvæ are recorded as appearing in March. At Washington it is by the middle of May; in the State of New York, early in June; at Amherst, Mass., they were first noticed 12th June; and, as far as I can learn, between the middle of June and 1st July in our Niagara district. Most careful observations have been made under direction of the U. S. Entomologist, by Mr. Theo. Pergande. The following condensed life history is compiled chiefly from U. S. Div. of Entom. Bul. No. 3, N.S., in which Mr. Pergande's observations are recorded.

The adult female gives birth to living young, differing in this respect from most other scale insects. Ordinary, as with the Oyster-shell Bark-louse, eggs are laid beneath the scale, which in the course of a longer or shorter time hatch and the young larvæ migrate to different parts of the plant; but in the case of the San José scale young are produced day and night for a period of nearly six weeks before the exhausted female perishes, and this at the rate of about nine or ten every twenty-four hours.

After birth the young larva remains motionless for a short time beneath the scale of the mother, it then forces its way out and runs over the plant, seeking a suitable place to settle. It is a microscopic creature, pale orange in color with an oval body, six legs and two feelers. The long, thread-like proboscis with which it sucks the sap of the plant, is doubled on itself and lies in a groove of the body wall After crawling about for a few hours, the larva settles down and works its bristle-like sucking tube through the bark and remains fixed, if it be a female, for life; and if a male, until fully developed, when it will have a few hours more, during which it can fly about.

The development of the scale begins even before the larva becomes fixed. The secretion starts in the form of very minute, white, waxy filaments, which spring from all parts of the body and rapidly become more numerous until within two days the insect is entirely concealed by a whitish shell or scale, which now has a prominent central nipple. The scale is formed by the matting and melting together of the waxy filaments. As in the development of most insects, there are distinct periods of the larval life, divided by moults of the skin, and in the case of the male scale insects marked by important structural changes. The first moult takes place when the larva is twelve days old. Up to this time the male and female scales are exactly similar in size, color and shape, but after the moult the insects beneath the scales bear no resemblance to each other. The males are rather larger than the females and have large, purple eyes, while the females have lost their eyes entirely. The legs and feelers have disappeared in both sexes. Eighteen days after birth the second moult occurs and the males change to the first pupal condition (pro-pupa) the small scales now assume an elongated shape. the legs and feelers have re-appeared and there are now two prominent wing pads extending along the sides of the body. About twenty days after birth the male insect changes to the true pupa, in which all the parts shown in the pro-pupa are more developed and a slender organ at the end of the body, called the style, has appeared. From four to six days later, or from twenty four to twenty-six days after birth, the males mature and back out from the rear end of their scales. This is chiefly by night or in the evening.

The changes which have gone on beneath the female scales are less striking than those described above. After the first moult, the body of the female is practically an almost circular flattened sac, with indistinct segmentation and without organs, except the long sucking bristle with which it sucks up continuously the sap of the tree it is infesting. The female moults a second time about twenty days after birth and the last segment now shows the important characters of the mature female which are of so much service in the exact identification of the species. The segmentation of the body at this stage is quite distinct.

Thirty days from birth the females are full grown and the embryonic young may be seen within their bodies. The mature female, prior to the development of the young, is 1/30 of an inch wide and 1/25 of an inch long.

The length of time necessary for the development of a generation varies somewhat, and according to the Washington observations covers a period from thirty-three to forty days from the time the young larva appears until it develops into a mature female, bearing young. The San José scale is enormously prolific. It has been calculated that a single female may be the progenitor of 3,216 million descendants in a single season.

A most serious Enemy.—It cannot be too often repeated that the San José scale is one of the very worst enemies that the fruit grower has ever had to deal with. Its inconspicuousness and presence upon trees in a dormant condition at the time when these or scions from them are distributed, render it liable to be overlooked. Its great

power of increase when introduced into a new locality and the fatal effects of its attacks on trees, as well as the extensive range of food plants it will attack, which includes nearly every deciduous tree and shrub, added to the difficulty of treating it effectively, all combine to make this insect what it is acknowledged by most to be, as stated above, one of the worst insect enemies we have ever had to contend with.

Notwithstanding this, there is always a tendency among those who are not well informed, to minimize the danger and neglect the necessary precautions. On this point it may be well to give the following short quotations from two of the leading economic entomologists of the United States :

Prof. Webster, of Ohio, says in his official report to the Ohio State Horticultural Society : " The statement has been made that 'the scale is not a particle more destructive than many of our native species of injurious insects or than those to which we have become used;' but anyone who is at all familiar with this pest understands that this is not at all the case, and that we have no other insect that is so deadly in its effects or so difficult to detect until it has become fully established, and certainly we have nothing in Ohio which, if it gets on to a tree, is as sure death. Besides, such talk as this only makes the enforcing of remedial or protective measures more difficult."

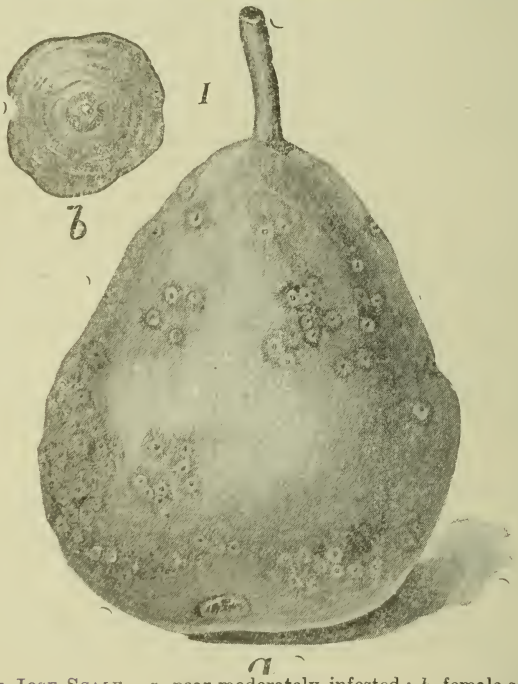


Fig. 56, San Jose Scale. *a*, pear moderately infested ; *b*, female scale enlarged.

Dr. J. B. Smith, speaking before the Moorestown (N. J.) Farmers' Institute in December, 1897, says : " The San José scale is without doubt the most important of the fruit pests with which the fruit growers of this section must deal. I say 'must deal' advisedly, because developments during the latter part of last summer and even since then have made it certain that the San José scale is so firmly established in our State that its extermination can no longer be considered a possibility."

After treating of the extent of the infestation in the State of New Jersey, Dr. Smith says : " The scale must be dealt with, or you must abandon fruit culture. It can be dealt with if intelligent effort is made. The treatment is not easy and at first is expensive. It is for the fruit grower to decide whether his orchards are worth it. If not, he had better destroy them at once and plant something else."

Remedies.

Cutting down.—When a tree is found to be heavily infested with the San José scale, the cheapest plan will generally be to cut it down at once and burn it, for it is probable that a tree which has once been badly attacked will never recover its full vigor, even although every scale is killed.

Whale-oil Soap.—If, however, a tree is only slightly infested or there are special reasons for trying to save it, it should be pruned back as closely as it will stand and then washed thoroughly two or three times with whale-oil soap (two pounds of soap to one gallon of water). This is an expensive treatment, but, on the whole, it is the most effective yet discovered.

Kerosene Emulsion.—A treatment which has given equally good results, but a little more trouble on account of the extra labor, is to spray the trees as soon as the leaves fall in the autumn with kerosene emulsion (Riley-Hubbard formula diluted with four or five times its volume of water, and then before the buds expand in the spring apply the two pounds to one gallon whale-oil soap wash.

Dr. Howard found after many experiments that what is required for spraying purposes is a caustic potash and fish oil soap which does not contain over twenty-five or thirty per cent. of water. Mr. Marlatt of the United States Division of Entomology, states that a new brand of soap known as Good's Caustic Potash Whale-oil Soap No. 3 is one of the best which has been put on the market.

Pure Coal Oil.—A great deal of attention has lately been drawn to the treatment of trees with pure kerosene or coal oil to free them from the San José scale. This matter was first brought forward publicly by Prof. Webster three years ago, and pure coal oil had also been used with success previous to that in 1893, by advice of Dr. J. A. Lintner, upon the trunks of peach trees infested with the Peach Bark-borer (*Phlœotribus liminaris*, Harris). (Cent. Exp. Farm Report, 1893, p. 216.)

Prof. J. B. Smith, of New Jersey, has experimented extensively with kerosene and claims that, when the work is done carefully and as he advises, the scale insects are killed by this treatment better and more cheaply than by any others, and without injury to the trees.

My own experiments with coal oil have been too limited and irregular in results to justify me in recommending this method, and Prof. Webster, when reporting upon his experiments says: "I own that for a time I hoped it was possible to use coal oil in destroying the scale without injury to the trees; but our experiments up to date indicate that except on the apple and some of the more hardy of the other fruits, and in cold weather, it is exceedingly dangerous to attempt its use; and, until we have had time to make further investigations, I wish to warn against its use otherwise than as above indicated." On the other hand, Prof. Smith and Mr. C. L. Marlatt have found that trees can be sprayed even in summer when in full leaf with pure kerosene and no injury result to the plant. Prof. Smith's instructions are as follows: "Spraying should be done with the finest Vermorel nozzle and with force enough behind it to send out an absolutely mist-like spray. Cover fully, but no more, that there may be no running down or lodging in forks or getting around the trunk down to the roots. The whole aim should be to put on the thinnest complete film possible. Spraying should be done on a clear, dry day, that evaporation of the kerosene may not be interfered with. The oil acts at once on the insect, and as soon as its work is done, we want to get rid of it as fast as possible. The trees should be dry when sprayed. If they are wet the oil will not penetrate, but remain as a film over the moisture until it disappears."

The details of the above treatment are given here because there has been so much inquiry about it by Canadian fruit growers who have seen Prof. Smith's recommendation, and it is doubtless advisable for those having infested trees to experiment upon a few of them and if good results are obtained many valuable trees may be saved.

Gas Treatment.—For thorough work in treating infested trees, the fumigation with hydrocyanic acid gas seems in California to have given the best satisfaction. This

method, however, is expensive and the materials used are intensely poisonous However, for large nurseries where many young trees have to be disinfected before being sent out, this is stated to be the best method and is very generally adopted by the large American nurseries.

The plants are placed under a canvas tent made air tight by painting it twice with linseed oil. The first coat must be quite dry before the second is applied. The size of the tent is immaterial, but must cover the trees entirely, and the edges of the tent should be long enough to lie on the ground so that the tent may be perfectly air-tight by having earth thrown upon the lower edge to prevent the gas from escaping. The latest formula for generating the gas is as follows :

Cyanide of potassium (98 per cent)	1 ounce
Sulphuric acid (66°)	1 ounce
Water	2 ounces

for every hundred feet of space to be fumigated. Put the acid and water in an earthenware vessel large enough to prevent spattering, then place the jar under the tent and add to it the cyanide of potassium and close the opening quickly. The trees should be treated for at least forty-five minutes, when it will be found that insects of all kinds have been destroyed.

For the treatment of nursery stock prior to shipment large air-tight chambers or boxes are made in which the trees are placed.

Warning.—There is at the present time a great demand on the part of fruit growers for protective legislation both from the Provincial and Dominion Governments, and it is possible that something may be done in this direction ; but, in the mean time, I would urge upon fruit growers and every one else to protect themselves and the country at large by putting into practice what after all are only ordinary common-sense measures of precaution. Foremost among these are certainly the exercising of the greatest care possible in buying nursery stock. As far as we have been able to learn, none of our Canadian nurseries are yet infested. Therefore, stock purchased at these nurseries, if grown in Canada, must be much safer than any that can be imported from nurseries in the United States which are known to be infested. Owing to the difficulty of detecting the scale on trees when it only occurs in small numbers, and to the fact that it infests almost every kind of plant likely to be imported, I do not consider it safe to accept for this insect the guarantees sometimes given by nurserymen that stock is free from infestation. It will be far better for Canadian growers to do without imported trees altogether, for a year at any rate, until we see the effects of the wise and active measures towards the eradication of this pest which are now being taken by the Department of Agriculture and Arts of Ontario, rather than by purchasing from United States nurseries to run the risk, however slight that may be, of bringing in more infested stock. Every effort is being made to discover and wipe out all cases of infestation, and I feel confident that, if energetic measures are adopted now, even the San José scale, as it now occurs in Canada, can be controlled.

NINTH ANNUAL MEETING OF THE ASSOCIATION OF ECONOMIC ENTOMOLOGISTS, DETROIT, MICH., AUG. 12-13, 1897.

The Association met in room 212, Central High School building, immediately following the adjournment of Section F. Thirteen active members were present, together with many visitors, prominent among the latter being Dr. C A. Dohrn, Prof. E. B Poulton, Dr. C. P. Hart, Dr. C. S. Minot, and Dr. C. W. Stiles The Association was called to order by the President, and in the absence of Secretary Marlatt, Mr. A. H. Kirkland was

chosen secretary *pro tem.* The address of the retiring president, Prof. F. M. Webster, treated of "The Present and Future of Applied Economic Entomology in the United States," and contained, among other very interesting features, an admirable tribute to the value of the systematist and a somewhat caustic criticism of the "species maker," helpful suggestions for the Experiment Station worker, and a very frank discussion of the unfortunate results which attend the attempts sometimes made to combine politics and science.

The following were elected to active membership :

A. T. Britton, New Haven, Con.

G. B. King, Lawrence, Mass.

Gerald McCarthy, Raleigh, N.C.

E. P. Felt, Albany, N.Y.

A. F. Burgess, Malden, Mass.

W. B. Barrows, Agricultural College, Mich.

R. H. Pettit, " " "

W. S. Blatchley, Indianapolis, Ind.

The following were elected foreign members :

Claude Fuller, Richard Helm, both of Perth, West Australia, and W. W. Froggatt, Sydney, New South Wales. These additions increase the numbers of this Association to 93 active and 31 foreign members.

Prefacing his remarks with a brief review of the damage by the larvæ of *Orgyia leucostigma* in Washington during the summer of 1895, and the important influence of parasites in controlling this outbreak, Mr. Howard presented the following papers :

ADDITIONAL OBSERVATIONS ON THE PARASITES OF ORGYIA LEUCOSTIGMA.

In Bulletin No. 5, Technical Series, Division of Entomology, United States Department of Agriculture, entitled "A study in Insect Parasitism," it was shown that following an extensive attack by *Orgyia leucostigma* upon the shade trees of Washington, which culminated in August, 1895, there was an extraordinary development of parasites. Thirty-five true parasites were reared, of which fifteen were primary hymenopterous parasites and six primary dipterous parasites, fourteen species being hymenopterous hyper-parasites. In the autumn of 1895 about 90 per cent. of the caterpillars were destroyed by primary parasites, the vast majority of these being hymenopterous and the bulk of the work being done by *Pimpla inquisitor* and *Chalcis ovata.* In the spring of 1896 so many of these primary parasites had successfully hibernated that they were in position to almost annihilate the first brood of caterpillars, already weakened greatly in numbers by the extensive parasitism of the previous autumn. In the later months of 1896, however, an extensive hyper-parasitism began to be effective, and the principal primary parasite, *Pimpla inquisitor*, was almost killed off by its own hymenopterous parasites and principally by *Dibrachys boucheanus.* Tertiary parasitism was noticed at this time, but was not especially effective, and the Orgyia had begun to recuperate in numbers at the close of 1896. Several careful accounts in July, 1896, showed the percentage of parasitism to be 98.8 per cent., and the numerical details of the parasites concerned were found in one instance to be as follows :

On June 30 and July 8, 1896, 624 cocoons of the tussock moth were collected

without discrimination from the trunks of trees in the United States Department of Agriculture park. From these 624 cocoons issued the following parasites :

	Specimens.
Pimpla inquisitor	729
Bathythrix pimplæ	13
Limneria valida	1
Theronia fulvescens	1
Chalcis ovata	69
Dibrachys boucheanus	50
Asecodes albitarsis	1
Frontina aletiæ	7
Frontina Frenchii	14
Tachina mella	12
Euphorocera claripennis	15
Exorista griseomicans	4
Total	916

The part played by dipterous parasites up to the winter of 1896, when the bulletin in question was published, had not been great, only 187 specimens in all having been reared. All the species were well-known Tachina flies of wide distribution and general parasitism.

A recuperation in numbers of the Orgyia was quite marked in the spring of 1897, and additional and heretofore unreported observations were made. So great had been the destruction of *Pimpla inquisitor* that in these observations this species did not appear in a single instance! Another hymenopterous parasite, *Chalcis ovata*, became prominent, and it is worthy of note that while secondary parasites of this species are strongly suspected, it is not absolutely known to have any, A striking feature, however, was the great increase in the number of the dipterous parasites. The rearings were conducted on a large scale, and the following table affords an interesting comparison to the one just given.

Five thousand larvæ and pupæ of *Orgyia leucostigma* were collected July 6 to 9, 1897. From these there had issued up to August 2 the following parasites :

	Specimens.
Tachina mella	220
Frontina Frenchii	355
Euphorocera claripennis	464
Exorista sp	13
Helicobia helicis	4
Phorocera sp	45
Chalcis ovata	551
Apanteles parorgyiæ	3
Dibrachys boucheanus	10
Total	1,665

Of these it will be noticed that more than two-thirds (1,101) were dipterous, while the previous summer dipterous parasites had constituted only about one-twentieth of the number reared.

From the 5,000 cocoons there issued also 321 male moths and 764 female moths; 146 of the caterpillars or chrysalids died from a disease which we have for convenience called "black rot," and 33 from another disease which for the same reason we have called "red rot."

In percentages the result may be expressed as follows :

	Per cent.
Moths	21 07
Dipterous parasites	22.02
Hymenopterous parasites	11 02
Disease	3.58
Total	57.69

This leaves about 2,000 chrysalids dead from causes not yet ascertained. From careful examination of a small proportion of them it seems probable that from 400 to 500 have been killed by parasites which have died without emerging. There still remain also about 200 dipterous puparia in the rearing cages, from which the adults may still emerge. That the majority of the remainder have died from disease seems probable. The mortality ratio was, therefore, 79 per cent., as against 98.2 per cent. at a corresponding time last year ; and, while last year hymenopterous parasites were responsible for nearly the whole of the mortality, this year they brought about not more than 15 per cent.

These additional observations only accentuate the extraordinary features of the parasitism of this lepidopterous insect. The multiplicity of factors upon which its increase and decrease depend and the important interrelations of the species concerned are astonishing to one who has not especially studied this phase of insect life.

TEMPERATURE EXPERIMENTS AS AFFECTING RECEIVED IDEAS ON THE HIBERNATION OF INJURIOUS INSECTS.

It is a well-known fact among agriculturists and horticulturists that winter weather of a steadv degree of severity is more favorable to plant growth than an open winter with alternating freezes and thaws. With regard to certain injurious insects it has become an accepted idea among economic entomologists that this same principle will hold, yet the question comes to all of us from farmers and others with a considerable degree of frequency as to whether a given winter which has been unusually severe will not have resulted in the destruction of injurious insects to such an extent as to promise comparative immunity the coming season. We have been obliged, or at least the writer has been obliged, to answer such questions theoretically. There has been no exact experimentation, so far as he is aware, along this line. It is, therefore, with pleasure that he calls attention to the results of recent experimentation by Dr. Albert M. Read, of Washington, the manager of the cold storage department of the American Security and Trust Company, and the same gentleman who conducted the experiments on the effect of cold storage upon household insects referred to in a paper read by the writer before the last meeting of this association. Dr. Read has found in the course of his experiments, which have now extended over two years, that a constant temperature in the neighborhood of 18° F. will not destroy the larvæ of *Tineola biselliella* or of *Attagenus piceus*, but that an alternation of a low temperature with a comparatively high one invariably results in the death of the larvæ of these two insects. For example, if larvæ of either which have been kept at a temperature of 18° F. are removed to a temperature of from 40° to 50° F. they will become slightly active, and when returned to the lower temperature and kept there for a little time will not revive upon a transfer to the warmer temperature.

It is thus rather satisfactory to have experimental proof in support of previously accepted but more or less theoretical ideas.

Mr. Rolfs had noticed that after severe frosts and cold in Florida there was an abundance of northern insects, especially Orthoptera.

Mr. Craig described the severity of the winter of 1896-97 in Canada, when there was severe cold but little snow. This year, throughout southern Canada, plant-lice were present in tremendous numbers on apple, plum, cherry, and other trees.

In the general discussion which followed, the fact was brought out that plant-lice had been particularly abundant throughout Canada and the United States during the past summer.

Mr. Howard pointed out the fact that this abundance was probably due to the wet weather of late spring and early summer, which had checked the feeding and multiplication of the natural enemies of the plant-lice.

Mr. Minot stated that in the vicinity of Milton, Mass., injurious insects had been quite scarce during the past summer; fewer potato beetles had been noticed than for many years, while rose-chafers and tent-caterpillars were equally scarce. He also had noticed the great abundance of plant-lice early in the season, but after the extreme hot weather of the first week of July their numbers greatly diminished.

Mr. Howard emphasized the fact that hot weather played a very important part in controlling plant-lice. He cited an instance where, several years ago, Mr. Barrows had called his attention to the extraordinarily large number of plant-lice upon certain shade trees of Washington, D.C. The following day the temperature reached the maximum of 100° F., and as a result the plant-lice disappeared like magic.

Mr. Ashmead called attention to the fact that the family of plant-lice was not extensive in the tropics, thus supporting the theory previously discussed.

Mr. Barrows stated that the condition in Michigan regarding plant-lice was probably the same as that in Canada. He was of the opinion that the great abundance of these insects in Michigan during the past summer was probably due to the large number present last year. While examining the orchards for the San José scale last winter his attention was attracted by the remarkable quantities of plant-lice eggs deposited on young nursery stock and on orchard trees. So numerous were these eggs in some cases that the trees had the appearance of being varnished. His experience agreed with that of Dr. Howard, that hot weather was a most important factor in controlling the increase of plant-lice. Referring to Mr. Howard's first paper, Mr. Barrows spoke of the general lack of appreciation of the value of such experiments as those described and the lack of careful observations concerning the relation of temperature effects to the increase or decrease of injurious insects in connection with the abundance or absence of their natural enemies. A man might have observed a decrease or increase over the normal of the temperature for the winter of 1895-96 and arrived at the conclusion that this had been the chief factor in checking the outbreak of the Orgyia caterpillar, thus neglecting to take into account the action of the parasites. There was great need for careful and exhaustive observations whenever temperature effects are associated with the abundance or scarcity of any insect.

Mr. Webster called attention to the fact that the great numbers of aphides in Ohio nurseries this year had seriously injured a large quantity of young, rapidly growing stock.

An abstract of "Notes on Certain Species of Coleoptera that Attack Useful Plants," by F. H. Chittenden, was read by the Secretary *pro tem.* These notes treated chiefly of the food plants and habits of certain Chrysomelids. "An Experience with Paris Green," by T. D. A. Cockerell, was also read by the acting Secretary.

A letter from Miss E. A. Ormerod called particular attention to the fact that the house sparrow had been very abundant and very obnoxious in certain parts of England, and it seemed probable that some legislation or public measures would need to be adopted to control this bird. The arrival from Tripoli of a cargo of wheat, badly infested by the Angoumois moth, was recorded and reference made to the occurrence in injurious numbers of *Xyleborus dispar* at Toddington.

Prof. P. H. Rolfs presented notes on "A Fungus Disease of the San José Scale." This disease seems to be confined to the southern part of the United States, but is very

helpful to fruit growers there. The scale has been almost eradicated from several orchards by means of it. Laboratory and field experiments now in progress promise hopeful results, but it does not seem probable that this disease will be of value in the northern part of the United States, since warmth and moisture are necessary for its development.

The next paper, treating of the same insect, was presented by Mr. Barrows :

THE PRESENT STATUS OF THE SAN JOSÉ SCALE IN MICHIGAN.

So far as we have any knowledge, the San José scale first came to the notice of the State Experiment Station May 14, 1896, when it was found on a single fruit tree in Jackson, and the tree was destroyed soon after. The origin of the affected tree was not ascertained, and as no other occurrences were reported from the vicinity it was supposed that no further trouble would result. In December following, however, it became evident from its invasion of the States adjoining Michigan on the south that our own State was in serious danger, and on application to the New Jersey nurserymen who were supposed to have sent out infested stock, a list of several hundred Michigan addresses was received by the horticulturist of the station, and a circular letter describing the scale and its work was sent to each address. Comparatively few replies to this letter were received, but among them were some which indicated the presence of the scale, and further enquiries showed its presence in several places.

During the winter many different parts of the State were visited in quest of the pest, but the severe weather, the lack of time, and especially the number and extent of the suspected orchards, made anything like thorough inspection impossible. The scale was located in greater or less abundance at half a dozen widely separated points, and this number has been increased by as many more through correspondence and the transmission of specimens. At present the scale is positively known to have existed in the ten counties, and in no case is there positive proof that it has been entirely eradicated.

In Ottawa County the infested stock was received from New Jersey in the spring of 1890, and thus had been established almost seven years before it came to the knowledge of any entomologist. During this time it had killed all or nearly all the trees on which it was brought, and had spread to all the other fruit trees in the immediate vicinity, some of which also had succumbed. Probably at this place several acres were badly infested, and of course it is to be feared that the scale has been carried to other orchards in the neighborhood.

In Ingham County one locality was found in the city of Lansing where the fruit trees about two houses and in their gardens were badly affected, and the scale had overrun rose bushes, currant bushes, grape vines, and even one or two shrubs of Spiræa. In this case the scale was originally brought on pear trees which were bought from a resident dealer in 1888 or 1889. The trees were said to have been obtained in New York State, but, as the dealer is known to have been unreliable, and as very few trees were true to name, it is not likely that any dependence can be placed on the statement. It is more than probable that the stock came from New Jersey, and that other parties in the vicinity have introduced the scale through the same dealer.

In still another case (and county) a dealer is known to have handled stock which was infested with the scale, and that at least five or six years ago, so that it is fair to assume that this pest is now pretty widely and thoroughly distributed through the fruit-growing parts of the State, and we may expect to find it in large quantities in all the counties of the four southern tiers, and yet farther north along the west side of the State. Since the scale thrives in Ingham and Ottawa counties it is likely to winter safely still farther north, and as yet the life zones in Michigan are so poorly defined that it is impossible to draw any line beyond which we may safely predict that the scale cannot live. * * * When we know more of the geographical distribution of life in Michigan, it may be possible to define with precision the limits beyond which the San José scale will

not become established, but at present we must consider the entire southern half of the Lower Peninsula as in danger of serious infestation, together with a strip of uncertain width bordering Lake Michigan at least as far north as Grand Traverse Bay.

It is too early yet to make any predictions as to the ultimate success or failure of attempts to limit by legislation the spread of the scale in Michgan. The last legislature passed a bill which takes effect late in the present month (August) requiring the inspection of all nursery stock offered for sale in the State, whether home grown or from outside, and compelling inspection and treatment of all suspected orchards or fruit trees wherever found. The bill as originally drawn was not, of course, altogether satisfactory, either to the nurserymen or the fruit growers, and during its passage through the legislature its strength was still further impaired by sundry concessions which seemed to be necessary in order to secure its adoption. It is hoped, however, that its provisions may be thoroughly enforced and its efficacy tested during the coming year, so that, if necessary, better measures may be provided by our next legislature.

In the discussion which followed these two papers, Mr. Craig stated that the condition in Canada relative to the San José scale was quite similar to that of Michigan. This insect had been found in British Columbia and in Ontario. In the latter Province there were seven well authenticated occurrences, these being probably in the upper austral region. Mr. Craig's investigations showed that the San José scale had been present in Canada for at least four years and came originally from two New Jersey nurseries, whose proprietors had kindly enabled him to trace the shipments of infested stock. Mr. Craig was of the opinion that the scale would do the greatest damage in the peach-growing region where, as early as July 1, 1897, he had found the young scales securely fixed on young, growing wood. Fungus cultures, received from Professor Rolfs, had been used in inoculation tests in the laboratory, but with no practical results as yet. It seemed probable that an endeavor would be made to obtain legislation with a view to preventing the shipment of infested nursery stock to Canada.

Mr. Howard inquired as to the known geographical distribution of the fungus disease. Mr. Rolfs said that, to the best of his knowledge, this disease was chiefly confined to the southern part of the United States. It had been found in Alabama, Georgia, South Carolina, and in one instance in Pennsylvania. It was most abundant at Auburn, Ala.

A paper from Prof. C. P. Gillette on "Insects taken at Light and Sugar," evoked considerable discussion, and was followed by "A Study of the Possible Origin and Distribution of the Chinch Bug," by Prof. F. M. Webster. The author advanced the idea that this insect had originated in the southern part of the United States and spread by two diverging streams up the Mississippi valley and along the eastern Atlantic coast. In the former region the long winged form predominated, while the coast form was short winged. In the discussion following this paper the general opinion seemed to be that the length of the wings depended upon environment rather than heredity. Mr. C. W. Mally recorded the capture at Ohio of a specimen having one long and one short wing, thus throwing additional light upon the relationship between the two forms.

"Notes on the Common House Fly," by Mr. Howard, gave the negative results of a series of experiments with lime, land plaster, etc., used to destroy the larvæ of the house fly. He emphasized the necessity of greater cleanliness in the management of horse stables

A paper from Mr. Gillette on "Vernacular Names of Insects," was read and referred to a committee consisting of Messrs. Howard, Fernald and Lintner. A communication from C. P. Lounsbury, giving very interesting notes on "Cape of Good Hope Insects," particularly the locusts of that region, was then read.

Mr. H. G. Hubbard presented an account of the "Insect Fauna of the Giant Cactus," recording the capture of a large number of insects on this plant and giving notes on their habits.

Mr. Howard described "A Valuable Coccid," lately discovered in Arizona and New Mexico, from which, by suitable treatment, a good grade of white wax could be obtained.

The refuse from this operation is of the nature and consistence of India rubber and may be of commercial value.

"Notes on Insects of the Year," by Messrs. Webster and Mally, recorded interesting experiences with several of the common insect pests. The negative results of a series of experiments with kainit, against the insects attacking the roots of the grape, caused considerable discussion, and the need for further experimentation along this line was pointed out.

A paper by A. H. Kirkland on "Preparation and Use of Arsenate of Lead," detailed a method of preparing this insecticide at a cost of about seven cents per pound. Work against the gypsy moth was mentioned, and the condition of the infested region was reported as generally better than that of last year. This undertaking, however, is still handicapped by insufficient financial support.

"A Malodorous Carabid," by Mr. Barrows, gave extensive notes on the annoyance and discomfort caused by the almost unbearable odour of this insect, *Nomius pygmæus.*

Among the papers read by title only, owing to the absence of their authors, but afterwards presented in the official report of the meeting, was a very valuable one by Mr. Marlatt, of the Division of Entomology, Washington, entitled "Notes on Insecticides," from which the following extracts are taken :

Soap as an Insecticide.

There is no more unsatisfactory substance to work with against insects than soap, for the reason, previously pointed out, of the extreme uncertainty of the composition and characteristics of any brand that is secured. The most earnest efforts on our part to get manufacturers to make a definite brand of soap which approached our ideal, and to keep the stock at a uniform and reliable strength and character, have been entirely unsuccessful, and we have not been able to get any two consecutive lots of soap having the same characteristics or value for insecticide purposes.

Pure Kerosene.

The discussion of this substance at the last meeting of the Association led to some additional experiments on our part with the use of pure coal oil or kerosene on plants. Various trees, including young and vigorous peach, pear, cherry and apple trees, euonymus bushes, and some old bearing peach trees, were thoroughly sprayed with pure kerosene early the past spring, with one exception, before the buds had begun to swell. In the case of two large bearing peach trees the blossom buds were swelling and opening and these trees were also badly infested with *Diaspis lanatus.* The other plants, with the exception of the euonymus bushes, were healthy and free from all insects. Much to my surprise and astonishment, no ill effects of any moment resulted in the case of any of the trees sprayed with kerosene. In the case of all the trees spraying was continued just long enough to moisten the plants thoroughly, but not to cause the oil to run down the trunks and collect about the base, and with the young trees the soil was carefully mounded up and pressed about the crown to avoid all danger of the oil collecting at that point.

The pear trees treated, and also the peach, came out in full bloom, the opening of the blossom buds not being at all interfered with by the oil bath. After the bloom fell the peach trees treated with pure oil made much finer growth than untreated trees. This may have been in part due to the more favorable location of the trees, and possibly also to the fact that in the treatment with the coal oil the eggs of Aphides on the trees had been entirely killed, whereas on the untreated trees a very bad infestation with plant lice developed early and checked the growth of the trees, killing some of them. No Aphides, however, appeared on the sprayed trees. In the case of the pear trees particularly, and also the apple, the unfolding of the leaf buds was very noticeably delayed as compared with untreated plants, the buds seeming to open up much more slowly, and for two weeks at least the difference was very marked. Very soon thereafter, however,

the treated trees overtopped the others both in abundance of foliage and amount of new growth, and at the present writing, July 20, there seems to have been no injury whatever as a result of the treatment.

The large peach tree sprayed showed no ill effects, and all of the scales on the tree were killed except where they had been protected in a few instances by masses of leaves webbed about the limbs. At least 99 per cent. of the scales were killed. On the euonymous a similar result was shown, at least 99 per cent. of scales having also been killed by the oil.

These results are so greatly in contrast with those previously attained in the experiments conducted in practically the same way that it seems difficult to account for them. That spraying with pure oil will often kill trees can not be doubted, even when applied in the dormant condition in winter, as demonstrated by experiments on a number of apple and peach trees two or three seasons ago. It is possible that with these earlier experiments the same care was not employed to prevent the collection of oil about the trunks of the trees and the trees were not mounded up, but the work was as carefully done as would ordinarily be the case in actual practice, and probably much more so. It is possible, therefore, that the death of the trees in some instances was due to the collection of the oil in the cavity formed about the trunk by the swaying of the trees in the wind, which, as will be shown later, has had disastrous results in California with the emulsion even. Others have reported the use of oil on trees without injurious effects in some instances and in others with injurious effects, so that pure oil as an insecticide is one to be used with caution and with full appreciation of the fact that the death of the plant may result.

Use of Kerosene Emulsion in California.

This insecticide is used to a very considerable extent in California, much more so in recent years than formerly. It is the principal insecticide used in the district about San Diego, and is also used extensively at Santa Barbara and to a less extent elsewhere in the State. The necessity for the use of very large quantities of insecticides in California has led to the establishment by private parties in several instances of steam or gasoline plants for the wholesale production of this insecticide. Probably the first extensive manufacturing plant of this sort was set up by Mr. W. R. Gunnis, county horticultural commissioner, of San Diego, who manufactures the emulsion by the aid of a small engine, doing all the work of heating, churning, etc., by this means. With coal oil at 11 cents per gallon, he is able to produce the emulsion at a charge of 13 cents per gallon in the undiluted state, which makes the wash as applied to the trees, diuted 7 times, cost a little over 1½ cents per gallon. In his district, Mr. Gunnis claims that the loss from scale insects has been reduced from 79 per cent. to 7 per cent., chiefly by the use of this wash.

At Santa Barbara the superintendent of the Las Fuentos ranch, Mr. Frank Kahles, has set up a very large plant for the manufacture of kerosene emulsion for the use of this ranch alone. The plant is similar to that devised by Mr. Gunnis, and the capacity is such that the emulsion can be made in quantities of 150 gallons at a time and very rapidly. He uses a formula slightly different from the Hubbard. The proportions are 35 gallons of whale-oil soap, 100 gallons of kerosene oil, and 50 gallons of water. This is diluted for application to trees with seven parts water, costing in the diluted state 1⅜ cents per gallon.

Kerosene emulsion has probably been given its most extensive trial on the Pacific Coast at the Las Fuentos ranch. Two years since Mr. Gunnings sent his excellent spraying apparatus to Santa Barbara, together with some 8,000 or 10,000 gallons of emulsion, and thoroughly sprayed the lemon plantings, comprising upward of 25,000 trees.

In some of the earlier work many trees were killed, owing probably to the accumulation of oil in the bottom of the reservoir or tank, so that the last three or four trees with each filling received an unusually heavy dose, which, running down the trunk, col-

lected in the cavity about the crown caused by the swaying of the trees in the wind. The accumulation of oil in this way may be prevented by giving the tank a conical bottom, so that the liquid may be thoroughly exhausted each time before refilling, and as a further precaution, before treating, the trees may be mounded up about the base and the earth thoroughly compacted. With these precautions no injury has resulted from the later sprayings. The treatment kills the young of the black scale and the fungus breaks up and soon peels off.

Lime, Salt, and Sulphur Wash.

As the members of the Association are aware, this is the almost invariable remedy for the San José scale on the Pacific slope, and as a rule it is undoubtedly effective. Our experience with this wash in the East had thrown doubt on its real efficiency as an insecticide, and it has been clearly demonstrated that under the climatic conditions east of the Alleghanies it is almost valueless. In California, however, after a careful study of the facts in the field, I am compelled to admit that the demonstration of its usefulness against the San José scale is complete and the benefit of its application to orchards is most manifest. In the vicinity of Pomona, Cal., unsprayed orchards were badly infested with San José scale, while in adjoining sprayed orchards the scale was entirely killed and the trees were rapidly recovering and showing vigorous and healthy new growth. In contiguous orchards, also, of the same kinds of trees, similarly treated so far as cultivation is concerned, the trees which had been subjected to yearly spraying were at least one-third larger than untreated trees. This wash is of value also as a fungicide, protecting stone fruits from leaf fungi, and is also a protection against birds, the common California linnet doing great damage to buds in January and February. The wash is almost invariably made and applied by contractors, and costs about 5 cents per gallon applied to the trees. It is a winter application, being applied in January and February.

Along the coast region and in northern California, where moister conditions prevail, this wash is very much less successful, bearing out somewhat the experience of the East, and doubtless explained by the similarity of climate in the districts mentioned with that of the Atlantic seaboard In making this wash the chief consideration seems to be prolonged boiling. The wash itself is practically a sulphide of lime, with much free lime and salt carried with it. Prolonged boiling will result in taking up temporarily additional sulphur, and will perhaps add to its caustic properties if it is applied very hot; on cooling, however, it reverts to the simpler tri- or bi-sulphide of lime. The proportions of the ingredients and the method of combining them vary slightly in different sections. The following is the ordinary formula: Unslaked lime, 40 pounds; sulphur, 20 pounds; salt, 15 pounds; one-fourth of the lime is first slaked and boiled with the sulphur in 20 gallons of water for two or three hours; the remainder of the lime is slaked and together with the salt is added to the hot mixture and the whole boiled for half an hour or an hour longer. Water is then added to make 60 gallons of wash. This wash is applied practically every year, or as often as the San José scale manifests itself in any numbers. In the coast region and in the northern part of the State it is necessary to apply it with greater frequency than in the interior districts.

Arsenicals and Lime.

The advantage of the employment of lime with Paris green or London purple having been called in question at the previous meeting of this association, the matter was again made the subject of experimental test, and the old belief of the decided protective value to the foliage of the addition of lime was fully and strikingly demonstrated.

At the final adjournment of the session it was voted to hold the next meeting at Boston, Mass., Aug. 19th and 20th.

Several resolutions were passed, among which were (1) a resolution requesting the publication of the proceedings as a bulletin of the Division of Entomology, U. S. Dept. of Agriculture and (2) expressing familiarity with the efforts of the State of Massachusetts to exterminate the gypsy moth and commending the results already accomplished.

The election of officers resulted as follows:—President, Herbert Osborn, Ames, Iowa ; 1st Vice-president, Lawrence Bruner, Lincoln, Neb.; 2nd Vice-president, C. P. Gillette, Ft. Collins, Colo.; Secretary and Treasurer, C. L. Marlatt, Washington, D. C.

James Fletcher, LL.D., F.R.S.C, F.L.S.

We are happy to be able to prefix to our twenty-eighth Annual Report, an excellent portrait of Dr. James Fletcher, whose name is a household word among Entomologists not only in Canada, but throughout North America, and in many parts of the world besides. Born and educated in England, Dr. Fletcher came to this country when a young man as a junior officer in the Bank of British North America, and soon began to devote his leisure hours to the study of insects and plants. Find the work of a bank by no means congenial to his literary and scientific tastes, he obtained a position as assistant in the Library of Parliament at Ottawa. It was not long before his talents and attainments in botany and entomology became widely known, chiefly through his contributions to the *Canadian Entomologist* and the Annual Reports of our Society. His first paper in the latter was an article on Canadian Buprestidæ, which was published in 1878, while his first contribution to the Magazine appeared in January 1880. During all the years that have followed no volume of either publication has been issued without some valuable articles from his pen.

In 1878 he became a member of the Council of the Entomological Society of Ontario and every year since has been elected to hold some office in the Society, being four times Vice-president and for three years, 1886-8, President. In 1879 he was one of the originators of the Ottawa Field Naturalists' Club, the most successful society of the kind in the Dominion, and more recently he suggested, and by his influence and energy, accomplished the formation of the important Association of Economic Entomologists of North America.

The first official recognition of his attainments was in 1885, when he was appointed Honorary Entomologist to the Department of Agriculture at Ottawa, and in that capacity, though much hampered by his duties in the library, he published a valuable report on the injurious insects of the year. Two years later his present position of Entomologist and Botanist to the experimental farms of the Dominion was conferred upon him. In the ten years that have now gone by, he has done an enormous amount of valuable work as shown in his Annual Reports and Evidence before the Standing Committee of the House of Commons on Agriculture, his voluminous correspondence with farmers and fruit growers all over the Dominion, and his addresses to Farmers' Institutes and other gatherings. No one in this country has done so much as he to instruct the people in a practical knowledge of their worst insect foes and the best methods of dealing with them, while probably no one but he could have given the Province of Manitoba the information and the advice that he has repeatedly afforded by his lectures, addresses and publications on the noxious weeds of that portion of the Dominion. All his friends will, we are sure, unite with us in the earnest wish that he may long be spared to carry on his admirable work which is of such vast importance, not only to those directly interested in the products of the soil, but to all the dwellers throughout this wide Dominion.

C. J. S. B.

BOOK NOTICES.

INSECT LIFE; AN INTRODUCTION TO NATURE-STUDY AND A GUIDE FOR TEACHERS, STUDENTS AND OTHERS INTERESTED IN OUT-OF-DOOR LIFE: By John Henry Comstock, Professor of Entomology, in Cornell University and in Leland Stanford Junior University, with many illustrations engraved by Anne Botsford Comstock. New York, D. Appleton and Company, pp. 340, with 6 plates and many figures. Price $2.50.

In this little book Prof. Comstock has given us a treatise, not only of practical value to teachers and amateurs, but also one that the professional worker will find very handy to have just within reach in order to settle some minor point that may suddenly present itself. Best of all, however, is the fact that the work is correct, a feature quite in contrast with some of the ordinary text-book entomology. There need be no hesitation about recommending this book to anyone, as its style, while not especially technical, is even more or less poetical, yet is never flippant or slipshod in expression. The illustrations are fine and are not simply pictures, but help to simplify the text; almost anyone who is at all versed in entomology will at once recognize the Katy-did on the cover. There is just one fault to be found with the book, and it is very doubtful if this is to be attributed to the author, and this is the title. A fascinating title may help to sell a novel, or some such work as that, but publishers should learn that this is not true with such books as this. However, it is no discredit to the author that his book should be found better than its title. For the present, and until there is something much better, I shall recommend this book to those who wish a simple and accurate introduction to the difficult study of entomology. F. M. W.

STORIES OF INSECT LIFE: By Clarence Moores Weed, Ginn and Company, publishers, Boston, U.S.A, and London, pp. 54, with many illustrations. Price 25c.

The title indicates the nature of the book, and no one will mistake the figure of the well known "Mourning Cloak" Butterfly on the front cover, even though no attempt was made in the way of colour. This is for the young people, and just the thing for boys and girls who are romping and playing over the fields and meadows, securing that most important element in an education, health. The insects treated of are the most common, and this is a great advantage because it is usually the things that are the nearest to us that we know the least about. Get the children to observe the common things carefully, and they will be all the better prepared to look after the uncommon later on in life. I only wish that some philanthropist would buy up the whole edition of this work and present them to the school children of the country. Surely it would help to make better men and women of many boys and girls, and open up them a world of wonders that are to be seen by any, no matter how lowly, provided they only know how and where to look. F. M. W.

GUIDE TO THE GENERA AND CLASSIFICATION OF THE NORTH AMERICAN ORTHOPTERA: By S. H. Scudder. 8vo. pp. 89. W. H. Wheeler, Cambridge, 1897. Price, $1.00.

The above volume, like all of Dr. Scudder's books, is exactly what the title states. It is simply a guide for the use of students of the Orthoptera by means of which they may determine the genera of their specimens. It consists of excellent and most carefully prepared tables of the seven families into which the Orthoptera of North America are divided. These are followed by most valuable bibliographical notes in which the student is referred under the head of each family of insects to all the works which refer to it. Then follows a full list of all the works which refer to North American Orthoptera, arranged alphabetically by authors and a complete index. All who have attempted to study Orthoptera know how badly such a book was wanted, and it is well for the science of entomology that the work was done by such a careful and experienced hand.

J. F.

THE GENERA OF NORTH AMERICAN MELANOPLI: By S. H. Scudder. (Proc. Am. Acad. of A. and S. V. 32, pp. 195-206, January, 1897.)

Almost simultaneously with Dr. Scudder's "Guide to the Genera of Orthoptera" two other important and extremely useful papers appeared, one on "*The Genera of North American Melanopli*," and the other on "*The Species of the Genus Melanoplus.*" These are both really advance issues of chapters in Dr. Scudder's great work on the Melanopli, which is to be published by the U. S. National Museum. The *Melanopli* are divided into thirty genera, seventeen of which are new and four have been previously published by the author. The genus *Melanoplus* is characteristically American and is widely disseminated. There are 131 species recognized, grouped under twenty-eight series. The name *furcula* is given to the processes of the last dorsal segment of the male abdomen. J. F.

THE BOOK OF BRITISH BUTTERFLIES: A practical manual for Collectors and Naturalists; 1 vol. pp. 247 (3s. 6d.)

THE BOOK OF BRITISH HAWK-MOTHS: A popular and practical Hand-book for Lepidopterists; 1 vol. pp. 157 (3s. 6d.)

By W. J. Lucas, B. A. London: L. Upcott Gill, 170 Strand, W. C.

Many excellent works on British butterflies have been published during the last twenty-five years and one would naturally suppose that there was little need of another book on the subject. Mr. Lucas, however, has succeeded in producing a very useful and excellent popular manual, which will be a welcome aid to those who wish to study the life history of butterflies as well as to identify the specimens they may collect in the British Isles. As it is intended for those who have made no previous study of the subject, the author begins at the beginning, telling the reader what an insect is, what place the butterfly takes in nature, how to capture, set and care for specimens, and then describes each British species from the egg to the imago in clear and simple language, and in almost every instance gives admirable drawings of the caterpillar, chrysalis and both surfaces of the imago. As there are no less than 266 figures in illustration of sixty-eight species, the collector should have no difficulty in determining any specimen of butterfly in any of its stages (except the egg) that he may chance to find. A book such as this should give a great impetus to the study of the preparatory stages of British butterflies, a section of entomology which is usually neglected in favor of the mere collection and arrangement of the perfect insects. A volume such as this on Canadian butterflies would be a very welcome aid to a large number of young people whose interest has been aroused by the beauty and variety of our species, but whose enthusiasm is dampened by the difficulty of obtaining any information about them.

"The Book of British Hawk-moths," by the same author, deals with a somewhat less familiar group, and gives much useful information that it would otherwise be hard to find. The plan of the work is similar to that of the butterfly book, and it is written in the same clear and simple style. As there are only seventeen species to deal with, the writer is able to go more fully into details respecting them and to make his work all the more complete and popular. He has also provided artificial keys to the larvæ and imagines, and tables for distinguishing the species where there is more than one representative of the genus. The fifteen plates with which the volume is illustrated are very beautiful and are admirably drawn by the author himself. Each species is represented life size, and is shown as a caterpillar on its food plant, chrysalis and imago. There are eighteen wood cuts for the most part illustrating details of structure. It is to be hoped that the author will continue his good work until he has completed the British lepidoptera, or at any rate the more conspicuous and familiar families. C. J. S. B.

LIFE HISTORIES OF AMERICAN INSECTS: By Clarence M. Weed. 1 vol. pp. 272. ($1.50). New York: The Macmillan Company.

The publication of a popular book on insects is so rare an event on this side of the Atlantic that we heartily welcome an addition to the number, especially when it is so

excellent and satisfactory as the volume before us. Dr. Weed has selected some five and twenty more or less familiar insects, and in a pleasant manner has given some account of their life histories. The chapters are quite independent of each other and arranged in no particular order; the book may therefore be opened at random, and the sketch that may be hit upon read without any detriment to the continuity of the work. Some of them which deal with such creatures as the leaf miners are naturally very brief since so little is known about these tiny foes to vegetation, but of other species which have been subjects of particular study on the part of the author we find long and full descriptions. Among the latter may be mentioned the interesting account of the hibernation of aphides, the chapter on "harvest spiders, the "army worm," etc. Anyone, young or old, who has any desire to read about the wonderful creatures that inhabit the world and to know something about their modes of life cannot fail to be pleased with this book, and to be led on we should hope to make his own observations of their curious habits and strange doings. The volume is handsomely illustrated with twenty-one full page plates and nearly 100 figures in the text. C. J. S. B.

INSECTS AND SPIDERS: Their Structure, Life Histories and Habits. By J. W. Tutt. 1 vol., pp. 116. (1 shilling). London: George Gill & Sons, Warwick Lane, E.C.

In the annual report of the Entomological Society of Ontario for 1896 much attention was paid to the subject of teaching natural history, and especially entomology, in schools, and the desire was expressed that some hand book might be drawn up for the assistance of teachers in rural schools. The volume before us is the very book that is needed, if only it dealt with Canadian instead of British insects. In England "Object lessons" are a compulsory part of the curriculum in elementary schools, and the teachers are required to give their pupils a series of simple lessons "adapted to cultivate habits of exact observation, statement and reasoning." These lessons are to be "on objects and on the phenomena of nature and of common life," and a wide discretion is thus left in the hands of the teacher. In the country schools of Ontario no subject could be more useful than the study in this way of the commonest species of injurious and beneficial insects, and no subject is likely to compare with it in interesting the pupils. A further advantage is the ease with which specimens can be obtained and their life histories traced. Mr. Tutt's volume is admirably adapted for the use of teachers in providing lessons of this kind. After giving a general account of the external structure of insects, their internal organs and metamorphoses, he devotes the "lessons" to typical common species of each order, giving similar particulars regarding the individuals and any general facts of interest that bear upon them. Each insect treated of is also illustrated with plates and wood cuts. It is not, however, a text-book for pupils, but is meant for the instruction and equipment of the teachers, affording them an excellent foundation upon which to frame the instructions they are to give to those committed to their charge.

C. J. S. B.

SUPPLEMENT.

AN ACT TO PROTECT CANADA AGAINST THE INTRODUCTION OF THE INSECT PEST KNOWN AS THE SAN JOSÉ SCALE.

Assented to March 18th, 1898.

Her Majesty, by and with the advice and consent of the Senate and House of Commons of Canada, enacts as follows :—

Short title.

1. This Act may be cited as *The San Jose Scale Act.*

Importation of nursery stock from certain places prohibited.

2. The importation of any trees, shrubs, plants, vines, grafts, cuttings or buds, commonly called nursery stock, from any country or place to which this Act applies is prohibited.

Penalty.

3. Any nursery stock so imported shall be forfeited to the Crown, and may be destroyed, and any person importing nursery stock from any such country or place, or causing or permitting it to be so imported, shall be deemed to be guilty of an offence under section 6 of *The Customs Tariff, 1897*, and shall be liable to the penalty prescribed by that section.

Application of Act to be regulated by Governor in Council.

4. The Governor in Council may from time to time declare that this Act applies to any country or place as to which it has been made to appear that San José Scale exists therein ; and, when satisfied that the importation of nursery stock from any country or place to which this Act has been applied may safely be permitted, he may in like manner declare that this Act no longer applies to such country or place.

Exemption of plants which are not liable to San José Scale.

5. The Governor in Council, upon its being made to appear to his satisfaction that any class of plants is not liable to the attack of the San José Scale, may exempt plants of such class, and grafts, cuttings or buds thereof from the operation of this Act.

Importation for scientific purposes.

6. The Governor in Council may from time to time, notwithstanding anything contained in this Act, permit the importation from any country or place to which this Act applies, of any such nursery stock as is required for scientific purposes.

Publication of Orders-in-Council.

7. All Orders in Council made under sections 4 and 5 of this Act shall be published in *The Canada Gazette.*

ORDERS IN COUNCIL.

At the Government House at Ottawa,
Friday, the 18th day of March, 1898.

PRESENT : HIS EXCELLENCY THE GOVERNOR-GENERAL IN COUNCIL.

His Excellency, in virtue of the provisions of section 4 of the Act passed during the present session of Parliament, cited as " The San José Scale Act," and by and with the advice of the Queen's Privy Council, is pleased to declare that the United States of America, Australia, Japan and the Hawaiian Islands shall be and the same are hereby declared to be countries to which this Act applies owing to the existence of the San José Scale in them.

JOHN J. MCGEE,
Clerk of the Privy Council.

At the Government House at Ottawa,
Friday, the 18th day of March, 1898.

PRESENT: HIS EXCELLENCY THE GOVERNOR-GENERAL IN COUNCIL.

His Excellency, in virtue of the provisions of section 5 of the Act passed during the present session of Parliament, and cited as "The San José Scale Act," and by and with the advice of the Privy Council, is pleased to order and declare that the following plants which are not liable to the attack of the San José Scale, viz. :—

1. Greenhouse plants, with the exception of roses,
2. Herbaceous perennials,
3. Herbaceous bedding plants,
4. All conifers,
5. Bulbs and tubers,

shall be and the same are hereby exempted from the operations of the above mentioned Act.

JOHN J. MCGEE,
Clerk of the Privy Council.

ONTARIO DEPARTMENT OF AGRICULTURE.

AN ACT TO PREVENT THE SPREAD OF THE SAN JOSE SCALE.

Passed January 17th, 1898

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

Short title.

1. This Act may be cited as *The San Jose Scale Act.*

Interpretation "Minister."

2. In this Act the word "Minister" shall mean the Minister of Agriculture for the Province of Ontario.

"Plant."

The word "plant" shall mean any tree, vine, shrub or plant, or any part of a tree, vine, shrub or plant, or the fruit of any tree, vine, shrub or plant.

"Scale."

The word "scale" shall mean the San José Scale insect in any of its stages of development.

Importation of diseased plants prohibited.

3. No person shall import or bring, or cause to be imported or brought into the Province of Ontario, for any purpose whatsoever, any plant infested with scale.

Having in possession or selling.

4. No person shall keep or have, or offer for exchange or sale, any plant infested with scale.

Scientific investigation.

5. For the purpose of scientific investigation the Minister may from time to time, by writing given under his hand, except such persons as he may deem proper, from the operation of the two preceding sections, and, while acting under such permission, such persons shall not be subject to the penalties imposed by this Act.

Notice to Minister on discovery of disease.

6. Any person having reason to suspect that any plant in his possession, or in his charge or keeping, is infested with the scale shall forthwith communicate with the Minister in regard to the same, and shall furnish the Minister with all such information in regard to the source or origin of the said infestation and the extent and nature of the same as he may be able to give.

Investigation and report.

7. Whenever the scale exists, or is supposed to exist on any plant, the Minister may direct a competent person to make an examination and inspection, and may order that any plant so infested, or such part as he may deem advisable, shall be immediately destroyed by burning, either by the person appointed to make the inspection or by the person owning or having possession of the said plant, or some other person so directed in writing, and the person so directed shall make a full report to the Minister in writing as to the nature and extent of the work so performed, together with a fair estimate of the value of the plant destroyed.

Destruction of diseased plant.

Duties of inspectors appointed under Rev. Stat. c. 280.

8. For the purpose of enforcing this Act, it shall be the duty of every inspector appointed under *The Yellows and Black Knot Act* to make careful examination and inspection for the occurrence of the scale within the municipality for which he is appointed, and to report forthwith every case of infestation, and neglect to make such report shall render the inspector liable to the penalties imposed under section 11 of this Act.

Right of access to places where tree is.

9. Any person appointed by the Minister under this Act to inspect or to destroy any plant for the purpose of enforcing the provisions of this Act, shall, upon producing his authority in writing, have free access to any nursery, orchard, store, storeroom or other place where it is known or suspected that any plant is kept.

Compensation for destruction of plants.

10. Upon the recommendation of the Minister there may be paid out of the Consolidated Revenue Fund of the Province to the owner of any plant so destroyed a sum not exceeding one-fourth of the value thereof (not including fruit) as reported upon by such officer or other competent person appointed as aforesaid ; but nothing in this section shall apply to any plant imported into the Province within a period of one year prior to the examination by the officer aforesaid.

Penalty.

11. Any person neglecting to carry out the provisions of this Act, or any person offering any hindrance to the carrying out of this Act, shall, upon summary conviction, be liable to a fine of not less than $20 nor more than $100, together with costs, and in default of payment thereof shall be subject to imprisonment in the common gaol for a period of not less than ten days nor more than thirty days.

Extension of Act to other scale insects.

12. The Lieutenant-Governor in Council may by order direct that other scale insects than the San José Scale may be included in the provisions of this Act, and thereafter during the continuance of such Order-in-Council the word "scale" in this Act shall include all such other scale insects. Public notice of such Order-in-Council shall be given by publication in two successive issues of *The Ontario Gazette.*

INDEX.